

FINAL

Endangered Species Act
2003/2003-2007 Implementation Plan
for the
Federal Columbia River Power System

APPENDIX: ACTION TABLE 3

Bureau of Reclamation
US Army Corps of Engineers
Bonneville Power Administration

October 2002

APPENDIX: 2003-2007 ACTION TABLES

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Guide to Action Tables

The Action Agencies have developed a database for planning and reporting of BiOp implementation measures. This database was used to produce the tables included in this Appendix. The database is undergoing continual refinement and some errors may be apparent. The Action Agencies are working together to maintain and update this database.

The tables provide detailed information about the Action Agencies' planned BiOp implementation projects. Each table shows a different grouping of the planned projects. To assist the reader, a sample of each Table is labeled below.

Table 1

2003-2007 Project Deliverables by Strategy and Substrategy		Report Title
Hydro		Category
1. Configure Dam Facilities to Enhance Juvenile & Adult Fish Passage & Survival		Strategy
1.1 Mainstem juvenile passage enhancement		Substrategy
320	Cylindrical Dewatering Evaluation (Corps)	BiOp Project id Project Title (lead agency)
2003:	P&S to remove prototype structure	Year: deliverable
2004:	Remove prototype structure	

Table 2

2003-2007 Project Deliverables by RPA		Report Title
Hatchery		Category
Hatchery NMFS 175		BiOp RPA Number
164	Safety-Net Coordinator (BPA)	Biop Project id Project Title (lead agency)
2003:	Coordination and integration of the completion of the four-step artificial propagation contingency planning process described in RPA 175 (Safety-net Artificial Propagation program [SNAPP]). Integration of SNAPP planning with Interior Columbia TRT planning.	Year: deliverable
165	Safety-Net Artificial Propagation Program – WDFW (BPA)	
2003:	FY 2003 deliverables and budget dependent upon results of Extinction Risk Analysis (SNAPP Step 1) to be conducted in FY 2002.	

Table 3 includes five reports that provide cross-references between the Action Agency BiOp Project Id (a unique identifier generated by the database that is permanently assigned to each Action Agency project), NMFS and USFWS BiOp action numbers (assigned in the NMFS and USFWS BiOps), Provinces/Subbasins, and ESUs. Reports 1 through 4 are intended to be cross-referenced with the detailed Project summary information provided in Report 5.

A brief description of each report is included below.

Report 1: Action Agency Projects for each NMFS BiOp Action

The report lists each Action Agency BiOp Project Id that is associated with a NMFS BiOp Action. A comprehensive description of each Project can be found in Report 5.

Report 2: Action Agency Projects for each USFWS BiOp Action

The report lists each Action Agency BiOp Project Id that is associated with a USFWS BiOp Action. A comprehensive description of each Project can be found in Report 5.

Report 3: Action Agency Projects for each Province and Subbasin

The report lists each Action Agency BiOp Project Id that is associated with each subbasin within a Province. A comprehensive description of each Project can be found in Report 5.

Report 4: Action Agency Projects for each ESU

The report lists each Action Agency BiOp Project Id that is associated with each ESU. A comprehensive description of each Project can be found in Report 5.

Report 5: Action Agency Projects Summaries

In order by BiOp Project Id, this report lists the Action Agency project summaries. When used as a cross reference with Reports 1 to 4, the reader can glean more detailed project information about BiOp implementation than may be available in the narrative portion of the Plan.

Table 3 - Report 1: Action Agency Projects for NMFS BiOp Actions

<i>BiopID</i>	<i>Project Title</i>
Hydro	
Habitat NMFS 028 - Water conservation improvements (Habitat)	
440	Pursue water conservation at USBR projects (Hydro) (USBR)
Habitat NMFS 029 - Report addressing water use without BOR authorization (Habitat)	
441	Investigate Unauthorized Use of USBR Water (Hydro) (USBR)
Habitat NMFS 030 - Supplemental, project-specific consultations (Habitat)	
442	Chief Joseph Project ESA Consultation with NMFS (Hydro) (USBR)
443	Deschutes Project ESA Consultation with NMFS (Hydro) (USBR)
444	Okanogan Project ESA Consultation with NMFS (Hydro) (USBR)
445	Tualatin Project ESA Consultation with NMFS (Hydro) (USBR)
446	Umatilla Project ESA Consultation with NMFS (Hydro) (USBR)
447	Yakima Project ESA Consultation with NMFS (Hydro) (USBR)
Hatchery NMFS 033 - Provide water supply temperatures for the Dworshak National Fish Hatchery (Hatchery)	
323	Modify Dworshak National Fish Hatchery System 1 Reuse System (Hydro) (CORPS)
Hydro NMFS 014 - Hatchery research, monitoring, and evaluation program (Hydro)	
313	Albeni Falls Operation (Hydro) (CORPS)
324	Dworshak Operations (Hydro) (CORPS)
329	Flow Objectives at McNary (Hydro) (CORPS)
330	Flow Objectives at Lower Granite (Hydro) (CORPS)
341	Libby Operations Andromous (Hydro) (CORPS)
374	Priest Rapids Flow Objective (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)
Hydro NMFS 015 - Provide flows to support chum salmon spawning at Ives Island (Hydro)	
318	Chum Flows Below Bonneville Dam (Hydro) (CORPS)
Hydro NMFS 016 - Provide access for chum salmon spawning in Hamilton and Hardy creeks (Hydro)	
318	Chum Flows Below Bonneville Dam (Hydro) (CORPS)
Hydro NMFS 018 - Meet the flow objectives and refill the storage reservoirs (Hydro)	
313	Albeni Falls Operation (Hydro) (CORPS)
324	Dworshak Operations (Hydro) (CORPS)
341	Libby Operations Andromous (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)
Hydro NMFS 019 - Operate specific FCRPS projects (Hydro)	
324	Dworshak Operations (Hydro) (CORPS)
341	Libby Operations Andromous (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)

Hydro

590	Hungry Horse Operations (Hydro) (USBR)
Hydro NMFS 020 - Operate the lower Snake River reservoirs within 1 foot of MOP (Hydro)	
339	John Day Minimum Pool Operation (Hydro) (CORPS)
361	Lower Snake projects Minimum Operating Pool operation (Hydro) (CORPS)
Hydro NMFS 021 - Identify opportunities to shift system flood control evacuation volumes (Hydro)	
377	Shift Flood Control to Maximize Snake River Water Storage (Hydro) (CORPS)
Hydro NMFS 022 - Implement VARQ flood control operations (Hydro)	
590	Hungry Horse Operations (Hydro) (USBR)
Hydro NMFS 023 - Operate Banks Lake at an elevation 5 feet from full during August (Hydro)	
589	Banks Lake Operations (Hydro) (USBR)
Hydro NMFS 024 - Provide 1 Maf of Treaty storage from January through April 15 (Hydro)	
500	Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
546	Request/Negotiate 1 MAF of Treaty storage with BC Hydro (Hydro) (CORPS)
Hydro NMFS 025 - Storage of water in non-Treaty storage space during the spring (Hydro)	
501	Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)
547	Up to 3.5 MAF flow augmentation from Candian storage in July and August (Hydro) (CORPS)
Hydro NMFS 026 - Shaping and release of water behind Canadian Treaty storage projects (Hydro)	
499	Report on use of Additional Canadian Storage To support mainstream flow objectives (Hydro) (BPA)
Hydro NMFS 027 - Zero net impact from any BOR commitment on ability to meet flow objectives (Hydro)	
439	Reclamation Water Contracts (Hydro) (USBR)
Hydro NMFS 031 - Environmental effects of operating Banks Lake up to 10 feet down (Hydro)	
448	Banks Lake Drawdown Study (Hydro) (USBR)
Hydro NMFS 032 - Acquire water for instream use from BOR's Upper Snake River basin projects (Hydro)	
449	Water Acquisition from Reclamation's Snake River Projects (Hydro) (USBR)
Hydro NMFS 034 - Draft Dworshak Reservoir to elevation 1,500 feet in September (Hydro)	
312	Adult Temperature Evaluation (Hydro) (CORPS)
Hydro NMFS 035 - Feasibility analysis of modifying current system flood control operations (Hydro)	
540	Evaluate Flood Control Operations to Reduce River Ecosystem Effects (Hydro) (CORPS)
Hydro NMFS 036 - Revised storage reservation diagram for Libby Reservoir (Hydro)	
548	Revise Storage Diagrams for Libby (Hydro) (CORPS)
Hydro NMFS 037 - Attraction of listed salmon and steelhead into wasteways and natural streams receiving waste	
450	Columbia Basin Project Wasteway and Drain Investigation (Hydro) (USBR)
Hydro NMFS 039 - Water quality characteristics of each point of surface return flows from the Columbia Basin Pi	
451	Return Flow Quality from Columbia Basin Project (Hydro) (USBR)
Hydro NMFS 040 - Transport all non-research juvenile salmonids at Snake River projects (Hydro)	
340	Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
557	Spill for Juvenile Fish Passage (Hydro) (CORPS)

Hydro**Hydro NMFS 041 - Bypass juvenile spring migrants collected at McNary Dam (Hydro)**

340 Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)

Hydro NMFS 042 - Maximize collection and transportation during the summer migration (Hydro)

340 Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)

557 Spill for Juvenile Fish Passage (Hydro) (CORPS)

Hydro NMFS 043 - Transport subyearling fall chinook at McNary when in-river conditions are deteriorating (Hydro)

340 Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)

Hydro NMFS 044 - Extend barge transportation to further reduce reliance on trucking (Hydro)

340 Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)

Hydro NMFS 045 - McNary Dam transportation evaluation study plan (Hydro)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 046 - Transport to in-river return ratios for wild SR yearling chinook salmon and steelhead (Hydro)

338 Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 047 - Evaluation of delayed mortality (D) (Hydro)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

321 Delayed Mortality of Juveniles (Hydro) (CORPS)

541 Evaluation of Transportation Strategies (Hydro) (CORPS)

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 048 - Effects of prior transport as smolts on the homing of adults (Hydro)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

Hydro NMFS 049 - Strategies to enhance post-release survival of transported fish (Hydro)

541 Evaluation of Transportation Strategies (Hydro) (CORPS)

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 050 - Install necessary adult PIT-tag detectors (Hydro)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

235 1989-107-00 Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)

237 1990-080-00 Columbia River Basin PIT Tag Information System (Hydro) (BPA)

331 Ice Harbor Adult Pit (Hydro) (CORPS)

522 Adult PIT tag program (Bonn, The Dalles, John Day) (Hydro) (CORPS)

Hydro NMFS 052 - Identify and implement improvements to the transportation program (Hydro)

340 Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)

541 Evaluation of Transportation Strategies (Hydro) (CORPS)

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

557 Spill for Juvenile Fish Passage (Hydro) (CORPS)

Hydro NMFS 053 - Structural and operational alternatives to improve juvenile transportation (Hydro)

340 Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)

Hydro

362	Lower Snake River Juvenile Bypass System Improvements (Hydro) (CORPS)
Hydro NMFS 055 - initiate planning and design necessary to construct a Schultz- Hanford 500-kV line (Hydro)	
304	Schultz-Wautoma 500-kV Transmission Line (Hydro) (BPA)
Hydro NMFS 056 - joint transmission project to upgrade the west-of-Hatwai cutplane (Hydro)	
300	Grand Coulee Bell 500-kV Transmission Line (Hydro) (BPA)
Hydro NMFS 057 - evaluate strategically located generation additions and other transmission system improve	
301	Hungry Horse Transmission Stability Study (Hydro) (BPA)
302	Libby Transmission Stability Study (Hydro) (BPA)
303	Report on New Generation Resources and Associated Transmission Improvements (Hydro) (BPA)
Hydro NMFS 058 - Operate all turbine units for optimum fish passage survival (Hydro)	
373	Operate Turbine units at 1% efficiency range (Hydro) (CORPS)
Hydro NMFS 059 - Determine appropriate operating range of minimum gap runner turbines (Hydro)	
520	Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 060 - Evaluate adult fallback and juvenile passage under daytime spill to the gas cap at BON (Hydro)	
508	Bonneville juvenile fish studies (Hydro) (CORPS)
521	Adult migration studies (Hydro) (CORPS)
Hydro NMFS 061 - Prototype powerhouse system surface collection evaluations at Bonneville PH 1 (Hydro)	
524	Bonneville 1st PH Surface Bypass (Hydro) (CORPS)
Hydro NMFS 062 - Bonneville PH 1 evaluations of intake and gatewell screens (Hydro)	
523	Bonneville 1st PH FGE (Hydro) (CORPS)
Hydro NMFS 063 - Design of debris removal facilities for Bonneville PH 1 forebay (Hydro)	
523	Bonneville 1st PH FGE (Hydro) (CORPS)
525	Bonneville 1st PH JBS improvements (Hydro) (CORPS)
Hydro NMFS 064 - Investigation of minimum gap runners at Bonneville PH 1 (Hydro)	
520	Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 065 - Bonneville PH 2 post-construction evaluation of juvenile fish bypass outfall (Hydro)	
526	Bonneville 2nd PH JBS improvements (Hydro) (CORPS)
Hydro NMFS 066 - Bonneville Second Powerhouse permanent corner collector (Hydro)	
502	Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
Hydro NMFS 067 - Bonneville PH 2 investigations to improve intake screen FGE (Hydro)	
504	Bonneville 2nd PH FGE improvements (Hydro) (CORPS)
Hydro NMFS 068 - Spill and passage survival studies at The Dalles Dam (Hydro)	
519	The Dalles project survival study (Hydro) (CORPS)
524	Bonneville 1st PH Surface Bypass (Hydro) (CORPS)
527	The Dalles spillway survival improvement s (Hydro) (CORPS)
Hydro NMFS 069 - Prototype testing of upper turbine intake occlusion devices at The Dalles (Hydro)	
530	The Dalles surface bypass (Hydro) (CORPS)

Hydro

- Hydro NMFS 070 - Sluiceway outfall relocation and adult ladder auxiliary water system at The Dalles (Hydro)**
518 The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
- Hydro NMFS 071 - Investigation of 24-hour spill at John Day Dam (Hydro)**
516 John Day survival and passage efficiency studies (Hydro) (CORPS)
- Hydro NMFS 072 - Fish survival benefits of rsws or a skeleton bay surface bypass (Hydro)**
514 John Day surface bypass spillway improvements (Hydro) (CORPS)
- Hydro NMFS 073 - John Day extended submerged intake screens, gatewell vertical barrier screens (Hydro)**
515 John Day Screens (Hydro) (CORPS)
- Hydro NMFS 074 - Improvements of screens, screen cleaning system, and bypass facilities at McNary (Hydro)**
320 Cylindrical Dewatering Evaluation (Hydro) (CORPS)
366 McNary Juvenile Bypass System Outfall (Hydro) (CORPS)
367 McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
- Hydro NMFS 076 - Juvenile bypass outfall at Lower Monumental Dam (Hydro)**
357 Lower Monumental Flow Deflectors (Hydro) (CORPS)
358 Lower Monumental Juvenile Bypass System Outfall (Hydro) (CORPS)
- Hydro NMFS 078 - Extended submerged intake screens and vertical barrier screens at Lower Monumental Dam (Hydro)**
356 Lower Monumental Extended Submerged Bar Screens (Hydro) (CORPS)
- Hydro NMFS 079 - Evaluation of the new debris containment boom at Little Goose (Hydro)**
347 Little Goose Trash Boom (Hydro) (CORPS)
- Hydro NMFS 080 - Prototype RSW at Lower Granite (Hydro)**
354 Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
- Hydro NMFS 081 - New juvenile bypass facilities at Lower Granite Dam (Hydro)**
351 Lower Granite Juvenile Bypass System (Hydro) (CORPS)
- Hydro NMFS 082 - Spillway passage survival of juvenile salmonids at appropriate FCRPS dams (Hydro)**
370 McNary Juvenile Survival (Hydro) (CORPS)
508 Bonneville juvenile fish studies (Hydro) (CORPS)
516 John Day survival and passage efficiency studies (Hydro) (CORPS)
519 The Dalles project survival study (Hydro) (CORPS)
527 The Dalles spillway survival improvements (Hydro) (CORPS)
545 Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
- Hydro NMFS 083 - Effect of spill duration and volume on spillway effectiveness (Hydro)**
370 McNary Juvenile Survival (Hydro) (CORPS)
508 Bonneville juvenile fish studies (Hydro) (CORPS)
516 John Day survival and passage efficiency studies (Hydro) (CORPS)
519 The Dalles project survival study (Hydro) (CORPS)
527 The Dalles spillway survival improvements (Hydro) (CORPS)
545 Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
- Hydro NMFS 084 - High-flow outfall investigations (Hydro)**

Hydro

502		Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
Hydro NMFS 085 - Improved fish-tracking technologies and computational fluid dynamics (Hydro)		
354		Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
Hydro NMFS 086 - Increase entry rates of fish approaching surface bypass/collector entrances. (Hydro)		
147	2001-010-00	Using Induced Turbulence to Assist Juvenile Migrating Salmon (Hydro) (BPA)
354		Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
502		Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
514		John Day surface bypass spillway improvements (Hydro) (CORPS)
519		The Dalles project survival study (Hydro) (CORPS)
Hydro NMFS 087 - Assess less-intrusive, PIT-tag interrogation methods at FCRPS juvenile bypass systems (Hydro)		
235	1989-107-00	Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
Hydro NMFS 088 - Improve turbine survival of juvenile and adult salmonids (Hydro)		
520		Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 089 - Develop biologically based turbine design and operating criteria (Hydro)		
520		Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 090 - Effects of draft tubes and tailraces on survival of fish passing through turbines (Hydro)		
520		Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 091 - Remove obstructions in the turbine units (Hydro)		
375		Remove Obstructions from Turbine Environments (Hydro) (CORPS)
520		Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 093 - Investigate the survival of adult salmonid passage through turbines (Hydro)		
520		Turbine passage studies (Hydro) (CORPS)
Hydro NMFS 094 - Improvements of screens, screen cleaning system, and bypass facilities at LSRP (Hydro)		
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
362		Lower Snake River Juvenile Bypass System Improvements (Hydro) (CORPS)
Hydro NMFS 095 - Improved wet separator designs (Hydro)		
376		Separator Evaluation (Hydro) (CORPS)
Hydro NMFS 096 - Extended submerged intake screen systemwide letter report (Hydro)		
343		Little Goose Extended Submerged Bar Screens (Hydro) (CORPS)
349		Lower Granite Extended Submerged Bar Screens (Hydro) (CORPS)
363		McNary Extended Submerged Bar Screens (Hydro) (CORPS)
Hydro NMFS 097 - Compare survival benefits of alternatives at Bonneville First Powerhouse (Hydro)		
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
502		Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
523		Bonneville 1st PH FGE (Hydro) (CORPS)
524		Bonneville 1st PH Surface Bypass (Hydro) (CORPS)
525		Bonneville 1st PH JBS improvements (Hydro) (CORPS)

Hydro**Hydro NMFS 098 - Survival benefits of rextended-length screens at JDA to surface collection (Hydro)**

514 John Day surface bypassspillway improvements (Hydro) (CORPS)

515 John Day Screens (Hydro) (CORPS)

Hydro NMFS 099 - Survival benefits of rextended-length screens at LMN to RSW (Hydro)

356 Lower Monumental Extended Submerged Bar Screens (Hydro) (CORPS)

Hydro NMFS 100 - Reduce the loss of juvenile salmonids to predacious fishes (Hydro)

483 1990-077-00 Northern Pikeminnow Management Program (Hydro) (BPA)

Hydro NMFS 101 - Effective means of discouraging avian predation (Hydro)

315 Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)

Hydro NMFS 102 - Evaluate avian predation of juvenile salmonids in the FCRPS reservoirs (Hydro)

149 1997-024-00 Avian Predation on Juvenile Salmonids (Hydro) (BPA)

Hydro NMFS 103 - Quantify predation by white pelicans on juvenile salmon at MCN (Hydro)

149 1997-024-00 Avian Predation on Juvenile Salmonids (Hydro) (BPA)

Hydro NMFS 107 - Assess survival of adult salmonids migrating upstream (Hydro)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

521 Adult migration studies (Hydro) (CORPS)

582 Adult Passage Counting and Trapping at Zosel Dam (Hydro) (BPA)

Hydro NMFS 109 - Adult steelhead downstream migrant (kelt) assessment program (Hydro)

142 2000-017-00 Kelt Reconditioning Research (Hydro) (BPA)

521 Adult migration studies (Hydro) (CORPS)

Hydro NMFS 110 - Adult steelhead holding and jumping in the fish ladders at John Day Dam (Hydro)

511 John Day salmon holding and jumping (Hydro) (CORPS)

Hydro NMFS 111 - Fallback of upstream migrant salmonids through turbine intakes (Hydro)

520 Turbine passage studies (Hydro) (CORPS)

Hydro NMFS 113 - Reduce adult fallback and mortality through the Bonneville spillway (Hydro)

506 Bonneville adult fallback (Hydro) (CORPS)

Hydro NMFS 114 - Temperature differences in fishways (Hydro)

326 Fish Ladder Temperature Evaluation (Hydro) (CORPS)

512 John Day Ladder Temperature (Hydro) (CORPS)

Hydro NMFS 115 - Comprehensive depth and temperature investigation to characterize direct mortality (Hydro)

312 Adult Temperature Evaluation (Hydro) (CORPS)

521 Adult migration studies (Hydro) (CORPS)

Hydro NMFS 116 - Adult fish delay and fallback at ladder junction pools (Hydro)

327 Fish Ladder Transition Pool Evaluation (Hydro) (CORPS)

511 John Day salmon holding and jumping (Hydro) (CORPS)

Hydro NMFS 117 - Evaluate adult count station facilities (Hydro)

237 1990-080-00 Columbia River Basin PIT Tag Information System (Hydro) (BPA)

Hydro

316	Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
337	Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Hydro NMFS 118 - Indirect prespawning mortality of adult upstream-migrating fish (Hydro)

295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
521		Adult migration studies (Hydro) (CORPS)
582		Adult Passage Counting and Trapping at Zosel Dam (Hydro) (BPA)

Hydro NMFS 119 - Accommodate Pacific lamprey passage (Hydro)

237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
517		Adult Lamprey Passage (Hydro) (CORPS)

Hydro NMFS 120 - Improved operations for adult fishway main entrances at FCRPS dams (Hydro)

381		Improve Operations of Adult Fishway Main Entrances (Hydro) (CORPS)
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Hydro NMFS 121 - Auxiliary water-supply, emergency-parts inventory for all adult fishways (Hydro)

378		Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
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Hydro NMFS 122 - Emergency auxiliary water supply system at The Dalles Dam's east ladder (Hydro)

518		The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
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Hydro NMFS 123 - Dewater adult auxiliary water system floor diffusers for inspection at The Dalles (Hydro)

529		The Dalles adult entrance channel dewatering mods (Hydro) (CORPS)
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Hydro NMFS 125 - Automated monitoring and alarm system at appropriate FCRPS projects (Hydro)

322		Automated Alarm System for Adult Collection Channel Diffuser Systems (Hydro) (CORPS)
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Hydro NMFS 126 - Bonneville PH 1 adult fishway auxiliary water system (Hydro)

316		Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
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Hydro NMFS 127 - Bonneville PH 2 adult fishway auxiliary water system (Hydro)

505		Bonneville 2nd PH emergency AWS (Hydro) (CORPS)
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Hydro NMFS 128 - Operating criteria at the John Day Dam north shore ladder (Hydro)

513		John Day N. Shore AWS (Hydro) (CORPS)
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Hydro NMFS 129 - Fishway auxiliary water supply evaluations at LSRP (Hydro)

332		Ice Harbor Emergency Auxiliary Water Supply (Hydro) (CORPS)
342		Little Goose Auxiliary Water Supply (Hydro) (CORPS)
348		Lower Granite Emergency Auxiliary Water Supply (Hydro) (CORPS)
355		Lower Monumental Auxiliary Water Supply (Hydro) (CORPS)

Hydro NMFS 131 - Monitor the physical and biological effects of TDG (Hydro)

148	1996-021-00	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (Hydro) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
550		Redudant TDG Monitors - Dworshak to McNary Dam (Hydro) (CORPS)

Hydro NMFS 132 - Review and evaluation of the TDG fixed monitoring stations (Hydro)

551		Review of Forebay Monitors Lower Granite to McNary (Hydro) (CORPS)
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Hydro NMFS 134 - Continue the spillway deflector optimization program at each FCRPS project (Hydro)

Hydro

344	Little Goose Flow Deflectors (Hydro) (CORPS)
350	Lower Granite Flow Deflectors (Hydro) (CORPS)
357	Lower Monumental Flow Deflectors (Hydro) (CORPS)
364	McNary Flow Deflectors (Hydro) (CORPS)
370	McNary Juvenile Survival (Hydro) (CORPS)
487	Bonneville Spillway Flow Deflectors (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)

Hydro NMFS 135 - Divider walls at each FCRPS project in the spillway deflector optimization program (Hydro)

344	Little Goose Flow Deflectors (Hydro) (CORPS)
350	Lower Granite Flow Deflectors (Hydro) (CORPS)
357	Lower Monumental Flow Deflectors (Hydro) (CORPS)
364	McNary Flow Deflectors (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)

Hydro NMFS 138 - Investigate rsws as a means of optimizing safe spillway passage (Hydro)

354	Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)

Hydro NMFS 139 - TDG abatement options at Dworshak Dam (Hydro)

552	Dworshak Dissolved Gas Abatement Study (Hydro) (CORPS)
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Hydro NMFS 142 - Juvenile fish mortality associated with high summer temperatures at mcnary Dam (Hydro)

365	McNary Forebay Temperature Improvements (Hydro) (CORPS)
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Hydro NMFS 144 - Maintain juvenile and adult fish facilities within identified criteria (Hydro)

243	1994-033-00 Fish Passage Center (Hydro) (BPA)
317	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
328	Fish Passage Plan Development and Implementation (Hydro) (CORPS)
333	Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334	Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338	Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
345	Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352	Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359	Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
368	Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
378	Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Hydro NMFS 145 - Preventative maintenance programs for fish passage facilities (Hydro)

Hydro

316	Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
317	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
333	Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334	Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
337	Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338	Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
345	Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352	Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359	Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
368	Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
378	Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
553	Temperature Modeling Plan Alternative Snake River Operations (Hydro) (CORPS)

Hydro NMFS 146 - Address debris-handling needs (Hydro)

334	Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
503	Bonneville 2nd PH fish unit trash rake (Hydro) (CORPS)
509	Bonneville 2nd PH gatewell debris removal (Hydro) (CORPS)
515	John Day Screens (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Hydro NMFS 185 - Compare the sars of transported and non-transported fish (Hydro)

321	Delayed Mortality of Juveniles (Hydro) (CORPS)
544	Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 186 - Determine whether D can be identified between BON and the mouth (Hydro)

321	Delayed Mortality of Juveniles (Hydro) (CORPS)
541	Evaluation of Transportation Strategies (Hydro) (CORPS)
544	Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 189 - Investigate adult return rates for juveniles with different passage histories (Hydro)

146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
541		Evaluation of Transportation Strategies (Hydro) (CORPS)

Hydro

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

Hydro NMFS 191 - Adult salmonid counting programs at FCRPS dams (Hydro)

314 Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)

317 Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

338 Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

380 Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

532 Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Hydro NMFS 192 - Install necessary adult PIT-tag detectors at appropriate FCRPS projects (Hydro)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

235 1989-107-00 Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)

237 1990-080-00 Columbia River Basin PIT Tag Information System (Hydro) (BPA)

522 Adult PIT tag program (Bonn, The dalles, John Day) (Hydro) (CORPS)

Hydro NMFS 195 - Causes of mortality below Bonneville Dam (Hydro)

321 Delayed Mortality of Juveniles (Hydro) (CORPS)

544 Juvenile salmon transportation evaluations (Hydro) (CORPS)

Planning/Coordination NMFS 003 - Develop and implement a 1- and 5-year water management plan (Habitat)

382 Water Management Plan (Hydro) (CORPS)

Planning/Coordination NMFS 005 - Annually develop a 1- and 5-year water quality plan (Hatchery)

486 Water Quality Plan (Hydro) (CORPS)

Planning/Coordination NMFS 006 - Develop and implement 1- and 5-year operations and maintenance (O&M) plan.

345 Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Planning/Coordination NMFS 017 - Coordinate preseason planning and in-season management of flow and spill (I

319 Coordinate Water Management Decisions with TMT (Hydro) (CORPS)

RM&E NMFS 193 - State-of-the-art, novel fish detection and tagging techniques (RME)

145 1983-319-00 New Marking and Monitoring Techniques (Hydro) (BPA)

Habitat**Habitat NMFS 149 - Initiate programs in three priority subbasins (Habitat)**

1	1985-062-00	Passage Improvement Evaluation - Phase II Screens (Habitat) (BPA)
4	1991-057-00	Fabricate and Install Yakima Basin Phase II Fish Screens (Habitat) (BPA)
5	1991-075-00	Yakima Phase II Screens - Construction (Habitat) (BPA)
6	1992-009-00	Operate & Maintain (O&M) Yakima Basin Phase II Fish Screens (Habitat) (BPA)
8	1995-033-00	O&M Of Yakima Phase II Fish Facilities* (Habitat) (BPA)
14	1997-053-00	Toppenish-Simcoe Instream Flow Restoration and Assessment (Habitat) (BPA)
16	1998-034-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yaki
19	2002-022-00	YKFP Big Creek Passage & Screening (Habitat) (BPA)
21	2002-025-00	Yakima Tributary Access and Habitat Program (Objective 1: Early Actions) (Habitat) (BPA)
35	1995-068-00	Preliminary Design for Passage & Habitat Improvement (Habitat) (BPA)
39	1983-436-00	Umatilla Passage O&M (Habitat) (BPA)
40	1988-022-00	Umatilla River Fish Passage Operations (Habitat) (BPA)
44	1989-027-00	Repay Power for Umatilla Basin Project (Habitat) (BPA)
46	1996-011-00	Juvenile Screens Smolt Traps on the WW River also reference 2000-033-00 (Habitat) (BPA)
52	2000-033-00	Walla Walla River Fish Passage Operations (Habitat) (BPA)
54	2001-039-00	Walla Walla Basin Screening (Habitat) (BPA)
55	2001-075-00	Increase Instream Flows to Dewatered Stream Reaches in the Walla Walla Basin (Habitat) (BPA)
56	2002-036-00	Walla Walla River Flow Restoration (Habitat) (BPA)
81	1993-062-00	Custer Soil & Water Conservation District Salmon River Fish Passage Enhancement (Habitat) (BPA)
82	1994-015-00	Idaho Fish Screen Improvement (Habitat) (BPA)
83	1994-017-00	Idaho Model Watershed Habitat Improvement Project (Habitat) (BPA)
85	1996-007-00	Upper Salmon River Diversion Consolidation Program (Habitat) (BPA)
86	1996-077-02	Protect and Restore Lolo Creek Watershed (Habitat) (BPA)
87	1996-077-03	Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Pap
88	1996-077-05	Restore McComas Meadows/Meadow Creek Watershed (Habitat) (BPA)
91	1999-014-00	Little Canyon Creek Subwatershed-Steelhead Trout Habitat Improvement Project (Habitat) (BPA)
93	1999-016-00	Protect and Restore Big Canyon Creek Watershed (Habitat) (BPA)
94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
100	2000-036-00	Protect & Restore Mill Creek (Habitat) (BPA)
102	2001-044-00	Conservation Easement, Baker Ranch, Salmon River East Fork (Habitat) (BPA)
103	2001-051-00	Reconnect Little Morgan Creek to the Main-stem Pahsimeroi River (Habitat) (BPA)
104	2001-052-00	Restoration of Anadromous Fish Access to Hawley Creek (Habitat) (BPA)
105	2001-067-00	Restore Passage Lower Lemhi / Salmon Rivers (Habitat) (BPA)
107	2001-068-00	Transfer Lemhi Water Users (L-6 to Salmon River (S-14) (Habitat) (BPA)
108	1996-034-01	Methow Valley Irrigation District Rehabilitation (Habitat) (BPA)
110	1996-042-00	Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (Habitat) (BPA)
111	1998-025-00	Restore Steelhead and Chinook habitat in Early Winters Creek (Habitat) (BPA)
114	2000-001-00	Anadromous Fish Habitat & Passage in Omak Creek (Habitat) (BPA)
115	2000-002-00	Remove Barriers/Restore Instream Habitat on Chumstick Creek (Habitat) (BPA)

Habitat

116	2001-063-00	Methow River Basin Screening (Habitat) (BPA)
117	2001-065-00	Hancock Springs Passage and Habitat Restoration Improvements (Habitat) (BPA)
120	2002-029-00	Fish Passage on WDFW Lands in Yakima (Habitat) (BPA)
127	1993-066-00	NE Oregon Pump Screening (Habitat) (BPA)
128	1998-017-00	Eliminate Gravel Push-up Dams in Lower North Fork John Day (Habitat) (BPA)
129	1998-018-00	John Day Watershed Restoration Program (Habitat) (USBR)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
136	2001-023-00	15 Mile Water Rights Acquisition (Habitat) (BPA)
137	2001-040-00	Wagner Ranch Acquisition (Habitat) (BPA)
138	2001-041-00	Forrest Ranch Acquisition (Habitat) (BPA)
139	2001-069-00	Oregon Water Trust Early Action Project (Habitat) (BPA)
140	1999-008-00	Columbia Plateau Water Rights Acquisition (Habitat) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
186	1998-028-00	Trout Creek Watershed Improvement Project (Habitat) (BPA)
189	2001-054-00	Emergency Flow Augmentation for Buck Hollow (Habitat) (BPA)
197	1992-026-01	Little Sheep Creek Lg Wood Placement and Culvert Replacement (Habitat) (BPA)
202	1992-026-01	GRMWS - Union County Bridges (Habitat) (BPA)
209	1996-083-01	McCoy Meadows Watershed Restoration (Habitat) (BPA)
210	1997-078	Catherine Creek Irrigation Stabilization (Habitat) (BPA)
215	1999-061	Mill Creek Fish Passage/Union County SWCD Channel Road (Habitat) (BPA)
218	1999-072-00	Wildcat Creek Culvert Replacement (Habitat) (BPA)
220	1999-079-00	Beaver Creek Fish Passage (Habitat) (BPA)
222	2000-059-00	USFS Marr Flat Allotment and Big Sheep/Imnaha Fisheries Enhancement (Habitat) (BPA)
224	2000-062-00	Imnaha/Park Ditch Water Conservation (Habitat) (BPA)
229	2000-069-00	Grande Ronde River Basin - Culvert Replacements (Habitat) (BPA)
246	2000-013-00	Evaluate An Experimental Re-Introduction of Sockeye Salmon into Skaha Lake (BPA Short Title: Eval Reintrodu
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-0
268	2001-038-00	Gourlay Creek Dam Fish Ladder (Habitat) (BPA)
270	2001-061-00	Touchet River Flow Acquisition (Habitat) (BPA)
271	2001-064-00	Improve Stream Flow and Passage for Simcoe Creek Steelhead (Habitat) (BPA)
272	2002-020-00	Fabricate and Install New Huntsville Mill Fish Screen (Habitat) (BPA)
298	2001-036-00	Ames Creek Restoration (Habitat) (BPA)
383		Beaver Creek Water Acquisitions (Habitat) (USBR)
384		Campbell Diversions (Habitat) (USBR)
385		Chelan County/Wenatchee IFIM Study (Habitat) (USBR)
387		Chewuch Ditch Diversion Structure (Habitat) (USBR)
388		Chumstick Diversions (Habitat) (USBR)
389		Entiat IFIM Studies (Habitat) (USBR)
390		Fort-Thurlow Pump Exchange (Habitat) (USBR)
391		Fulton Diversion Structure (Habitat) (USBR)

Habitat

392	Gold Creek Screen and Diversion (Habitat) (USBR)
393	L-13 Diversion Replacement (Habitat) (USBR)
394	L-13 Headgate (Habitat) (USBR)
395	L-13 Screen (Habitat) (USBR)
396	L-18 Headgate (Habitat) (USBR)
397	L-20 Headgate (Habitat) (USBR)
398	L-3 Diversion Replacement (Habitat) (USBR)
399	L-35A Diversion Replacement (Habitat) (USBR)
400	L-35A Headgate (Habitat) (USBR)
401	L-35A Screen (Habitat) (USBR)
402	L-3A Diversion Replacement (Habitat) (USBR)
403	L-3A0 Diversion Replacement (Habitat) (USBR)
404	L-3 Headgate (Habitat) (USBR)
405	L-6/S14 Water Exchange (Habitat) (USBR)
406	L-9 Diversion Replacement (Habitat) (USBR)
407	L-9 Headgate (Habitat) (USBR)
408	Marracci/Washington Department of Fish and Wildlife Diverson (Habitat) (USBR)
409	USGS Hydrologic Model Upgrades (Habitat) (USBR)
410	Methow Valley Irrigation District Methow River Screen (Habitat) (USBR)
411	Methow Valley Irrigation District Twisp River Screen (Habitat) (USBR)
412	Methow Valley Irrigation District Twisp River Pump Exchange (Habitat) (USBR)
413	Middle Fork John Day Gaging Stations (Habitat) (USBR)
414	Middle Fork John Day IFIM Study (Habitat) (USBR)
415	Mission Diversions (Habitat) (USBR)
416	Methow Valley Irrigation District Methow River Diversion (Habitat) (USBR)
417	Methow Valley Irrigation District Twisp River Diversion (Habitat) (USBR)
418	North Fork John Day River IFIM Studies (Habitat) (USBR)
419	Okanogan Gaging Stations (Habitat) (USBR)
420	Panama Ditch Screen Replacement (Habitat) (USBR)
421	Strawberry Creek Complex Screen Replacement (Habitat) (USBR)
422	Upper John Day Gaging stations (Habitat) (USBR)
423	Upper John Day IFIM study (Habitat) (USBR)
424	USBR Entiat Subbasin Program Management (Habitat) (USBR)
425	USBR Lemhi program management (Habitat) (USBR)
426	USBR Little Salmon Subbasin Program Management (Habitat) (USBR)
427	USBR Methow program management (Habitat) (USBR)
428	USBR Middle Clearwater Subbasin Program Management (Habitat) (USBR)
429	USBR Middle Fork John Day program management (Habitat) (USBR)
430	USBR North Fork John Day Program Management (Habitat) (USBR)
431	USBR Upper John Day Program Management (Habitat) (USBR)

Habitat

432	USBR Upper Salmon program management (Habitat) (USBR)
433	USBR Wenatchee Subbasin Program Management (Habitat) (USBR)
434	Williams Creek Diversion Replacements (Habitat) (USBR)
435	Williams Creek Headgate Projects (Habitat) (USBR)
436	Williams Creek Screens (Habitat) (USBR)
479	Yakima-Klickitat Fisheries Project - Manastash Creek Fish Passage and Screening (Habitat) (BPA)
555	Salmon River Aquatic Ecosystem Restoration (Habitat) (CORPS)
559	SW Washington Streams Section 206 (Habitat) (CORPS)
560	Trout Creek Section 206 (Habitat) (CORPS)
561	Walla Walla GI Feasibility Study (Habitat) (CORPS)
562	Asotin County Riparian Buffer and Couse and Tenmile Creeks Protection and Implementation Project (Habitat)
573	Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho (Habitat) (BP)
574	Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (Habitat) (BPA)
575	Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho (Habitat) (BF)
576	Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (Habitat) (BPA)
577	Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (Habitat) (BPA)
581	Evaluation of 1872 Water Rights to Supplement Flows Between Basins (Habitat) (BPA)
583	Restore Passage on Private Lands in Beaver Creek Drainage to Benefit Spring Chinook, Steelhead and Bulltrout
587	Entiat IFIM Studies (Habitat) (USBR)
588	Lemhi Subbasin IFIM studies (Habitat) (USBR)

Habitat NMFS 150 - Protection of currently productive non-Federal habitat (Habitat)

13	1997-051-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (Habitat) (BPA)
16	1998-034-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yaki
110	1996-042-00	Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (Habitat) (BPA)
119	2002-018-00	Tapteal Bend Riparian Corridor Restoration (Habitat) (BPA)
132	1998-022-00	Pine Creek Ranch Acquisition (Habitat) (BPA)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
137	2001-040-00	Wagner Ranch Acquisition (Habitat) (BPA)
562		Asotin County Riparian Buffer and Couse and Tenmile Creeks Protection and Implementation Project (Habitat)
564		Protect and Restore the Asotin Creek Watershed (Habitat) (BPA)
568		Riparian Conservation Easement Purchase of Scarrow Property on Lake Creek a Tributary to the Secesh River,
573		Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho (Habitat) (BP)
574		Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (Habitat) (BPA)
575		Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho (Habitat) (BF)
576		Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (Habitat) (BPA)
577		Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (Habitat) (BPA)

Habitat NMFS 152 - Coordinate efforts and support offsite habitat enhancement measures (Habitat)

79	1992-026-03	Upper Salmon Basin Watershed Project Administration/Implementation Support (Habitat) (BPA)
89	1996-086-00	Clearwater Focus Program (Habitat) (BPA)
90	1997-060-00	Clearwater Subbasin Focus Watershed Program - NPT (Habitat) (BPA)

Habitat

94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
98	2000-034-00	Protect and Restore The North Lochsa Face Analysis Area Watersheds (Habitat) (BPA)
99	2000-35-00	Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (Habitat) (BPA)
101	2001-035-00	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning and Rearing Habitat (Habitat) (BPA)
108	1996-034-01	Methow Valley Irrigation District Rehabilitation (Habitat) (BPA)
113	1998-031-00	Implementation of Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment and Restoration Plan (Habitat) (BPA)
133	1999-010-00	Mitigate Effects of Erosion on Salmonid Habitat - Pine Hollow (Habitat) (BPA)
150	1998-035-01	Watershed Scale Response of Habitat to Abandoned Mine Waste (Habitat) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
180	1987-100-02	Umatilla Subbasin Fish Habitat Improvement (Habitat) (BPA)
183	1993-040-00	Fifteenmile Creek Habitat Restoration Project (Habitat) (BPA)
184	1994-042-00	Trout Creek Habitat Restoration Project (Habitat) (BPA)
185	1998-021-00	Hood River Fish Habitat Project (Habitat) (BPA)
186	1998-028-00	Trout Creek Watershed Improvement Project (Habitat) (BPA)
187	2001-020-00	Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)
188	2001-021-00	Fifteenmile Creek Riparian Buffers - Wasco County (Habitat) (BPA)
190	2002-015-00	Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Ore
203	1992-026-01	GRMWP - Bue Road Improvement (Habitat) (BPA)
206	1992-026-01	GRMWP - Indian Creek/Trick Runoff and Buffering System (Habitat) (BPA)
207	1992-026-01	GRMWP - Rangeland Drill/Watershed Restoration and Enhancement (Habitat) (BPA)
217	1999-071-00	Hagedorn Road Relocation/Stream Restoration (Habitat) (BPA)
221	1999-081-00	East End Road Obliteration and Sediment Reduction (Habitat) (BPA)
231	2001-019-00	Little Catherine and Lick Creek Restoration (Habitat) (BPA)
246	2000-013-00	Evaluate An Experimental Re-Introduction of Sockeye Salmon into Skaha Lake (BPA Short Title: Eval Reintrodu
255	1987-100-01	Umatilla River Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-0
263	1994-018-07	Garfield County Sediment Reduction and Riparian Improvement Program - (proposal) - funded under: 1999-02
264	1994-046-01	Walla Walla River Basin Fish Habitat Enhancement (Habitat) (BPA)
281	1997-080-00	Asotin Creek Upland Sedimentation Reductin (Habitat) (BPA)
282	1997-086-00	Asotin Watershed Upland BMP's (Habitat) (BPA)
283	1999-002-00	Asotin Watershed Project Implementation (Habitat) (BPA)
284	1999-052-00	Asotin Creek Five Year Minimum Till Program (Habitat) (BPA)
285	1999-060-00	Asotin Watershed Upland BMP Implementation (Habitat) (BPA)
571		Potlatch River Watershed Restoration (Habitat) (BPA)

Habitat NMFS 153 - Long-term protection for 100 miles of riparian buffers per year (Habitat)

7	1992-062-00	Yakama Nation - Riparian/Wetlands Restoration (Habitat) (BPA)
11	1996-035-00	Satus Watershed Restoration (Habitat) (BPA)
13	1997-051-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (Habitat) (BPA)
15	1998-033-00	Restore Upper Toppenish Watershed (Habitat) (BPA)
20	2002-023-00	Yakima-Klickitat Fisheries Project - Wilson Creek Snowden Parcel Acquisition (Habitat) (BPA)

Habitat

21	2002-025-00	Yakima Tributary Access and Habitat Program (Objective 1: Early Actions) (Habitat) (BPA)
22	2002-038-00	Protect Normative Structure and Function of Critical Aquatic and Terrestrial Habitat (Habitat) (BPA)
36	1997-056-00	Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (Habitat) (BPA)
55	2001-075-00	Increase Instream Flows to Dewatered Stream Reaches in the Walla Walla Basin (Habitat) (BPA)
80	1993-035-01	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed (Habitat) (BPA)
81	1993-062-00	Custer Soil & Water Conservation District Salmon River Fish Passage Enhancement (Habitat) (BPA)
83	1994-017-00	Idaho Model Watershed Habitat Improvement Project (Habitat) (BPA)
84	1994-050-00	Salmon River Habitat Enhancement M & E (Habitat) (BPA)
85	1996-007-00	Upper Salmon River Diversion Consolidation Program (Habitat) (BPA)
86	1996-077-02	Protect and Restore Lolo Creek Watershed (Habitat) (BPA)
88	1996-077-05	Restore McComas Meadows/Meadow Creek Watershed (Habitat) (BPA)
91	1999-014-00	Little Canyon Creek Subwatershed-Steelhead Trout Habitat Improvement Project (Habitat) (BPA)
92	1999-015-00	Restoring Anadromous Fish Habitat in Big Canyon Watershed (Habitat) (BPA)
93	1999-016-00	Protect and Restore Big Canyon Creek Watershed (Habitat) (BPA)
94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
96	1999-019-00	Holistic Restoration of the Twelvemile Reach of the Salmon River near Challis, Idaho (Habitat) (BPA)
99	2000-35-00	Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (Habitat) (BPA)
100	2000-036-00	Protect & Restore Mill Creek (Habitat) (BPA)
102	2001-044-00	Conservation Easement, Baker Ranch, Salmon River East Fork (Habitat) (BPA)
110	1996-042-00	Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (Habitat) (BPA)
111	1998-025-00	Restore Steelhead and Chinook habitat in Early Winters Creek (Habitat) (BPA)
112	1998-029-00	Goat Creek In-Stream Restoration for Salmonids (Habitat) (BPA)
114	2000-001-00	Anadromous Fish Habitat & Passage in Omak Creek (Habitat) (BPA)
115	2000-002-00	Remove Barriers/Restore Instream Habitat on Chumstick Creek (Habitat) (BPA)
117	2001-065-00	Hancock Springs Passage and Habitat Restoration Improvements (Habitat) (BPA)
119	2002-018-00	Tapteal Bend Riparian Corridor Restoration (Habitat) (BPA)
126	1984-021-00	Protect and Enhance John Day Anadromous Fish (Habitat) (BPA)
129	1998-018-00	John Day Watershed Restoration Program (Habitat) (USBR)
133	1999-010-00	Mitigate Effects of Erosion on Salmonid Habitat - Pine Hollow (Habitat) (BPA)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
135	2000-031-00	North Fork John Day River Subbasin Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
138	2001-041-00	Forrest Ranch Acquisition (Habitat) (BPA)
150	1998-035-01	Watershed Scale Response of Habitat to Abandoned Mine Waste (Habitat) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
180	1987-100-02	Umatilla Subbasin Fish Habitat Improvement (Habitat) (BPA)
183	1993-040-00	Fifteenmile Creek Habitat Restoration Project (Habitat) (BPA)
184	1994-042-00	Trout Creek Habitat Restoration Project (Habitat) (BPA)
185	1998-021-00	Hood River Fish Habitat Project (Habitat) (BPA)
186	1998-028-00	Trout Creek Watershed Improvement Project (Habitat) (BPA)
187	2001-020-00	Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)

Habitat

188	2001-021-00	Fifteenmile Creek Riparian Buffers - Wasco County (Habitat) (BPA)
189	2001-054-00	Emergency Flow Augmentation for Buck Hollow (Habitat) (BPA)
190	2002-015-00	Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Ore
191	2002-019-00	Establish Riparian Buffer Systems (Habitat) (BPA)
192	2002-026-00	Morrow County Buffer Initiative (Habitat) (BPA)
193	2002-034-00	Wheeler SWCD Riparian Buffer Planning and Implementation (Habitat) (BPA)
194	2002-035-00	Gilliam SWCD Riparian Buffers (Habitat) (BPA)
195	1984-025-00	Joseph Creek, Grande Ronde River (Habitat) (BPA)
199	1992-026-01	Grouse Creek Restoration (Habitat) (BPA)
200	1992-026-01	GRMWS - LaGrande Ranger District FY01 Projects (Habitat) (BPA)
201	1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)
205	1992-026-01	GRMWP - Clark Creek/Bryant Alternative Watering System (Habitat) (BPA)
208	1992-026-01	GRMWP - Eisminger/CREP Dike Relocation (Habitat) (BPA)
214	1999-058-00	Upper Grande Ronde and Catherine Creek Watershed Restoration (Habitat) (BPA)
219	1999-074-00	Little Fly Creek Headcut Rehabilitation (Habitat) (BPA)
220	1999-079-00	Beaver Creek Fish Passage (Habitat) (BPA)
222	2000-059-00	USFS Marr Flat Allotment and Big Sheep/Imnaha Fisheries Enhancement (Habitat) (BPA)
223	2000-061-00	Upper Wildcat and Joseph Creek Watershed improvement (Habitat) (BPA)
225	2000-063-00	Meadow Creek Riparian Pasure Fence (Habitat) (BPA)
226	2000-064-00	Conservation Reserve Enhancement Program Incentive (Habitat) (BPA)
227	2000-065-00	Meadow Creek/Habberstad fish habitat Enhancement (Habitat) (BPA)
228	2000-066-00	McCoy Creek-Alta Cunha Rances Riparian Restoration (Habitat) (BPA)
231	2001-019-00	Little Catherine and Lick Creek Restoration (Habitat) (BPA)
255	1987-100-01	Umatilla River Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-0
264	1994-046-01	Walla Walla River Basin Fish Habitat Enhancement (Habitat) (BPA)
283	1999-002-00	Asotin Watershed Project Implementation (Habitat) (BPA)
288	2000-053-00	Asotin Creek Riparian Planting (Habitat) (BPA)
289	2000-054-00	Asotin Creek Riparian Fencing Projects (Habitat) (BPA)
290	2000-067-00	Asotin Creek Channel, Floodplain and Riparian Restoration (Habitat) (BPA)
298	2001-036-00	Ames Creek Restoration (Habitat) (BPA)
562		Asotin County Riparian Buffer and Couse and Tenmile Creeks Protection and Implementation Project (Habitat)

Habitat NMFS 154 - Development and updating of subbasin assessments and plans (Habitat)

17	1999-013-00	Ahtanum Creek Wastershed Assessment (Habitat) (BPA)
18	2000-011-00	Rock Creek Watershed Assessment and Restoration project. (Habitat) (BPA)
36	1997-056-00	Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (Habitat) (BPA)
37	2000-010-00	Klickitat River Subbasin Assessment (Habitat) (BPA)
79	1992-026-03	Upper Salmon Basin Watershed Project Administration/Implementation Support (Habitat) (BPA)
87	1996-077-03	Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Pap
89	1996-086-00	Clearwater Focus Program (Habitat) (BPA)

Habitat

90	1997-060-00	Clearwater Subbasin Focus Watershed Program - NPT (Habitat) (BPA)
94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
113	1998-031-00	Implementation of Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment and Restoration Plan (Habitat) (BPA)
132	1998-022-00	Pine Creek Ranch Acquisition (Habitat) (BPA)
180	1987-100-02	Umatilla Subbasin Fish Habitat Improvement (Habitat) (BPA)
183	1993-040-00	Fifteenmile Creek Habitat Restoration Project (Habitat) (BPA)
184	1994-042-00	Trout Creek Habitat Restoration Project (Habitat) (BPA)
185	1998-021-00	Hood River Fish Habitat Project (Habitat) (BPA)
186	1998-028-00	Trout Creek Watershed Improvement Project (Habitat) (BPA)
187	2001-020-00	Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)
188	2001-021-00	Fifteenmile Creek Riparian Buffers - Wasco County (Habitat) (BPA)
190	2002-015-00	Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Ore
196	1992-026-01	Grande Ronde Model Watershed - Planning (Habitat) (BPA)
200	1992-026-01	GRMWS - LaGrande Ranger District FY01 Projects (Habitat) (BPA)
201	1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)
204	1992-026-01	GRMWP - Lostine Watershed Assessment (Habitat) (BPA)
211	1999-043-00	Union County Technical Engineering Assistance (Habitat) (BPA)
212	1999-044-00	Wallowa County Technical Engineering Assistance (Habitat) (BPA)
213	1999-047-00	Wet Meadow Inventory and Assessment (Habitat) (BPA)
230	2001-018-00	Phillips-Gordon Watershed Assessment (Habitat) (BPA)
246	2000-013-00	Evaluate An Experimental Re-Introduction of Sockeye Salmon into Skaha Lake (BPA Short Title: Eval Reintrodu
252	2002-051-00	Subbasin Planning, Regional Level (Habitat) (BPA)
253	2002-051-00	Subbasin Planning, Statewide/Provincial/Tribal Level (Habitat) (BPA)
254	2002-051-00	Subbasin Planning, Subbasin Level (Habitat) (BPA)
255	1987-100-01	Umatilla River Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-0
263	1994-018-07	Garfield County Sediment Reduction and Riparian Improvement Program - (proposal) - funded under: 1999-02
264	1994-046-01	Walla Walla River Basin Fish Habitat Enhancement (Habitat) (BPA)
283	1999-002-00	Asotin Watershed Project Implementation (Habitat) (BPA)
287	2000-047-00	GIS Mapping of Asotin Creek Watershed Habitat Projects (Habitat) (BPA)
481	2002-028-00	Conduct Watershed Assessments for Priority Watersheds on Private Lands in the Columbia Plateau (Habitat)
555		Salmon River Aquatic Ecosystem Restoration (Habitat) (CORPS)
559		SW Washington Streams Section 206 (Habitat) (CORPS)
560		Trout Creek Section 206 (Habitat) (CORPS)
561		Walla Walla GI Feasibility Study (Habitat) (CORPS)
571		Potlatch River Watershed Restoration (Habitat) (BPA)
580		Restoring anadromous fish habitat in the Lapwai Creek watershed (Habitat) (BPA)

Habitat NMFS 155 - Improvement plans for all mainstem reaches and improvements in three reaches (Habitat)

69	2000-012-00	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (Habitat) (BPA)
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Habitat NMFS 156 - Improve spawning conditions for chum at Ives Island (Habitat)

Habitat

250 2001-053-00 Re-Introduction of Lower Columbia River Chum Salmon into Duncan Creek (Habitat) (BPA)
 531 Improve spawning conditions for chum salmon in the vicinity of Pierce/Ives Islands. (Habitat) (CORPS)

Habitat NMFS 157 - Improve and restore tributary and mainstem habitat for CR chum salmon (Habitat)

69 2000-012-00 Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (Habitat) (BPA)
 250 2001-053-00 Re-Introduction of Lower Columbia River Chum Salmon into Duncan Creek (Habitat) (BPA)

Habitat NMFS 158 - Impacts of the FCRPS system on habitat and listed salmon in the estuary (Habitat)

251 2002-012-00 Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
 536 Estuary General Investigation Study (Habitat) (CORPS)
 537 Estuary Mapping (Habitat) (CORPS)
 539 Research: Columbia River Estuary (Habitat) (CORPS)

Habitat NMFS 159 - BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habit

536 Estuary General Investigation Study (Habitat) (CORPS)

Habitat NMFS 160 - Estuary restoration program (Habitat)

533 Brownsmead, Clatsop County OR, Section 1135 (Habitat) (CORPS)
 534 Estuary Restoration 536 Program (Habitat) (CORPS)
 537 Estuary Mapping (Habitat) (CORPS)
 549 Rooster Rock Wetlands (Habitat) (CORPS)
 556 Skipanon Slough (Habitat) (CORPS)

RM&E NMFS 161 - Monitoring and research program (RME)

539 Research: Columbia River Estuary (Habitat) (CORPS)

Hatchery**Harvest MNFS 168 - Crediting harvest reforms (Harvest)**

109 1996-040-00 Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (Hatchery) (BPA)

Hatchery NMFS 169 - HGMPs for all the Columbia basin hatchery programs and facilities (Hatchery)

274 2002-047-00 Artificial Production Review Evaluation (APRE) (Hatchery) (BPA)

309 HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORP)

336 HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORP)

437 HGMP Funding & Development-Leavenworth (Hatchery) (USBR)

Hatchery NMFS 171 - Grand Coulee mitigation anadromous fish hatchery programs (Hatchery)

438 HGMPs Implementation - Leavenworth (Hatchery) (USBR)

Hatchery NMFS 174 Pt.1 - Comprehensive marking strategy for all salmon and steelhead hatcheries (Hatchery)

178 1982-013-02 Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)

179 1982-013-04 Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)

Hatchery NMFS 174 Pt.2 - Begin marking all spring chinook salmon that are currently released unmarked (Hatchery)

178 1982-013-02 Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)

179 1982-013-04 Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)

Hatchery NMFS 174 Pt.3 - Action Agencies' share of the comprehensive marking plan for production (Hatchery)

178 1982-013-02 Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)

179 1982-013-04 Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)

Hatchery NMFS 175 - Implement safety-net projects (Hatchery)

164 2001-049-00 Safety-Net Coordinator (Hatchery) (BPA)

165 2002-004-04 Safety-Net Artificial Propagation Program - WDFW (Hatchery) (BPA)

166 2002-004-00 Safety-Net Artificial Propagation Program - CRITFC (Hatchery) (BPA)

167 2002-004-01 Safety-Net Artificial Propagation Program - NPT (Hatchery) (BPA)

168 2002-004-02 Safety-Net Artificial Propagation Program - IDFG (Hatchery) (BPA)

169 2002-004-03 Safety-Net Artificial Propagation Program - SBT (Hatchery) (BPA)

Hatchery NMFS 176 - Grande Ronde and Tucannon spring/summer chinook safety-net programs (Hatchery)

47 1998-007-02 Grande Ronde Supplementation - Lostine River Spring Chinook (Hatchery) (BPA)

174 1998-010-06 Captive Broodstock Artificial Propagation (Hatchery) (BPA)

266 2000-019-00 Tucannon River Spring Chinook Captive Broodstock Program (Hatchery) (BPA)

Hatchery NMFS 177 - Safety-net projects (Hatchery)

41 1988-053-04 Northeast Oregon Hatchery Project (Hatchery) (BPA)

43 1988-053-05 Northeast Oregon Hatchery Project (Hatchery) (BPA)

49 1998-007-03 Grande Ronde Satellite Facility O&M (Hatchery) (BPA)

51 1998-007-04 Grande Ronde Spring Chinook Supplementation Program (Hatchery) (BPA)

57 1988-053-01 Northeast Oregon Hatchery Project (Hatchery) (BPA)

158 1990-093-00 Genetic Analysis of *Onchorhynchus nerka* (Modified to Include Chinook Salmon) (Hatchery) (BPA)

160 1991-072-00 Redfish Lake Sockeye Salmon Captive Broodstock Program (Hatchery) (BPA)

161 1992-040-00 Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research (Hatchery) (BPA)

171 1996-043-00 Johnson Creek Artificial Propagation & Enhancement (Hatchery) (BPA)

Hatchery

172	1997-038-00	Listed Stock Chinook Salmon Gamete Preservation (Hatchery) (BPA)
173	1996-010-05	Pittsburgh Landing Fall Chinook Acclimation Facility (Hatchery) (BPA)
175	1996-010-07	Capt. John Rapid's Fall Chinook Acclimation Facility (Hatchery) (BPA)
176	1996-010-08	Big Canyon Fall Chinook Acclimation Facility (Hatchery) (BPA)
276	1998-010-01	Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program (Hatchery) (BPA)
277	1997-001-00	Idaho Chinook Salmon Captive Rearing (Hatchery) (BPA)
279	1996-067-00	Manchester Spring Chinook Broodstock Project (Hatchery) (BPA)

Hatchery NMFS 184 - Hatchery research, monitoring, and evaluation program (Hatchery)

73	2000-072-00	Phenotypic Correlations between Prevalence of Renibacterium salmoninarum among Spring Chinook Salmon an
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RM&E NMFS 198 - Common data management system (RME)

177	1982-013-01	Coded-Wire Tag Recovery Program (Hatchery) (BPA)
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Harvest**Harvest NMFS 164 - Selective fishing methods and gear (Harvest)**

292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
294	1998-056-00	NMFS Net Exchange Program (Harvest) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)

Harvest NMFS 166 - Changes in catch sampling programs and data recovery systems (Harvest)

299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)
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Harvest NMFS 167 - Methods for estimating incidental mortalities in fisheries (Harvest)

296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)

Hydro NMFS 107 - Assess survival of adult salmonids migrating upstream (Hydro)

299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)
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Resident Fish**Hydro NMFS 019 - Operate specific FCRPS projects (Hydro)**

461		Draw down Albeni Falls for kokanee egg-to fry-study (Resident Fish) (CORPS)
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RME**Habitat NMFS 149 - Initiate programs in three priority subbasins (Habitat)**

144 2002-033-00 John Day Recovery Monitoring (RME) (BPA)

Habitat NMFS 152 - Coordinate efforts and support offsite habitat enhancement measures (Habitat)

159 1991-071-00 Snake River Sockeye Salmon Habitat and Limmological Research (RME) (BPA)

Habitat NMFS 155 - Improvement plans for all mainstem reaches and improvements in three reaches (Habitat)

64 1994-069-00 Estimate production potential of fall chinook salmon in the Hanford Reach of the Columbia River (RME) (BPA)

484 2000-012-00 Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (RME) (BPA)

Habitat NMFS 157 - Improve and restore tributary and mainstem habitat for CR chum salmon (Habitat)

484 2000-012-00 Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (RME) (BPA)

Habitat NMFS 158 - Impacts of the FCRPS system on habitat and listed salmon in the estuary (Habitat)

247 1998-014-00 Ocean Survival of Salmonids (RME) (BPA)

Habitat NMFS 160 - Estuary restoration program (Habitat)

247 1998-014-00 Ocean Survival of Salmonids (RME) (BPA)

Habitat NMFS 162 - Model the relationship between estuarine conditions and salmon population (Habitat)

247 1998-014-00 Ocean Survival of Salmonids (RME) (BPA)

Habitat NMFS 196 - Juvenile and adult salmon use of the Columbia River estuary (Habitat)

247 1998-014-00 Ocean Survival of Salmonids (RME) (BPA)

510 Estuary study (CRFM) (RME) (CORPS)

Habitat NMFS 197 - Juvenile and adult salmon use of the Columbia River plume (Habitat)

247 1998-014-00 Ocean Survival of Salmonids (RME) (BPA)

510 Estuary study (CRFM) (RME) (CORPS)

Hatchery NMFS 174 Pt.4 - Determine relative distribution and timing of hatchery and natural spawners (Hatchery)

66 1998-010-03 Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)

Hatchery NMFS 182 - Determine the reproductive success of hatchery fish relative to wild fish (Hatchery)

156 1989-096-00 Genetic Monitoring and Evaluation Program for Supplemented Populations of Salmon and Steelhead in the Snak

162 1993-056-00 Research on Captive Broodstock Programs for Pacific Salmon (RME) (BPA)

163 2000-071-00 Analyzing Behavioral Changes During Salmonid Domestication (RME) (BPA)

248 1998-014-00 Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)

256 1989-098-00 Idaho Supplementation Studies - salmon (RME) (BPA)

257 1989-098-01 Idaho Supplementation Studies - salmon (RME) (BPA)

273 2002-030-00 Develop Progeny Marker for Salmonids to Evaluate Supplementation (RME) (BPA)

Hatchery NMFS 184 - Hatchery research, monitoring, and evaluation program (Hatchery)

61 1992-022-00 Physiological Assessment and Behavioral Interactions of Wild and Hatchery Juvenile Salmonids (RME) (BPA)

63 1994-034-00 Assessing Summer And Fall Chinook Salmon Restoration In The Clearwater, Lower Salmon, Grande Ronde, Ai

76 2002-031-00 Growth Rate Modulation in Spring Chinook Salmon Supplementation (RME) (BPA)

156 1989-096-00 Genetic Monitoring and Evaluation Program for Supplemented Populations of Salmon and Steelhead in the Snak

162 1993-056-00 Research on Captive Broodstock Programs for Pacific Salmon (RME) (BPA)

182 1988-053-04 Hood River Production Program - ODFW M&E (RME) (BPA)

RME

233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)
256	1989-098-00	Idaho Supplementation Studies - salmon (RME) (BPA)
257	1989-098-01	Idaho Supplementation Studies - salmon (RME) (BPA)
273	2002-030-00	Develop Progeny Marker for Salmonids to Evaluate Supplementation (RME) (BPA)

Hydro NMFS 048 - Effects of prior transport as smolts on the homing of adults (Hydro)

465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
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Hydro NMFS 050 - Install necessary adult PIT-tag detectors (Hydro)

465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
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Hydro NMFS 082 - Spillway passage survival of juvenile salmonids at appropriate FCRPS dams (Hydro)

335		Ice Harbor Survival Studies (RME) (CORPS)
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Hydro NMFS 083 - Effect of spill duration and volume on spillway effectiveness (Hydro)

335		Ice Harbor Survival Studies (RME) (CORPS)
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Hydro NMFS 104 - Recover PIT-tag information from predacious bird colonies (Hydro)

325		Estuary PIT tag recovery (RME) (CORPS)
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Hydro NMFS 105 - Assess enhancing function of ecological communities to reduce predation losses (Hydro)

542		Juvenile Salmon Temperature Studies (RME) (CORPS)
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Hydro NMFS 106 - Investigate marine mammal predation in the tailrace of BON (Hydro)

465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
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Hydro NMFS 107 - Assess survival of adult salmonids migrating upstream (Hydro)

66	1998-010-03	Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)
234	1989-107-00	Statistical Support for Salmonid Survival Studies (RME) (BPA)
465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)

Hydro NMFS 108 - Investigate the causes of headburn in adult salmonids (Hydro)

465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
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Hydro NMFS 109 - Adult steelhead downstream migrant (kelt) assessment program (Hydro)

465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
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Hydro NMFS 118 - Indirect prespawning mortality of adult upstream-migrating fish (Hydro)

234	1989-107-00	Statistical Support for Salmonid Survival Studies (RME) (BPA)
465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)

Hydro NMFS 131 - Monitor the physical and biological effects of TDG (Hydro)

232	1987-127-00	Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)
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Hydro NMFS 134 - Continue the spillway deflector optimization program at each FCRPS project (Hydro)

335		Ice Harbor Survival Studies (RME) (CORPS)
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Hydro NMFS 141 - Evaluate juvenile fish condition due to disease in relation to high temperature impacts (Hydro)

154	2002-027-00	Lower Snake Hydrodynamics and Water Quality (RME) (BPA)
542		Juvenile Salmon Temperature Studies (RME) (CORPS)

Hydro NMFS 143 - Model the water temperature effects of alternative Snake River operations (Hydro)

RME

154 2002-027-00 Lower Snake Hydrodynamics and Water Quality (RME) (BPA)

542 Juvenile Salmon Temperature Studies (RME) (CORPS)

Hydro NMFS 185 - Compare the sars of transported and non-transported fish (Hydro)

248 1998-014-00 Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)

Hydro NMFS 187 - Ocean entry timing and sars for transported and downstream migrants (Hydro)

244 1996-020-00 Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA S

248 1998-014-00 Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)

Hydro NMFS 188 - Studies of PIT-tagged wild stocks from the lower river streams (Hydro)

234 1989-107-00 Statistical Support for Salmonid Survival Studies (RME) (BPA)

244 1996-020-00 Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA S

Hydro NMFS 189 - Investigate adult return rates for juveniles with different passage histories (Hydro)

244 1996-020-00 Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA S

Hydro NMFS 190 - Monitor survival and growth of Snake River wild juvenile fall chinook (Hydro)

59 1991-029-00 The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall chin

Hydro NMFS 195 - Causes of mortality below Bonneville Dam (Hydro)

247 1998-014-00 Ocean Survival of Salmonids (RME) (BPA)

248 1998-014-00 Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)

510 Estuary study (CRFM) (RME) (CORPS)

Hydro NMFS 199 - Implement the specific research/monitoring actions outlined in Appendix H (Hydro)

232 1987-127-00 Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)

238 1991-028-00 Monitoring Smolt Migrations of Wild Snake River Spring/Summer Salmon (RME) (BPA)

244 1996-020-00 Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA S

542 Juvenile Salmon Temperature Studies (RME) (CORPS)

RM&E NMFS 179 - Develop recovery goals for listed salmon ESUs in the Columbia River basin (RME)

460 Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)

RM&E NMFS 180 - Develop and implement a basinwide hierarchical monitoring program (RME)

9 1995-063-25 Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)

34 1995-063-35 Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)

45 1990-005-01 Umatilla Natural Production M&E (RME) (BPA)

48 1998-007-02 Grande Ronde Supplementation - Lostine River Spring Chinook M&E (RME) (BPA)

122 1996-019-00 Second-Tier Database Support (RME) (BPA)

563 Assess Salmonids in the Asotin Creek Watershed (RME) (BPA)

567 Evaluate Factors Influencing Bias and Precision of Chinook Salmon Redd Counts (RME) (BPA)

572 Chinook Salmon Smolt Survival and Smolt to Adult Return Rate Quantification, South Fork Salmon River, Idaho

578 Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation

RM&E NMFS 181 - Digitize aerial or satellite imagery of the entire Columbia River basin (RME)

453 John Day Basin Aerial Imagery Project (RME) (USBR)

459 TRT Digital Satellite Imagery Project (RME) (USBR)

RME**RM&E NMFS 182 - Determine the reproductive success of hatchery fish relative to wild fish (RME)**

9	1995-063-25	Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)
34	1995-063-35	Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)
45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
48	1998-007-02	Grande Ronde Supplementation - Lostine River Spring Chinook M&E (RME) (BPA)
50	1998-007-03	Grande Ronde Supplementation - Catharine Creek and Upper Grande Ronde M&E (RME) (BPA)
66	1998-010-03	Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)
157	1990-052-00	Performance/Stock Productivity Impacts of Hatchery Supplementation (RME) (BPA)
170	1983-350-03	New Perce Tribal Hatchery; M & E (RME) (BPA)
233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)
258	1989-098-02	Idaho Supplementation Studies - salmon (RME) (BPA)
259	1989-098-03	Idaho Supplementation Studies - salmon (RME) (BPA)
260	1990-055-00	Idaho Supplementation Studies - steelhead - previously 1989-098-00 (RME) (BPA)
261	1991-073-00	Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (RME) (BPA)
275	1992-026-04	Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin

RM&E NMFS 183 - Three tier 3 studies within each ESU (RME)

452		Fish Production/Flow Analysis (RME) (USBR)
452		Fish Production/Flow Analysis (RME) (USBR)
454		Pushup Dam Research - John Day Basin (RME) (USBR)
455		John Day Basin Steelhead Data and Information Compilation (RME) (USBR)
458		Effectiveness Monitoring Prioritization Project (RME) (USBR)
563		Assess Salmonids in the Asotin Creek Watershed (RME) (BPA)
572		Chinook Salmon Smolt Survival and Smolt to Adult Return Rate Quantification, South Fork Salmon River, Idaho
578		Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation

RM&E NMFS 184 - Hatchery research, monitoring, and evaluation program (RME)

9	1995-063-25	Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)
34	1995-063-35	Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)
45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
48	1998-007-02	Grande Ronde Supplementation - Lostine River Spring Chinook M&E (RME) (BPA)
50	1998-007-03	Grande Ronde Supplementation - Catharine Creek and Upper Grande Ronde M&E (RME) (BPA)
59	1991-029-00	The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall chin
66	1998-010-03	Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)
95	1999-018-00	Characterize and quantify residual steelhead in the Clearwater River, Idaho (RME) (BPA)
157	1990-052-00	Performance/Stock Productivity Impacts of Hatchery Supplementation (RME) (BPA)
163	2000-071-00	Analyzing Behavioral Changes During Salmonid Domestication (RME) (BPA)
170	1983-350-03	New Perce Tribal Hatchery; M & E (RME) (BPA)
181	1988-053-03	Hood River Production Program - CTWSRO M&E (RME) (BPA)
258	1989-098-02	Idaho Supplementation Studies - salmon (RME) (BPA)
259	1989-098-03	Idaho Supplementation Studies - salmon (RME) (BPA)
260	1990-055-00	Idaho Supplementation Studies - steelhead - previously 1989-098-00 (RME) (BPA)

RME

261	1991-073-00	Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (RME) (BPA)
275	1992-026-04	Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin
278	1991-055-00	NATURES [Formerly Supplementation Fish Quality (Yakima)] (RME) (BPA)
280	2001-047-00	Reintroduction success of steelhead from captive propagation and release strategies (RME) (BPA)

RM&E NMFS 185 - Compare the sars of transported and non-transported fish (RME)

242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and
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RM&E NMFS 187 - Ocean entry timing and sars for transported and downstream migrants (RME)

242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and
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RM&E NMFS 188 - Studies of PIT-tagged wild stocks from the lower river streams (RME)

141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau
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RM&E NMFS 189 - Investigate adult return rates for juveniles with different passage histories (RME)

242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and
372		Multiple Bypass Accumulative Impacts (RME) (CORPS)

RM&E NMFS 190 - Monitor survival and growth of Snake River wild juvenile fall chinook (RME)

77	2002-032-00	Investigating passage of ESA-listed juvenile fall chinook salmon at Lower Granite Dam during winter when the fish
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and

RM&E NMFS 191 - Adult salmonid counting programs at FCRPS dams (RME)

465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
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RM&E NMFS 193 - State-of-the-art, novel fish detection and tagging techniques (RME)

242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and
249	2000-080-00	Pacific Ocean Salmon Tracking (POST) (RME) (BPA)
566		Adult Steelhead Status Monitoring - Imnaha River Subbasin (RME) (BPA)

RM&E NMFS 194 - Physical model of the lower Columbia River and plume (RME)

247	1998-014-00	Ocean Survival of Salmonids (RME) (BPA)
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RM&E NMFS 195 - Causes of mortality below Bonneville Dam (RME)

234	1989-107-00	Statistical Support for Salmonid Survival Studies (RME) (BPA)
247	1998-014-00	Ocean Survival of Salmonids (RME) (BPA)

RM&E NMFS 198 - Common data management system (RME)

122	1996-019-00	Second-Tier Database Support (RME) (BPA)
123	1988-108-04	Pacific Northwest Hydropower Data Base and Analysis System (NWHS) (RME) (BPA)
124	1998-011-00	Montana Natural Heritage Program (RME) (BPA)
125	2001-017-00	Idaho Conservation Data Center (RME) (BPA)
151	1988-108-04	StreamNet (CIS/NED) (RME) (BPA)
152	2001-074-00	NPPC Regional Data Needs (RME) (BPA)
236	1990-080-00	Columbia River Basin PIT Tag Information System (RME) (BPA)
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and
466		Regional Database (RME) (CORPS)

RM&E NMFS 199 - Implement the specific research/monitoring actions outlined in Appendix H (RME)

RME

53	2000-039-00	Walla Walla Natural Production M&E (RME) (BPA)
66	1998-010-03	Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)
141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau
240	1991-051-00	Monitoring and Evaluation Statistical Support (RME) (BPA)
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and
245	1997-015-01	Title Present Scope: Imnaha River Smolt Monitoring Program. Title for proposed expanded scope: Imnaha Smo

Table 3 - Report 2: Action Agency Projects for USFWS BiOp Actions

<i>RPA</i>	<i>BiopID</i>	<i>Project Title</i>
Hydro		
10.A.1.2	590	Hungry Horse Operations (Hydro) (USBR)
10.A.2.1	371	Monitoring of Bull Trout at Mainstem Projects (Hydro) (CORPS)
10.A.2.2	371	Monitoring of Bull Trout at Mainstem Projects (Hydro) (CORPS)
Habitat		
11.A.3.1.f	201 1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)

Resident Fish**8.1.f**

492 1994-049-00 Improving the Kootenai River Ecosystem (Resident Fish) (BPA)

8.4.a

489 1988-064-00 Kootenai River White Sturgeon Study and Experimental Aquaculture (Resident Fish) (BPA)

10.2

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

10.6

471 2002-008-00 Reconnection of floodplain slough habitat to the Kootenai River (Resident Fish) (BPA)

496 2002-009-00 Lake Pend Oreille Predation Research (Resident Fish) (BPA)

498 2002-011-00 Implement Floodplain Operational Loss Assessment, Protection, Mitigation and Rehabilitation on the Lower K

10.8

143 2002-006-00 Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers (Resident Fish) (BPA)

10.A.1.1

462 Libby Operations Bull Trout (Resident Fish) (CORPS)

584 1995-004-00 Libby Mitigation Plan (Resident Fish) (BPA)

10.A.1.2

585 1991-019-03 Hungry Horse Mitigation - Habitat (Resident Fish) (BPA)

10.A.1.4

461 Draw down Albeni Falls for kokanee egg-to fry-study (Resident Fish) (CORPS)

491 1994-047-00 Lake Pend Oreille Fishery Recovery Project (Resident Fish) (BPA)

11.A.1.1.b

462 Libby Operations Bull Trout (Resident Fish) (CORPS)

11.A.1.4.a

461 Draw down Albeni Falls for kokanee egg-to fry-study (Resident Fish) (CORPS)

491 1994-047-00 Lake Pend Oreille Fishery Recovery Project (Resident Fish) (BPA)

11.A.1.4.b

491 1994-047-00 Lake Pend Oreille Fishery Recovery Project (Resident Fish) (BPA)

496 2002-009-00 Lake Pend Oreille Predation Research (Resident Fish) (BPA)

11.A.1.4.d

491 1994-047-00 Lake Pend Oreille Fishery Recovery Project (Resident Fish) (BPA)

8.1.a

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

8.1.g

464 Seek USFWS concurrence on water storage (Resident Fish) (CORPS)

8.2.a.1

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)

8.2.a.8

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)

Resident Fish

584 1995-004-00 Libby Mitigation Plan (Resident Fish) (BPA)

8.2.a.9

489 1988-064-00 Kootenai River White Sturgeon Study and Experimental Aquaculture (Resident Fish) (BPA)

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)

8.2.c

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

8.3.b

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

8.3.d

489 1988-064-00 Kootenai River White Sturgeon Study and Experimental Aquaculture (Resident Fish) (BPA)

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)

584 1995-004-00 Libby Mitigation Plan (Resident Fish) (BPA)

8.3.f

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

8.3.g

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

8.3.i

494 2002-002-00 Assess Feasibility of Enhancing White Sturgeon Spawning Substrate Habitat, Kootenai R., Idaho (Resident F

8.3.j

494 2002-002-00 Assess Feasibility of Enhancing White Sturgeon Spawning Substrate Habitat, Kootenai R., Idaho (Resident F

8.4.b

489 1988-064-00 Kootenai River White Sturgeon Study and Experimental Aquaculture (Resident Fish) (BPA)

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)

492 1994-049-00 Improving the Kootenai River Ecosystem (Resident Fish) (BPA)

10.A.3.2

488 1987-407-00 Dworshak Integrated Rule Curves/M&E (Resident Fish) (BPA)

11.A.3.1.d

143 2002-006-00 Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers (Resident Fish) (BPA)

11.A.3.1.f

143 2002-006-00 Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers (Resident Fish) (BPA)

RME**11.A.2.1.b**

232 1987-127-00 Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)

11.A.3.1.a

232 1987-127-00 Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)

10.A.3.1

232 1987-127-00 Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)

Table 3 - Report 3: Action Agency Projects by Province and Subbasin

*BiOp
ID*

Projects

18	2000-011-00	Rock Creek Watershed Assessment and Restoration project. (Habitat) (BPA)
303		Report on New Generation Resources and Associated Transmission Improvements (Hydro) (BPA)
319		Coordinate Water Management Decisions with TMT (Hydro) (CORPS)
320		Cylindrical Dewatering Evaluation (Hydro) (CORPS)
464		Seek USFWS concurrence on water storage (Resident Fish) (CORPS)
487		Bonneville Spillway Flow Deflectors (Hydro) (CORPS)
529		The Dalles adult entrance channel dewatering mods (Hydro) (CORPS)

Blue Mountain**Asotin**

61	1992-022-00	Physiological Assessment and Behavioral Interactions of Wild and Hatchery Juvenile Salmonids (RME) (BPA)
281	1997-080-00	Asotin Creek Upland Sedimentation Reduction (Habitat) (BPA)
282	1997-086-00	Asotin Watershed Upland BMP's (Habitat) (BPA)
283	1999-002-00	Asotin Watershed Project Implementation (Habitat) (BPA)
284	1999-052-00	Asotin Creek Five Year Minimum Till Program (Habitat) (BPA)
285	1999-060-00	Asotin Watershed Upland BMP Implementation (Habitat) (BPA)
286	2000-046-00	ISCO Water Sampling and Macroinvertebrate Samples (RME) (BPA)
287	2000-047-00	GIS Mapping of Asotin Creek Watershed Habitat Projects (Habitat) (BPA)
288	2000-053-00	Asotin Creek Riparian Planting (Habitat) (BPA)
289	2000-054-00	Asotin Creek Riparian Fencing Projects (Habitat) (BPA)
290	2000-067-00	Asotin Creek Channel, Floodplain and Riparian Restoration (Habitat) (BPA)
562		Asotin County Riparian Buffer and Couse and Tenmile Creeks Protection and Implementation Project (Habitat) (BPA)
563		Assess Salmonids in the Asotin Creek Watershed (RME) (BPA)
564		Protect and Restore the Asotin Creek Watershed (Habitat) (BPA)

Grande Ronde

41	1988-053-04	Northeast Oregon Hatchery Project (Hatchery) (BPA)
43	1988-053-05	Northeast Oregon Hatchery Project (Hatchery) (BPA)
47	1998-007-02	Grande Ronde Supplementation - Lostine River Spring Chinook (Hatchery) (BPA)
48	1998-007-02	Grande Ronde Supplementation - Lostine River Spring Chinook M&E (RME) (BPA)
49	1998-007-03	Grande Ronde Satellite Facility O&M (Hatchery) (BPA)
50	1998-007-03	Grande Ronde Supplementation - Catharine Creek and Upper Grande Ronde M&E (RME) (BPA)
51	1998-007-04	Grande Ronde Spring Chinook Supplementation Program (Hatchery) (BPA)
57	1988-053-01	Northeast Oregon Hatchery Project (Hatchery) (BPA)
174	1998-010-06	Captive Broodstock Artificial Propagation (Hatchery) (BPA)
195	1984-025-00	Joseph Creek, Grande Ronde River (Habitat) (BPA)
196	1992-026-01	Grande Ronde Model Watershed - Planning (Habitat) (BPA)
197	1992-026-01	Little Sheep Creek Lg Wood Placement and Culvert Replacement (Habitat) (BPA)
198	1992-026-01	Lostine River/Carcass Supplementation and Evaluation (RME) (BPA)
199	1992-026-01	Grouse Creek Restoration (Habitat) (BPA)
200	1992-026-01	GRMWS - LaGrande Ranger District FY01 Projects (Habitat) (BPA)
201	1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)
202	1992-026-01	GRMWS - Union County Bridges (Habitat) (BPA)
203	1992-026-01	GRMWP - Bue Road Improvement (Habitat) (BPA)
204	1992-026-01	GRMWP - Lostine Watershed Assessment (Habitat) (BPA)
205	1992-026-01	GRMWP - Clark Creek/Bryant Alternative Watering System (Habitat) (BPA)
206	1992-026-01	GRMWP - Indian Creek/Trick Runoff and Buffering System (Habitat) (BPA)
207	1992-026-01	GRMWP - Rangeland Drill/Watershed Restoration and Enhancement (Habitat) (BPA)
208	1992-026-01	GRMWP - Eisminger/CREP Dike Relocation (Habitat) (BPA)
209	1996-083-01	McCoy Meadows Watershed Restoration (Habitat) (BPA)
210	1997-078	Catherine Creek Irrigation Stabilization (Habitat) (BPA)
211	1999-043-00	Union County Technical Engineering Assistance (Habitat) (BPA)
212	1999-044-00	Wallowa County Technical Engineering Assistance (Habitat) (BPA)
213	1999-047-00	Wet Meadow Inventory and Assessment (Habitat) (BPA)
214	1999-058-00	Upper Grande Ronde and Catherine Creek Watershed Restoration (Habitat) (BPA)
215	1999-061	Mill Creek Fish Passage/Union County SWCD Channel Road (Habitat) (BPA)
216	1999-070-00	Wallowa County Gaging Station (RME) (BPA)
217	1999-071-00	Hagedorn Road Relocation/Stream Restoration (Habitat) (BPA)
218	1999-072-00	Wildcat Creek Culvert Replacement (Habitat) (BPA)
219	1999-074-00	Little Fly Creek Headcut Rehabilitation (Habitat) (BPA)
220	1999-079-00	Beaver Creek Fish Passage (Habitat) (BPA)
221	1999-081-00	East End Road Obliteration and Sediment Reduction (Habitat) (BPA)

222	2000-059-00	USFS Marr Flat Allotment and Big Sheep/Imnaha Fisheries Enhancement (Habitat) (BPA)
223	2000-061-00	Upper Wildcat and Joseph Creek Watershed improvement (Habitat) (BPA)
224	2000-062-00	Imnaha/Park Ditch Water Conservation (Habitat) (BPA)
225	2000-063-00	Meadow Creek Riparian Pasure Fence (Habitat) (BPA)
226	2000-064-00	Conservation Reserve Enhancement Program Incentive (Habitat) (BPA)
227	2000-065-00	Meadow Creek/Habberstad fish habitat Enhancement (Habitat) (BPA)
228	2000-066-00	McCoy Creek-Alta Cunha Rances Riparian Restoration (Habitat) (BPA)
229	2000-069-00	Grande Ronde River Basin - Culvert Replacements (Habitat) (BPA)
230	2001-018-00	Phillips-Gordon Watershed Assessment (Habitat) (BPA)
231	2001-019-00	Little Catherine and Lick Creek Restoration (Habitat) (BPA)
275	1992-026-04	Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin (RME) (BPA)
276	1998-010-01	Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program (Hatchery) (BPA)
565		Oregon Plan Blue Mountain Province Fish Screening/Fish Passage (Habitat) (BPA)

Imnaha

41	1988-053-04	Northeast Oregon Hatchery Project (Hatchery) (BPA)
43	1988-053-05	Northeast Oregon Hatchery Project (Hatchery) (BPA)
57	1988-053-01	Northeast Oregon Hatchery Project (Hatchery) (BPA)
245	1997-015-01	Title Present Scope: Imnaha River Smolt Monitoring Program. Title for proposed expanded scope: Imnaha Smolt Survival and Smolt to Adult Return Rate Quantification (RME) (BPA)
275	1992-026-04	Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin (RME) (BPA)
566		Adult Steelhead Status Monitoring - Imnaha River Subbasin (RME) (BPA)

Snake Hells Canyon

59	1991-029-00	The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall chinook salmon (RME) (BPA)
66	1998-010-03	Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)
67	1998-010-04	Monitoring and Evaluation of Yearling Snake River Fall Chinook Salmon Outplanted Upstream of Lower Granite Dam (RME) (BPA)
173	1996-010-05	Pittsburgh Landing Fall Chinook Acclimation Facility (Hatchery) (BPA)
175	1996-010-07	Capt. John Rapid's Fall Chinook Acclimation Facility (Hatchery) (BPA)
176	1996-010-08	Big Canyon Fall Chinook Acclimation Facility (Hatchery) (BPA)
293	1997-009-00	Evaluate Potential Means of Rebuilding Sturgeon Populations in the Snake River Between Lower Granite and Hells Canyon Dams (Resident Fish) (BPA)

Columbia Cascade**Columbia Upper Middle**

- 442 Chief Joseph Project ESA Consultation with NMFS (Hydro) (USBR)
460 Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)

Entiat

- 109 1996-040-00 Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (Hatchery) (BPA)
121 2002-041-00 Columbia Cascade Stream Gauging (RME) (BPA)
389 Entiat IFIM Studies (Habitat) (USBR)
424 USBR Entiat Subbasin Program Management (Habitat) (USBR)
587 Entiat IFIM Studies (Habitat) (USBR)

Methow

- 108 1996-034-01 Methow Valley Irrigation District Rehabilitation (Habitat) (BPA)
109 1996-040-00 Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (Hatchery) (BPA)
111 1998-025-00 Restore Steelhead and Chinook habitat in Early Winters Creek (Habitat) (BPA)
112 1998-029-00 Goat Creek In-Stream Restoration for Salmonids (Habitat) (BPA)
116 2001-063-00 Methow River Basin Screening (Habitat) (BPA)
117 2001-065-00 Hancock Springs Passage and Habitat Restoration Improvements (Habitat) (BPA)
150 1998-035-01 Watershed Scale Response of Habitat to Abandoned Mine Waste (Habitat) (BPA)
383 Beaver Creek Water Acquisitions (Habitat) (USBR)
384 Campbell Diversions (Habitat) (USBR)
387 Chewuch Ditch Diversion Structure (Habitat) (USBR)
390 Fort-Thurlow Pump Exchange (Habitat) (USBR)
391 Fulton Diversion Structure (Habitat) (USBR)
392 Gold Creek Screen and Diversion (Habitat) (USBR)
408 Marracci/Washington Department of Fish and Wildlife Diverson (Habitat) (USBR)
409 USGS Hydrologic Model Upgrades (Habitat) (USBR)
410 Methow Valley Irrigation District Methow River Screen (Habitat) (USBR)
411 Methow Valley Irrigation District Twisp River Screen (Habitat) (USBR)
412 Methow Valley Irrigation District Twisp River Pump Exchange (Habitat) (USBR)
416 Methow Valley Irrigation District Methow River Diversion (Habitat) (USBR)
417 Methow Valley Irrigation District Twisp River Diversion (Habitat) (USBR)
419 Okanogan Gaging Stations (Habitat) (USBR)
427 USBR Methow program management (Habitat) (USBR)
459 TRT Digital Satellite Imagery Project (RME) (USBR)
581 Evaluation of 1872 Water Rights to Supplement Flows Between Basins (Habitat) (BPA)
583 Restore Passage on Private Lands in Beaver Creek Drainage to Benefit Spring Chinook, Steelhead and Bulltrout (Habitat) (BPA)

Okanogan

110	1996-042-00	Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (Habitat) (BPA)
114	2000-001-00	Anadromous Fish Habitat & Passage in Omak Creek (Habitat) (BPA)
118	2002-001-00	Colville Confederated Tribes Ellisford Acclimation (Hatchery) (BPA)
121	2002-041-00	Columbia Cascade Stream Gauging (RME) (BPA)
246	2000-013-00	Evaluate An Experimental Re-Introduction of Sockeye Salmon into Skaha Lake (BPA Short Title: Eval Reintroduction Sockeye Salmon Skaha Lake) (Habitat) (BPA)
444		Okanogan Project ESA Consultation with NMFS (Hydro) (USBR)
582		Adult Passage Counting and Trapping at Zosel Dam (Hydro) (BPA)

Wenatchee

109	1996-040-00	Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (Hatchery) (BPA)
115	2000-002-00	Remove Barriers/Restore Instream Habitat on Chumstick Creek (Habitat) (BPA)
121	2002-041-00	Columbia Cascade Stream Gauging (RME) (BPA)
385		Chelan County/Wenatchee IFIM Study (Habitat) (USBR)
388		Chumstick Diversions (Habitat) (USBR)
415		Mission Diversions (Habitat) (USBR)
433		USBR Wenatchee Subbasin Program Management (Habitat) (USBR)
437		HGMP Funding & Development-Leavenworth (Hatchery) (USBR)
438		HGMPs Implementation - Leavenworth (Hatchery) (USBR)
459		TRT Digital Satellite Imagery Project (RME) (USBR)

Columbia Estuary/Ocean**Columbia Estuary**

247	1998-014-00	Ocean Survival of Salmonids (RME) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
325		Estuary PIT tag recovery (RME) (CORPS)
533		Brownsmead, Clatsop County OR, Section 1135 (Habitat) (CORPS)
534		Estuary Restoration 536 Program (Habitat) (CORPS)
536		Estuary General Investigation Study (Habitat) (CORPS)
539		Research: Columbia River Estuary (Habitat) (CORPS)
549		Rooster Rock Wetlands (Habitat) (CORPS)
556		Skipanon Slough (Habitat) (CORPS)

Grays

559		SW Washington Streams Section 206 (Habitat) (CORPS)
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Columbia Gorge**Big White Salmon**

61 1992-022-00 Physiological Assessment and Behavioral Interactions of Wild and Hatchery Juvenile Salmonids (RME) (BPA)

Columbia Gorge

68 1999-003-00 Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (RME) (BPA)

73 2000-072-00 Phenotypic Correlations between Prevalence of Renibacterium salmoninarum among Spring Chinook Salmon and Resistance/Susceptibility of their Progeny to Infectious Bacteria and Bacterial Kidney Disease (BKD) (Hatchery) (BPA)

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)

294 1998-056-00 NMFS Net Exchange Program (Harvest) (BPA)

297 2001-026-00 Evaluate Status of Coastal Cutthroat Trout in the Columbia River Basin above Bonneville Dam (Resident Fish) (BPA)

299 2001-058-00 Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)

525 Bonneville 1st PH JBS improvements (Hydro) (CORPS)

537 Estuary Mapping (Habitat) (CORPS)

Fifteenmile

136 2001-023-00 15 Mile Water Rights Acquisition (Habitat) (BPA)

183 1993-040-00 Fifteenmile Creek Habitat Restoration Project (Habitat) (BPA)

187 2001-020-00 Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)

188 2001-021-00 Fifteenmile Creek Riparian Buffers - Wasco County (Habitat) (BPA)

297 2001-026-00 Evaluate Status of Coastal Cutthroat Trout in the Columbia River Basin above Bonneville Dam (Resident Fish) (BPA)

Hood

181 1988-053-03 Hood River Production Program - CTWSRO M&E (RME) (BPA)

182 1988-053-04 Hood River Production Program - ODFW M&E (RME) (BPA)

185 1998-021-00 Hood River Fish Habitat Project (Habitat) (BPA)

Klickitat

33 1988-115-35 Yakima/Klickitat Fisheries Project Design and Construction - Klickitat ONLY (Hatchery) (BPA)

34 1995-063-35 Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)

35 1995-068-00 Preliminary Design for Passage & Habitat Improvement (Habitat) (BPA)

36 1997-056-00 Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (Habitat) (BPA)

37 2000-010-00 Klickitat River Subbasin Assessment (Habitat) (BPA)

38 2001-024-00 Klickitat River Salmon Exertion Study - Determination of difficult passage areas, migration patterns and energetic use of upriver migrating salmon and steelhead (RME) (BPA)

269 2000-055-00 Nutrient enhancement studies (RME) (BPA)

Wind

130 1998-019-01 Wind River Watershed USGS (RME) (BPA)

131 1998-019-02 Wind River Watershed Monitoring (RME) (BPA)

Columbia Plateau**Columbia Lower Middle**

64	1994-069-00	Estimate production potential of fall chinook salmon in the Hanford Reach of the Columbia River (RME) (BPA)
68	1999-003-00	Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (RME) (BPA)
74	2001-008-00	Genetic sex of chinook salmon in the Columbia River Basin (RME) (BPA)
363		McNary Extended Submerged Bar Screens (Hydro) (CORPS)
364		McNary Flow Deflectors (Hydro) (CORPS)
366		McNary Juvenile Bypass System Outfall (Hydro) (CORPS)
367		McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
374		Priest Rapids Flow Objective (Hydro) (CORPS)
376		Separator Evaluation (Hydro) (CORPS)

Crab

450		Columbia Basin Project Wasteway and Drain Investigation (Hydro) (USBR)
451		Return Flow Quality from Columbia Basin Project (Hydro) (USBR)

Deschutes

75	2002-016-00	Determine lamprey species composition, larval distribution and adult abundance in the Deschutes Subbasin (RME) (BPA)
140	1999-008-00	Columbia Plateau Water Rights Acquisition (Habitat) (BPA)
141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau Province (RME) (BPA)
181	1988-053-03	Hood River Production Program - CTWSRO M&E (RME) (BPA)
182	1988-053-04	Hood River Production Program - ODFW M&E (RME) (BPA)
186	1998-028-00	Trout Creek Watershed Improvement Project (Habitat) (BPA)
189	2001-054-00	Emergency Flow Augmentation for Buck Hollow (Habitat) (BPA)
191	2002-019-00	Establish Riparian Buffer Systems (Habitat) (BPA)
443		Deschutes Project ESA Consultation with NMFS (Hydro) (USBR)
476	2002-017-00	Regional Stream Conditions and Stressor Evaluation (RME) (BPA)
481	2002-028-00	Conduct Watershed Assessments for Priority Watersheds on Private Lands in the Columbia Plateau (Habitat) (BPA)
560		Trout Creek Section 206 (Habitat) (CORPS)

John Day

126	1984-021-00	Protect and Enhance John Day Anadromous Fish (Habitat) (BPA)
127	1993-066-00	NE Oregon Pump Screening (Habitat) (BPA)
128	1998-017-00	Eliminate Gravel Push-up Dams in Lower North Fork John Day (Habitat) (BPA)
129	1998-018-00	John Day Watershed Restoration Program (Habitat) (USBR)
132	1998-022-00	Pine Creek Ranch Acquisition (Habitat) (BPA)
133	1999-010-00	Mitigate Effects of Erosion on Salmonid Habitat - Pine Hollow (Habitat) (BPA)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
135	2000-031-00	North Fork John Day River Subbasin Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
137	2001-040-00	Wagner Ranch Acquisition (Habitat) (BPA)
138	2001-041-00	Forrest Ranch Acquisition (Habitat) (BPA)
139	2001-069-00	Oregon Water Trust Early Action Project (Habitat) (BPA)
140	1999-008-00	Columbia Plateau Water Rights Acquisition (Habitat) (BPA)
141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau Province (RME) (BPA)
144	2002-033-00	John Day Recovery Monitoring (RME) (BPA)
157	1990-052-00	Performance/Stock Productivity Impacts of Hatchery Supplementation (RME) (BPA)
184	1994-042-00	Trout Creek Habitat Restoration Project (Habitat) (BPA)
190	2002-015-00	Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon (Habitat) (BPA)
193	2002-034-00	Wheeler SWCD Riparian Buffer Planning and Implementation (Habitat) (BPA)
194	2002-035-00	Gilliam SWCD Riparian Buffers (Habitat) (BPA)
413		Middle Fork John Day Gaging Stations (Habitat) (USBR)
414		Middle Fork John Day IFIM Study (Habitat) (USBR)
418		North Fork John Day River IFIM Studies (Habitat) (USBR)
420		Panama Ditch Screen Replacement (Habitat) (USBR)
421		Strawberry Creek Complex Screen Replacement (Habitat) (USBR)
422		Upper John Day Gaging stations (Habitat) (USBR)
423		Upper John Day IFIM study (Habitat) (USBR)
429		USBR Middle Fork John Day program management (Habitat) (USBR)
430		USBR North Fork John Day Program Management (Habitat) (USBR)
431		USBR Upper John Day Program Management (Habitat) (USBR)
453		John Day Basin Aerial Imagery Project (RME) (USBR)
454		Pushup Dam Research - John Day Basin (RME) (USBR)
455		John Day Basin Steelhead Data and Information Compilation (RME) (USBR)
459		TRT Digital Satellite Imagery Project (RME) (USBR)
476	2002-017-00	Regional Stream Conditions and Stressor Evaluation (RME) (BPA)
481	2002-028-00	Conduct Watershed Assessments for Priority Watersheds on Private Lands in the Columbia Plateau (Habitat) (BPA)

Snake Lower

59	1991-029-00	The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall chinook salmon (RME) (BPA)
77	2002-032-00	Investigating passage of ESA-listed juvenile fall chinook salmon at Lower Granite Dam during winter when the fish bypass system is inoperable (RME) (BPA)
142	2000-017-00	Kelt Reconditioning Research (Hydro) (BPA)
146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
154	2002-027-00	Lower Snake Hydrodynamics and Water Quality (RME) (BPA)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
326		Fish Ladder Temperature Evaluation (Hydro) (CORPS)
327		Fish Ladder Transition Pool Evaluation (Hydro) (CORPS)
330		Flow Objectives at Lower Granite (Hydro) (CORPS)
331		Ice Harbor Adult Pit (Hydro) (CORPS)
332		Ice Harbor Emergency Auxiliary Water Supply (Hydro) (CORPS)
335		Ice Harbor Survival Studies (RME) (CORPS)
342		Little Goose Auxiliary Water Supply (Hydro) (CORPS)
343		Little Goose Extended Submerged Bar Screens (Hydro) (CORPS)
344		Little Goose Flow Deflectors (Hydro) (CORPS)
347		Little Goose Trash Boom (Hydro) (CORPS)
348		Lower Granite Emergency Auxiliary Water Supply (Hydro) (CORPS)
349		Lower Granite Extended Submerged Bar Screens (Hydro) (CORPS)
350		Lower Granite Flow Deflectors (Hydro) (CORPS)
351		Lower Granite Juvenile Bypass System (Hydro) (CORPS)
354		Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
355		Lower Monumental Auxiliary Water Supply (Hydro) (CORPS)
356		Lower Monumental Extended Submerged Bar Screens (Hydro) (CORPS)
357		Lower Monumental Flow Deflectors (Hydro) (CORPS)
358		Lower Monumental Juvenile Bypass System Outfall (Hydro) (CORPS)
361		Lower Snake projects Minimum Operating Pool operation (Hydro) (CORPS)
362		Lower Snake River Juvenile Bypass System Improvements (Hydro) (CORPS)
376		Separator Evaluation (Hydro) (CORPS)
449		Water Acquisition from Reclamation's Snake River Projects (Hydro) (USBR)
460		Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)
541		Evaluation of Transportation Strategies (Hydro) (CORPS)
542		Juvenile Salmon Temperature Studies (RME) (CORPS)
544		Juvenile salmon transportation evaluations (Hydro) (CORPS)
545		Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
557		Spill for Juvenile Fish Passage (Hydro) (CORPS)

Tucannon

143	2002-006-00	Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers (Resident Fish) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-001-00, 1999-057-00) (Habitat) (BPA)
263	1994-018-07	Garfield County Sediment Reduction and Riparian Improvement Program - (proposal) - funded under: 1999-021-00, 1999-059-00, 1997-088-00 (closed, but some 088 activities carried into 021 and 059 contracts) (Habitat) (BPA)
266	2000-019-00	Tucannon River Spring Chinook Captive Broodstock Program (Hatchery) (BPA)

Umatilla

39	1983-436-00	Umatilla Passage O&M (Habitat) (BPA)
40	1988-022-00	Umatilla River Fish Passage Operations (Habitat) (BPA)
44	1989-027-00	Repay Power for Umatilla Basin Project (Habitat) (BPA)
45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
62	1994-026-00	LAMPREY RESEARCH AND RESTORATION (RME) (BPA)
78	2002-037-00	Characterize Genetic Differences and Distribution of Freshwater Mussels (RME) (BPA)
140	1999-008-00	Columbia Plateau Water Rights Acquisition (Habitat) (BPA)
141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau Province (RME) (BPA)
142	2000-017-00	Kelt Reconditioning Research (Hydro) (BPA)
180	1987-100-02	Umatilla Subbasin Fish Habitat Improvement (Habitat) (BPA)
192	2002-026-00	Morrow County Buffer Initiative (Habitat) (BPA)
255	1987-100-01	Umatilla River Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
267	2001-011-00	Habitat Diversity in Alluvial Rivers (RME) (BPA)
273	2002-030-00	Develop Progeny Marker for Salmonids to Evaluate Supplementation (RME) (BPA)
446		Umatilla Project ESA Consultation with NMFS (Hydro) (USBR)

Walla Walla

46	1996-011-00	Juvenile Screens Smolt Traps on the WW River also reference 2000-033-00 (Habitat) (BPA)
52	2000-033-00	Walla Walla River Fish Passage Operations (Habitat) (BPA)
53	2000-039-00	Walla Walla Natural Production M&E (RME) (BPA)
54	2001-039-00	Walla Walla Basin Screening (Habitat) (BPA)
55	2001-075-00	Increase Instream Flows to Dewatered Stream Reaches in the Walla Walla Basin (Habitat) (BPA)
56	2002-036-00	Walla Walla River Flow Restoration (Habitat) (BPA)
264	1994-046-01	Walla Walla River Basin Fish Habitat Enhancement (Habitat) (BPA)
265	1998-020-00	Assess Fish Habitat and Salmonids in the Walla Walla Watershed in Washington (RME) (BPA)
270	2001-061-00	Touchet River Flow Acquisition (Habitat) (BPA)
481	2002-028-00	Conduct Watershed Assessments for Priority Watersheds on Private Lands in the Columbia Plateau (Habitat) (BPA)
561		Walla Walla GI Feasibility Study (Habitat) (CORPS)

Yakima

1	1985-062-00	Passage Improvement Evaluation - Phase II Screens (Habitat) (BPA)
2	1988-115-25	Yakima/Klickitat Fisheries Project (YKFP) Design and Const. - Yakima Basin Only (Hatchery) (BPA)
3	1988-120-25	Yakima/Klickitat Fisheries Project (YKFP) Management (Hatchery) (BPA)
4	1991-057-00	Fabricate and Install Yakima Basin Phase II Fish Screens (Habitat) (BPA)
5	1991-075-00	Yakima Phase II Screens - Construction (Habitat) (BPA)
6	1992-009-00	Operate & Maintain (O&M) Yakima Basin Phase II Fish Screens (Habitat) (BPA)
7	1992-062-00	Yakama Nation - Riparian/Wetlands Restoration (Habitat) (BPA)
8	1995-033-00	O&M Of Yakima Phase II Fish Facilities* (Habitat) (BPA)
9	1995-063-25	Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)
10	1995-064-25	Policy/Technical Involvement and Planning in the Yakima/Klickitat Fisheries Project (Hatchery) (BPA)
11	1996-035-00	Satus Watershed Restoration (Habitat) (BPA)
12	1997-013-25	Yakima/Klickitat Fisheries Project Operations and Maintenance (Hatchery) (BPA)
13	1997-051-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (Habitat) (BPA)
14	1997-053-00	Toppenish-Simcoe Instream Flow Restoration and Assessment (Habitat) (BPA)
15	1998-033-00	Restore Upper Toppenish Watershed (Habitat) (BPA)
16	1998-034-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yakima Subbasin (Habitat) (BPA)
17	1999-013-00	Ahtanum Creek Wastershed Assessment (Habitat) (BPA)
19	2002-022-00	YKFP Big Creek Passage & Screening (Habitat) (BPA)
20	2002-023-00	Yakima-Klickitat Fisheries Project - Wilson Creek Snowden Parcel Acquisition (Habitat) (BPA)
21	2002-025-00	Yakima Tributary Access and Habitat Program (Objective 1: Early Actions) (Habitat) (BPA)
22	2002-038-00	Protect Normative Structure and Function of Critical Aquatic and Terrestrial Habitat (Habitat) (BPA)
76	2002-031-00	Growth Rate Modulation in Spring Chinook Salmon Supplementation (RME) (BPA)
119	2002-018-00	Tapteal Bend Riparian Corridor Restoration (Habitat) (BPA)
120	2002-029-00	Fish Passage on WDFW Lands in Yakima (Habitat) (BPA)
142	2000-017-00	Kelt Reconditioning Research (Hydro) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
269	2000-055-00	Nutrient enhancement studies (RME) (BPA)
271	2001-064-00	Improve Stream Flow and Passage for Simcoe Creek Steelhead (Habitat) (BPA)
272	2002-020-00	Fabricate and Install New Huntsville Mill Fish Screen (Habitat) (BPA)
304		Schultz-Wautoma 500-kV Transmission Line (Hydro) (BPA)
447		Yakima Project ESA Consultation with NMFS (Hydro) (USBR)
479		Yakima-Klickitat Fisheries Project - Manastash Creek Fish Passage and Screening (Habitat) (BPA)

Inter-Mountain

Columbia Upper

300 Grand Coulee Bell 500-kV Transmission Line (Hydro) (BPA)
460 Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)
496 2002-009-00 Lake Pend Oreille Predation Research (Resident Fish) (BPA)
497 2002-010-00 Acquire and conserve high priority bull and westslope cutthroat trout habitat in Trestle Creek (Resident Fish) (BPA)
548 Revise Storage Diagrams for Libby (Hydro) (CORPS)

Pend Oreille

313 Albeni Falls Operation (Hydro) (CORPS)
461 Draw down Albeni Falls for kokanee egg-to fry-study (Resident Fish) (CORPS)
491 1994-047-00 Lake Pend Oreille Fishery Recovery Project (Resident Fish) (BPA)

Spokane

300 Grand Coulee Bell 500-kV Transmission Line (Hydro) (BPA)

Lower Columbia**Columbia Lower**

68	1999-003-00	Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (RME) (BPA)
69	2000-012-00	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (Habitat) (BPA)
146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
250	2001-053-00	Re-Introduction of Lower Columbia River Chum Salmon into Duncan Creek (Habitat) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
318		Chum Flows Below Bonneville Dam (Hydro) (CORPS)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
329		Flow Objectives at McNary (Hydro) (CORPS)
339		John Day Minimum Pool Operation (Hydro) (CORPS)
365		McNary Forebay Temperature Improvements (Hydro) (CORPS)
370		McNary Juvenile Survival (Hydro) (CORPS)
484	2000-012-00	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (RME) (BPA)
541		Evaluation of Transportation Strategies (Hydro) (CORPS)
542		Juvenile Salmon Temperature Studies (RME) (CORPS)
544		Juvenile salmon transportation evaluations (Hydro) (CORPS)
557		Spill for Juvenile Fish Passage (Hydro) (CORPS)
558		Steigerwald Lake, Camas, Washougal, WA, Section 1135 (Habitat) (CORPS)

Cowlitz

251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
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Lewis

70	2000-014-00	Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek (RME) (BPA)
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Willamette

268	2001-038-00	Gourlay Creek Dam Fish Ladder (Habitat) (BPA)
298	2001-036-00	Ames Creek Restoration (Habitat) (BPA)

Mainstem/System-wide

Mainstem

72	2000-029-00	Identification of larval Pacific lampreys (<i>Lampetra tridentata</i>), river lampreys (<i>L. ayresi</i>), and western brook lampreys (<i>L. richardsoni</i>) and thermal requirements of early life history stages of lampreys (RME) (BPA)
148	1996-021-00	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (Hydro) (BPA)
149	1997-024-00	Avian Predation on Juvenile Salmonids (Hydro) (BPA)
232	1987-127-00	Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)
243	1994-033-00	Fish Passage Center (Hydro) (BPA)
250	2001-053-00	Re-Introduction of Lower Columbia River Chum Salmon into Duncan Creek (Habitat) (BPA)
291	1986-050-00	White Sturgeon Mitigation and Restoration in the Columbia And Snake Rivers Upstream from Bonneville Dam (Resident Fish) (BPA)
294	1998-056-00	NMFS Net Exchange Program (Harvest) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)
309		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
316		Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
317		Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
322		Automated Alarm System for Adult Collection Channel Diffuser Systems (Hydro) (CORPS)
323		Modify Dworshak National Fish Hatchery System 1 Reuse System (Hydro) (CORPS)
328		Fish Passage Plan Development and Implementation (Hydro) (CORPS)
333		Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334		Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
336		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)
337		Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338		Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
340		Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
345		Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346		Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352		Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353		Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359		Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360		Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
368		Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369		Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
371		Monitoring of Bull Trout at Mainstem Projects (Hydro) (CORPS)
375		Remove Obstructions from Turbine Environments (Hydro) (CORPS)
378		Spare Parts for Fish Passage Facilities (Hydro) (CORPS)

379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
381	Improve Operations of Adult Fishway Main Entrances (Hydro) (CORPS)
448	Banks Lake Drawdown Study (Hydro) (USBR)
465	AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
466	Regional Database (RME) (CORPS)
483	1990-077-00 Northern Pikeminnow Management Program (Hydro) (BPA)
486	Water Quality Plan (Hydro) (CORPS)
502	Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
503	Bonneville 2nd PH fish unit trash rake (Hydro) (CORPS)
504	Bonneville 2nd PH FGE improvements (Hydro) (CORPS)
505	Bonneville 2nd PH emergency AWS (Hydro) (CORPS)
506	Bonneville adult fallback (Hydro) (CORPS)
507	Bonneville flat plate detector (Hydro) (CORPS)
508	Bonneville juvenile fish studies (Hydro) (CORPS)
509	Bonneville 2nd PH gatewell debris removal (Hydro) (CORPS)
510	Estuary study (CRFM) (RME) (CORPS)
511	John Day salmon holding and jumping (Hydro) (CORPS)
512	John Day Ladder Temperature (Hydro) (CORPS)
513	John Day N. Shore AWS (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)
515	John Day Screens (Hydro) (CORPS)
516	John Day survival and passage efficiency studies (Hydro) (CORPS)
517	Adult Lamprey Passage (Hydro) (CORPS)
518	The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
519	The Dalles project survival study (Hydro) (CORPS)
520	Turbine passage studies (Hydro) (CORPS)
521	Adult migration studies (Hydro) (CORPS)
522	Adult PIT tag program (Bonn, The dalles, John Day) (Hydro) (CORPS)
523	Bonneville 1st PH FGE (Hydro) (CORPS)
524	Bonneville 1st PH Surface Bypass (Hydro) (CORPS)
526	Bonneville 2nd PH JBS improvements (Hydro) (CORPS)
527	The Dalles spillway survival improvement s (Hydro) (CORPS)
530	The Dalles surface bypass (Hydro) (CORPS)
531	Improve spawning conditions for chum salmon in the vicinity of Pierce/Ives Islands. (Habitat) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
540	Evaluate Flood Control Operations to Reduce River Ecosystem Effects (Hydro) (CORPS)

546	Request/Negotiate 1 MAF of Treaty storage with BC Hydro (Hydro) (CORPS)
547	Up to 3.5 MAF flow augmentation from Candian storagein July and Auugst (Hydro) (CORPS)
550	Redudant TDG Monitors - Dworshak to McNary Dam (Hydro) (CORPS)
551	Review of Forebay Monitors Lower Granite to McNary (Hydro) (CORPS)
552	Dworshak Dissolved Gas Abatement Study (Hydro) (CORPS)
553	Temperature Modeling Plan Alternative Snake River Operations (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
589	Banks Lake Operations (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)

Systemwide

113	1998-031-00	Implementation of Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment and Restoration Plan (Habitat) (BPA)
122	1996-019-00	Second-Tier Database Support (RME) (BPA)
123	1988-108-04	Pacific Northwest Hydropower Data Base and Analysis System (NWHS) (RME) (BPA)
145	1983-319-00	New Marking and Monitoring Techniques (Hydro) (BPA)
147	2001-010-00	Using Induced Turbulence to Assist Juvenile Migrating Salmon (Hydro) (BPA)
151	1988-108-04	StreamNet (CIS/NED) (RME) (BPA)
152	2001-074-00	NPPC Regional Data Needs (RME) (BPA)
156	1989-096-00	Genetic Monitoring and Evaluation Program for Supplemented Populations of Salmon and Steelhead in the Snake River Basin (RME) (BPA)
158	1990-093-00	Genetic Analysis of <i>Onchorhynchus nerka</i> (Modified to Include Chinook Salmon) (Hatchery) (BPA)
162	1993-056-00	Research on Captive Broodstock Programs for Pacific Salmon (RME) (BPA)
163	2000-071-00	Analyzing Behavioral Changes During Salmonid Domestication (RME) (BPA)
177	1982-013-01	Coded-Wire Tag Recovery Program (Hatchery) (BPA)
178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)
233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)
234	1989-107-00	Statistical Support for Salmonid Survival Studies (RME) (BPA)
235	1989-107-00	Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)
236	1990-080-00	Columbia River Basin PIT Tag Information System (RME) (BPA)
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
240	1991-051-00	Monitoring and Evaluation Statistical Support (RME) (BPA)
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and Columbia Rivers Short BPA Title: Survival Estimates Through Dams and Reservoirs (RME) (BPA)
244	1996-020-00	Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA Short Title: PIT Tagging Spring/Summer Chinook in Hatcheries (RME) (BPA)
248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
249	2000-080-00	Pacific Ocean Salmon Tracking (POST) (RME) (BPA)
252	2002-051-00	Subbasin Planning, Regional Level (Habitat) (BPA)
253	2002-051-00	Subbasin Planning, Statewide/Provincial/Tribal Level (Habitat) (BPA)
254	2002-051-00	Subbasin Planning, Subbasin Level (Habitat) (BPA)
274	2002-047-00	Artificial Production Review Evaluation (APRE) (Hatchery) (BPA)
278	1991-055-00	NATURES [Formerly Supplementation Fish Quality (Yakima)] (RME) (BPA)
279	1996-067-00	Manchester Spring Chinook Broodstock Project (Hatchery) (BPA)
280	2001-047-00	Reintroduction success of steelhead from captive propagation and release strategies (RME) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
312		Adult Temperature Evaluation (Hydro) (CORPS)
372		Multiple Bypass Accumulative Impacts (RME) (CORPS)
373		Operate Turbine units at 1% efficiency range (Hydro) (CORPS)

382	Water Management Plan (Hydro) (CORPS)
439	Reclamation Water Contracts (Hydro) (USBR)
440	Pursue water conservation at USBR projects (Hydro) (USBR)
441	Investigate Unauthorized Use of USBR Water (Hydro) (USBR)
458	Effectiveness Monitoring Prioritization Project (RME) (USBR)
499	Report on use of Additional Canadian Storage To support mainstream flow objectives (Hydro) (BPA)
500	Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
501	Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)
590	Hungry Horse Operations (Hydro) (USBR)

Middle Snake

Snake Lower Middle

377	Shift Flood Control to Maximize Snake River Water Storage (Hydro) (CORPS)
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Snake Upper Middle

449	Water Acquisition from Reclamation's Snake River Projects (Hydro) (USBR)
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Mountain Columbia**Bitterroot**

124 1998-011-00 Montana Natural Heritage Program (RME) (BPA)

Blackfoot

124 1998-011-00 Montana Natural Heritage Program (RME) (BPA)

472 Restoring Bull Trout Habitat in The Blackfoot River's North Fork (Resident Fish) (BPA)

Clark Fork

124 1998-011-00 Montana Natural Heritage Program (RME) (BPA)

Flathead

124 1998-011-00 Montana Natural Heritage Program (RME) (BPA)

301 Hungry Horse Transmission Stability Study (Hydro) (BPA)

473 Secure and Restore Critical Fish and Wildlife Habitats (Resident Fish) (BPA)

474 1991-019-01 Hungry Horse Mitigation - Flathead Lake (Resident Fish) (BPA)

585 1991-019-03 Hungry Horse Mitigation - Habitat (Resident Fish) (BPA)

590 Hungry Horse Operations (Hydro) (USBR)

Kootenai

124 1998-011-00 Montana Natural Heritage Program (RME) (BPA)

302 Libby Transmission Stability Study (Hydro) (BPA)

341 Libby Operations Andromous (Hydro) (CORPS)

462 Libby Operations Bull Trout (Resident Fish) (CORPS)

463 Libby Operations Sturgeon (Resident Fish) (CORPS)

469 Smith Creek Restoration (Resident Fish) (BPA)

471 2002-008-00 Reconnection of floodplain slough habitat to the Kootenai River (Resident Fish) (BPA)

473 Secure and Restore Critical Fish and Wildlife Habitats (Resident Fish) (BPA)

475 Purchase Conservation Easement from Plum Creek Timber Company (PCT) along Fisher River (Habitat) (BPA)

489 1988-064-00 Kootenai River White Sturgeon Study and Experimental Aquaculture (Resident Fish) (BPA)

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)

492 1994-049-00 Improving the Kootenai River Ecosystem (Resident Fish) (BPA)

493 2001-013-00 Evaluate the effects of nutrient supplementation on benthic periphyton, macroinvertebrates, and juvenile sturgeon in the Kootenai River (Resident Fish) (BPA)

494 2002-002-00 Assess Feasibility of Enhancing White Sturgeon Spawning Substrate Habitat, Kootenai R., Idaho (Resident Fish) (BPA)

498 2002-011-00 Implement Floodplain Operational Loss Assessment, Protection, Mitigation and Rehabilitation on the Lower Kootenai River Watershed Ecosystem (Resident Fish) (BPA)

584 1995-004-00 Libby Mitigation Plan (Resident Fish) (BPA)

Mountain Snake

Clearwater

63	1994-034-00	Assessing Summer And Fall Chinook Salmon Restoration In The Clearwater, Lower Salmon, Grande Ronde, And Imnaha Rivers (RME) (BPA)
71	2000-028-00	Status of Pacific Lamprey in the Clearwater River Drainage, Idaho (RME) (BPA)
80	1993-035-01	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed (Habitat) (BPA)
86	1996-077-02	Protect and Restore Lolo Creek Watershed (Habitat) (BPA)
87	1996-077-03	Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Papoose) Creek Watersheds Analysis Area (Habitat) (BPA)
88	1996-077-05	Restore McComas Meadows/Meadow Creek Watershed (Habitat) (BPA)
89	1996-086-00	Clearwater Focus Program (Habitat) (BPA)
90	1997-060-00	Clearwater Subbasin Focus Watershed Program - NPT (Habitat) (BPA)
91	1999-014-00	Little Canyon Creek Subwatershed-Steelhead Trout Habitat Improvement Project (Habitat) (BPA)
92	1999-015-00	Restoring Anadromous Fish Habitat in Big Canyon Watershed (Habitat) (BPA)
93	1999-016-00	Protect and Restore Big Canyon Creek Watershed (Habitat) (BPA)
94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
95	1999-018-00	Characterize and quantify residual steelhead in the Clearwater River, Idaho (RME) (BPA)
98	2000-034-00	Protect and Restore The North Lochsa Face Analysis Area Watersheds (Habitat) (BPA)
99	2000-35-00	Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (Habitat) (BPA)
100	2000-036-00	Protect & Restore Mill Creek (Habitat) (BPA)
157	1990-052-00	Performance/Stock Productivity Impacts of Hatchery Supplementation (RME) (BPA)
170	1983-350-03	New Perce Tribal Hatchery; M & E (RME) (BPA)
258	1989-098-02	Idaho Supplementation Studies - salmon (RME) (BPA)
259	1989-098-03	Idaho Supplementation Studies - salmon (RME) (BPA)
260	1990-055-00	Idaho Supplementation Studies - steelhead - previously 1989-098-00 (RME) (BPA)
261	1991-073-00	Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (RME) (BPA)
324		Dworshak Operations (Hydro) (CORPS)
428		USBR Middle Clearwater Subbasin Program Management (Habitat) (USBR)
445		Tualatin Project ESA Consultation with NMFS (Hydro) (USBR)
488	1987-407-00	Dworshak Integrated Rule Curves/M&E (Resident Fish) (BPA)
570		Nez Perce Tribe Harvest Monitoring Program (RME) (BPA)
571		Potlatch River Watershed Restoration (Habitat) (BPA)
578		Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (RME) (BPA)
580		Restoring anadromous fish habitat in the Lapwai Creek watershed (Habitat) (BPA)

Salmon

65	1997-030-00	Listed Stock Chinook Salmon Escapement Monitoring (RME) (BPA)
79	1992-026-03	Upper Salmon Basin Watershed Project Administration/Implementation Support (Habitat) (BPA)
81	1993-062-00	Custer Soil & Water Conservation District Salmon River Fish Passage Enhancement (Habitat) (BPA)
82	1994-015-00	Idaho Fish Screen Improvement (Habitat) (BPA)
83	1994-017-00	Idaho Model Watershed Habitat Improvement Project (Habitat) (BPA)
84	1994-050-00	Salmon River Habitat Enhancement M & E (Habitat) (BPA)
85	1996-007-00	Upper Salmon River Diversion Consolidation Program (Habitat) (BPA)
96	1999-019-00	Holistic Restoration of the Twelvemile Reach of the Salmon River near Challis, Idaho (Habitat) (BPA)
97	1999-020-00	Analyze the Persistence and Spatial Dynamics of Snake River Chinook Salmon (RME) (BPA)
101	2001-035-00	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning and Rearing Habitat (Habitat) (BPA)
102	2001-044-00	Conservation Easement, Baker Ranch, Salmon River East Fork (Habitat) (BPA)
103	2001-051-00	Reconnect Little Morgan Creek to the Main-stem Pahsimeroi River (Habitat) (BPA)
104	2001-052-00	Restoration of Anadromous Fish Access to Hawley Creek (Habitat) (BPA)
105	2001-067-00	Restore Passage Lower Lemhi / Salmon Rivers (Habitat) (BPA)
107	2001-068-00	Transfer Lemhi Water Users (L-6 to Salmon River (S-14) (Habitat) (BPA)
159	1991-071-00	Snake River Sockeye Salmon Habitat and Limnological Research (RME) (BPA)
160	1991-072-00	Redfish Lake Sockeye Salmon Captive Broodstock Program (Hatchery) (BPA)
161	1992-040-00	Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research (Hatchery) (BPA)
164	2001-049-00	Safety-Net Coordinator (Hatchery) (BPA)
165	2002-004-04	Safety-Net Artificial Propagation Program - WDFW (Hatchery) (BPA)
166	2002-004-00	Safety-Net Artificial Propagation Program - CRITFC (Hatchery) (BPA)
167	2002-004-01	Safety-Net Artificial Propagation Program - NPT (Hatchery) (BPA)
168	2002-004-02	Safety-Net Artificial Propagation Program - IDFG (Hatchery) (BPA)
169	2002-004-03	Safety-Net Artificial Propagation Program - SBT (Hatchery) (BPA)
171	1996-043-00	Johnson Creek Artificial Propagation & Enhancement (Hatchery) (BPA)
172	1997-038-00	Listed Stock Chinook Salmon Gamete Preservation (Hatchery) (BPA)
238	1991-028-00	Monitoring Smolt Migrations of Wild Snake River Spring/Summer Salmon (RME) (BPA)
256	1989-098-00	Idaho Supplementation Studies - salmon (RME) (BPA)
257	1989-098-01	Idaho Supplementation Studies - salmon (RME) (BPA)
258	1989-098-02	Idaho Supplementation Studies - salmon (RME) (BPA)
259	1989-098-03	Idaho Supplementation Studies - salmon (RME) (BPA)
260	1990-055-00	Idaho Supplementation Studies - steelhead - previously 1989-098-00 (RME) (BPA)
261	1991-073-00	Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (RME) (BPA)
269	2000-055-00	Nutrient enhancement studies (RME) (BPA)
277	1997-001-00	Idaho Chinook Salmon Captive Rearing (Hatchery) (BPA)
393		L-13 Diversion Replacement (Habitat) (USBR)

394	L-13 Headgate (Habitat) (USBR)
395	L-13 Screen (Habitat) (USBR)
396	L-18 Headgate (Habitat) (USBR)
397	L-20 Headgate (Habitat) (USBR)
398	L-3 Diversion Replacement (Habitat) (USBR)
399	L-35A Diversion Replacement (Habitat) (USBR)
400	L-35A Headgate (Habitat) (USBR)
401	L-35A Screen (Habitat) (USBR)
402	L-3A Diversion Replacement (Habitat) (USBR)
403	L-3A0 Diversion Replacement (Habitat) (USBR)
404	L-3 Headgate (Habitat) (USBR)
405	L-6/S14 Water Exchange (Habitat) (USBR)
406	L-9 Diversion Replacement (Habitat) (USBR)
407	L-9 Headgate (Habitat) (USBR)
425	USBR Lemhi program management (Habitat) (USBR)
426	USBR Little Salmon Subbasin Program Management (Habitat) (USBR)
432	USBR Upper Salmon program management (Habitat) (USBR)
434	Williams Creek Diversion Replacements (Habitat) (USBR)
435	Williams Creek Headgate Projects (Habitat) (USBR)
436	Williams Creek Screens (Habitat) (USBR)
452	Fish Production/Flow Analysis (RME) (USBR)
555	Salmon River Aquatic Ecosystem Restoration (Habitat) (CORPS)
567	Evaluate Factors Influencing Bias and Precision of Chinook Salmon Redd Counts (RME) (BPA)
568	Riparian Conservation Easement Purchase of Scarrow Property on Lake Creek a Tributary to the Secesh River, Idaho (Habitat) (BPA)
569	Restoration of the Yankee Fork Salmon River (Habitat) (BPA)
572	Chinook Salmon Smolt Survival and Smolt to Adult Return Rate Quantification, South Fork Salmon River, Idaho (RME) (BPA)
573	Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho (Habitat) (BPA)
574	Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (Habitat) (BPA)
575	Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho (Habitat) (BPA)
576	Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (Habitat) (BPA)
577	Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (Habitat) (BPA)
578	Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (RME) (BPA)
579	Protect and Restore Little Salmon River (Habitat) (BPA)
580	Restoring anadromous fish habitat in the Lapwai Creek watershed (Habitat) (BPA)
588	Lemhi Subbasin IFIM studies (Habitat) (USBR)

Other

All Idaho Subbasins

125 2001-017-00 Idaho Conservation Data Center (RME) (BPA)

Table 3 - Report 4: Action Agency Projects by ESU

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Projects

No ESU assigned for Project

62	1994-026-00	LAMPREY RESEARCH AND RESTORATION (RME) (BPA)
70	2000-014-00	Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek (RME) (BPA)
71	2000-028-00	Status of Pacific Lamprey in the Clearwater River Drainage, Idaho (RME) (BPA)
72	2000-029-00	Identification of larval Pacific lampreys (<i>Lampetra tridentata</i>), river lampreys (<i>L. ayresi</i>), and western brook lampreys (<i>L. richardsoni</i>) and thermal requirements of early life history stages of lampreys (RME) (BPA)
75	2002-016-00	Determine lamprey species composition, larval distribution and adult abundance in the Deschutes Subbasin (RME) (BPA)
78	2002-037-00	Characterize Genetic Differences and Distribution of Freshwater Mussels (RME) (BPA)
113	1998-031-00	Implementation of Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment and Restoration Plan (Habitat) (BPA)
138	2001-041-00	Forrest Ranch Acquisition (Habitat) (BPA)
163	2000-071-00	Analyzing Behavioral Changes During Salmonid Domestication (RME) (BPA)
206	1992-026-01	GRMWP - Indian Creek/Trick Runoff and Buffering System (Habitat) (BPA)
327		Fish Ladder Transition Pool Evaluation (Hydro) (CORPS)
469		Smith Creek Restoration (Resident Fish) (BPA)
525		Bonneville 1st PH JBS improvements (Hydro) (CORPS)
556		Skipanon Slough (Habitat) (CORPS)
558		Steigerwald Lake, Camas, Washougal, WA, Section 1135 (Habitat) (CORPS)

All Columbia River Spring

145	1983-319-00	New Marking and Monitoring Techniques (Hydro) (BPA)
147	2001-010-00	Using Induced Turbulence to Assist Juvenile Migrating Salmon (Hydro) (BPA)
148	1996-021-00	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (Hydro) (BPA)
149	1997-024-00	Avian Predation on Juvenile Salmonids (Hydro) (BPA)
235	1989-107-00	Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and Columbia Rivers Short BPA Title: Survival Estimates Through Dams and Reservoirs (RME) (BPA)
243	1994-033-00	Fish Passage Center (Hydro) (BPA)
244	1996-020-00	Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA Short Title: PIT Tagging Spring/Summer Chinook in Hatcheries (RME) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
252	2002-051-00	Subbasin Planning, Regional Level (Habitat) (BPA)
253	2002-051-00	Subbasin Planning, Statewide/Provincial/Tribal Level (Habitat) (BPA)
254	2002-051-00	Subbasin Planning, Subbasin Level (Habitat) (BPA)
278	1991-055-00	NATURES [Formerly Supplementation Fish Quality (Yakima)] (RME) (BPA)
292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)
303		Report on New Generation Resources and Associated Transmission Improvements (Hydro) (BPA)
304		Schultz-Wautoma 500-kV Transmission Line (Hydro) (BPA)
313		Albeni Falls Operation (Hydro) (CORPS)
316		Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
317		Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
319		Coordinate Water Management Decisions with TMT (Hydro) (CORPS)
322		Automated Alarm System for Adult Collection Channel Diffuser Systems (Hydro) (CORPS)
324		Dworshak Operations (Hydro) (CORPS)
328		Fish Passage Plan Development and Implementation (Hydro) (CORPS)
329		Flow Objectives at McNary (Hydro) (CORPS)
330		Flow Objectives at Lower Granite (Hydro) (CORPS)
337		Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338		Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
339		John Day Minimum Pool Operation (Hydro) (CORPS)
341		Libby Operations Andromous (Hydro) (CORPS)
372		Multiple Bypass Accumulative Impacts (RME) (CORPS)
373		Operate Turbine units at 1% efficiency range (Hydro) (CORPS)
374		Priest Rapids Flow Objective (Hydro) (CORPS)
375		Remove Obstructions from Turbine Environments (Hydro) (CORPS)

All Columbia River Spring

376	Separator Evaluation (Hydro) (CORPS)
377	Shift Flood Control to Maximize Snake River Water Storage (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
381	Improve Operations of Adult Fishway Main Entrances (Hydro) (CORPS)
382	Water Management Plan (Hydro) (CORPS)
439	Reclamation Water Contracts (Hydro) (USBR)
440	Pursue water conservation at USBR projects (Hydro) (USBR)
441	Investigate Unauthorized Use of USBR Water (Hydro) (USBR)
458	Effectiveness Monitoring Prioritization Project (RME) (USBR)
460	Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)
466	Regional Database (RME) (CORPS)
483	1990-077-00 Northern Pikeminnow Management Program (Hydro) (BPA)
486	Water Quality Plan (Hydro) (CORPS)
487	Bonneville Spillway Flow Deflectors (Hydro) (CORPS)
499	Report on use of Additional Canadian Storage To support mainstream flow objectives (Hydro) (BPA)
500	Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
501	Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)
502	Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
503	Bonneville 2nd PH fish unit trash rake (Hydro) (CORPS)
504	Bonneville 2nd PH FGE improvements (Hydro) (CORPS)
505	Bonneville 2nd PH emergency AWS (Hydro) (CORPS)
506	Bonneville adult fallback (Hydro) (CORPS)
507	Bonneville flat plate detector (Hydro) (CORPS)
508	Bonneville juvenile fish studies (Hydro) (CORPS)
509	Bonneville 2nd PH gatewell debris removal (Hydro) (CORPS)
510	Estuary study (CRFM) (RME) (CORPS)
511	John Day salmon holding and jumping (Hydro) (CORPS)
512	John Day Ladder Temperature (Hydro) (CORPS)
513	John Day N. Shore AWS (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)
515	John Day Screens (Hydro) (CORPS)
516	John Day survival and passage efficiency studies (Hydro) (CORPS)
517	Adult Lamprey Passage (Hydro) (CORPS)
518	The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
519	The Dalles project survival study (Hydro) (CORPS)

All Columbia River Spring

520	Turbine passage studies (Hydro) (CORPS)
521	Adult migration studies (Hydro) (CORPS)
522	Adult PIT tag program (Bonn, The dalles, John Day) (Hydro) (CORPS)
523	Bonneville 1st PH FGE (Hydro) (CORPS)
526	Bonneville 2nd PH JBS improvements (Hydro) (CORPS)
527	The Dalles spillway survival improvement s (Hydro) (CORPS)
529	The Dalles adult entrance channel dewatering mods (Hydro) (CORPS)
530	The Dalles surface bypass (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
533	Brownsmead, Clatsop County OR, Section 1135 (Habitat) (CORPS)
534	Estuary Restoration 536 Program (Habitat) (CORPS)
536	Estuary General Investigation Study (Habitat) (CORPS)
537	Estuary Mapping (Habitat) (CORPS)
540	Evaluate Flood Control Operations to Reduce River Ecosystem Effects (Hydro) (CORPS)
546	Request/Negotiate 1 MAF of Treaty storage with BC Hydro (Hydro) (CORPS)
547	Up to 3.5 MAF flow augmentation from Candian storage in July and August (Hydro) (CORPS)
548	Revise Storage Diagrams for Libby (Hydro) (CORPS)
549	Rooster Rock Wetlands (Habitat) (CORPS)
550	Redundant TDG Monitors - Dworshak to McNary Dam (Hydro) (CORPS)
551	Review of Forebay Monitors Lower Granite to McNary (Hydro) (CORPS)
557	Spill for Juvenile Fish Passage (Hydro) (CORPS)
557	Spill for Juvenile Fish Passage (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)

All Columbia River Summer

145	1983-319-00	New Marking and Monitoring Techniques (Hydro) (BPA)
147	2001-010-00	Using Induced Turbulence to Assist Juvenile Migrating Salmon (Hydro) (BPA)
148	1996-021-00	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (Hydro) (BPA)
149	1997-024-00	Avian Predation on Juvenile Salmonids (Hydro) (BPA)
235	1989-107-00	Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and Columbia Rivers Short BPA Title: Survival Estimates Through Dams and Reservoirs (RME) (BPA)
243	1994-033-00	Fish Passage Center (Hydro) (BPA)
244	1996-020-00	Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA Short Title: PIT Tagging Spring/Summer Chinook in Hatcheries (RME) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
252	2002-051-00	Subbasin Planning, Regional Level (Habitat) (BPA)
253	2002-051-00	Subbasin Planning, Statewide/Provincial/Tribal Level (Habitat) (BPA)
254	2002-051-00	Subbasin Planning, Subbasin Level (Habitat) (BPA)
278	1991-055-00	NATURES [Formerly Supplementation Fish Quality (Yakima)] (RME) (BPA)
292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)
303		Report on New Generation Resources and Associated Transmission Improvements (Hydro) (BPA)
304		Schultz-Wautoma 500-kV Transmission Line (Hydro) (BPA)
313		Albeni Falls Operation (Hydro) (CORPS)
316		Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
317		Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
319		Coordinate Water Management Decisions with TMT (Hydro) (CORPS)
322		Automated Alarm System for Adult Collection Channel Diffuser Systems (Hydro) (CORPS)
324		Dworshak Operations (Hydro) (CORPS)
328		Fish Passage Plan Development and Implementation (Hydro) (CORPS)
329		Flow Objectives at McNary (Hydro) (CORPS)
330		Flow Objectives at Lower Granite (Hydro) (CORPS)
337		Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338		Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
339		John Day Minimum Pool Operation (Hydro) (CORPS)
341		Libby Operations Andromous (Hydro) (CORPS)
372		Multiple Bypass Accumulative Impacts (RME) (CORPS)
373		Operate Turbine units at 1% efficiency range (Hydro) (CORPS)
375		Remove Obstructions from Turbine Environments (Hydro) (CORPS)
376		Separator Evaluation (Hydro) (CORPS)

All Columbia River Summer

377	Shift Flood Control to Maximize Snake River Water Storage (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
381	Improve Operations of Adult Fishway Main Entrances (Hydro) (CORPS)
382	Water Management Plan (Hydro) (CORPS)
439	Reclamation Water Contracts (Hydro) (USBR)
440	Pursue water conservation at USBR projects (Hydro) (USBR)
441	Investigate Unauthorized Use of USBR Water (Hydro) (USBR)
458	Effectiveness Monitoring Prioritization Project (RME) (USBR)
460	Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)
466	Regional Database (RME) (CORPS)
483	1990-077-00 Northern Pikeminnow Management Program (Hydro) (BPA)
486	Water Quality Plan (Hydro) (CORPS)
487	Bonneville Spillway Flow Deflectors (Hydro) (CORPS)
499	Report on use of Additional Canadian Storage To support mainstream flow objectives (Hydro) (BPA)
500	Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
501	Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)
502	Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
503	Bonneville 2nd PH fish unit trash rake (Hydro) (CORPS)
504	Bonneville 2nd PH FGE improvements (Hydro) (CORPS)
505	Bonneville 2nd PH emergency AWS (Hydro) (CORPS)
506	Bonneville adult fallback (Hydro) (CORPS)
507	Bonneville flat plate detector (Hydro) (CORPS)
508	Bonneville juvenile fish studies (Hydro) (CORPS)
509	Bonneville 2nd PH gatewell debris removal (Hydro) (CORPS)
510	Estuary study (CRFM) (RME) (CORPS)
511	John Day salmon holding and jumping (Hydro) (CORPS)
512	John Day Ladder Temperature (Hydro) (CORPS)
513	John Day N. Shore AWS (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)
515	John Day Screens (Hydro) (CORPS)
516	John Day survival and passage efficiency studies (Hydro) (CORPS)
517	Adult Lamprey Passage (Hydro) (CORPS)
518	The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
519	The Dalles project survival study (Hydro) (CORPS)
520	Turbine passage studies (Hydro) (CORPS)

All Columbia River Summer

521	Adult migration studies (Hydro) (CORPS)
522	Adult PIT tag program (Bonn, The Dalles, John Day) (Hydro) (CORPS)
523	Bonneville 1st PH FGE (Hydro) (CORPS)
526	Bonneville 2nd PH JBS improvements (Hydro) (CORPS)
527	The Dalles spillway survival improvements (Hydro) (CORPS)
529	The Dalles adult entrance channel dewatering mods (Hydro) (CORPS)
530	The Dalles surface bypass (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
533	Brownsmead, Clatsop County OR, Section 1135 (Habitat) (CORPS)
534	Estuary Restoration 536 Program (Habitat) (CORPS)
536	Estuary General Investigation Study (Habitat) (CORPS)
537	Estuary Mapping (Habitat) (CORPS)
539	Research: Columbia River Estuary (Habitat) (CORPS)
539	Research: Columbia River Estuary (Habitat) (CORPS)
540	Evaluate Flood Control Operations to Reduce River Ecosystem Effects (Hydro) (CORPS)
546	Request/Negotiate 1 MAF of Treaty storage with BC Hydro (Hydro) (CORPS)
547	Up to 3.5 MAF flow augmentation from Canadian storage in July and August (Hydro) (CORPS)
548	Revise Storage Diagrams for Libby (Hydro) (CORPS)
549	Rooster Rock Wetlands (Habitat) (CORPS)
551	Review of Forebay Monitors Lower Granite to McNary (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)

All ESU's

122	1996-019-00	Second-Tier Database Support (RME) (BPA)
123	1988-108-04	Pacific Northwest Hydropower Data Base and Analysis System (NWHS) (RME) (BPA)
151	1988-108-04	StreamNet (CIS/NED) (RME) (BPA)
152	2001-074-00	NPPC Regional Data Needs (RME) (BPA)
177	1982-013-01	Coded-Wire Tag Recovery Program (Hatchery) (BPA)
234	1989-107-00	Statistical Support for Salmonid Survival Studies (RME) (BPA)
236	1990-080-00	Columbia River Basin PIT Tag Information System (RME) (BPA)
240	1991-051-00	Monitoring and Evaluation Statistical Support (RME) (BPA)
247	1998-014-00	Ocean Survival of Salmonids (RME) (BPA)
249	2000-080-00	Pacific Ocean Salmon Tracking (POST) (RME) (BPA)
274	2002-047-00	Artificial Production Review Evaluation (APRE) (Hatchery) (BPA)
325		Estuary PIT tag recovery (RME) (CORPS)
524		Bonneville 1st PH Surface Bypass (Hydro) (CORPS)

All Snake River ESU's

125	2001-017-00	Idaho Conservation Data Center (RME) (BPA)
232	1987-127-00	Smolt Monitoring by Federal and Non-Federal Agencies (RME) (BPA)

All Snake River Spring

145	1983-319-00	New Marking and Monitoring Techniques (Hydro) (BPA)
147	2001-010-00	Using Induced Turbulence to Assist Juvenile Migrating Salmon (Hydro) (BPA)
148	1996-021-00	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (Hydro) (BPA)
235	1989-107-00	Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
242	1993-029-00	Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and Columbia Rivers Short BPA Title: Survival Estimates Through Dams and Reservoirs (RME) (BPA)
243	1994-033-00	Fish Passage Center (Hydro) (BPA)
244	1996-020-00	Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA Short Title: PIT Tagging Spring/Summer Chinook in Hatcheries (RME) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
252	2002-051-00	Subbasin Planning, Regional Level (Habitat) (BPA)
253	2002-051-00	Subbasin Planning, Statewide/Provincial/Tribal Level (Habitat) (BPA)
254	2002-051-00	Subbasin Planning, Subbasin Level (Habitat) (BPA)
261	1991-073-00	Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (RME) (BPA)
278	1991-055-00	NATURES [Formerly Supplementation Fish Quality (Yakima)] (RME) (BPA)
292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
299	2001-058-00	Removal of Ghost Fishing Nets - Feasibility (Harvest) (BPA)
300		Grand Coulee Bell 500-kV Transmission Line (Hydro) (BPA)
303		Report on New Generation Resources and Associated Transmission Improvements (Hydro) (BPA)
304		Schultz-Wautoma 500-kV Transmission Line (Hydro) (BPA)
313		Albeni Falls Operation (Hydro) (CORPS)
316		Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
317		Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
319		Coordinate Water Management Decisions with TMT (Hydro) (CORPS)
322		Automated Alarm System for Adult Collection Channel Diffuser Systems (Hydro) (CORPS)
324		Dworshak Operations (Hydro) (CORPS)
328		Fish Passage Plan Development and Implementation (Hydro) (CORPS)
329		Flow Objectives at McNary (Hydro) (CORPS)
330		Flow Objectives at Lower Granite (Hydro) (CORPS)
337		Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338		Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
339		John Day Minimum Pool Operation (Hydro) (CORPS)
341		Libby Operations Andromous (Hydro) (CORPS)
342		Little Goose Auxiliary Water Supply (Hydro) (CORPS)
343		Little Goose Extended Submerged Bar Screens (Hydro) (CORPS)
344		Little Goose Flow Deflectors (Hydro) (CORPS)

All Snake River Spring

347	Little Goose Trash Boom (Hydro) (CORPS)
348	Lower Granite Emergency Auxiliary Water Supply (Hydro) (CORPS)
349	Lower Granite Extended Submerged Bar Screens (Hydro) (CORPS)
350	Lower Granite Flow Deflectors (Hydro) (CORPS)
351	Lower Granite Juvenile Bypass System (Hydro) (CORPS)
354	Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
355	Lower Monumental Auxiliary Water Supply (Hydro) (CORPS)
356	Lower Monumental Extended Submerged Bar Screens (Hydro) (CORPS)
357	Lower Monumental Flow Deflectors (Hydro) (CORPS)
358	Lower Monumental Juvenile Bypass System Outfall (Hydro) (CORPS)
361	Lower Snake projects Minimum Operating Pool operation (Hydro) (CORPS)
362	Lower Snake River Juvenile Bypass System Improvements (Hydro) (CORPS)
366	McNary Juvenile Bypass System Outfall (Hydro) (CORPS)
372	Multiple Bypass Accumulative Impacts (RME) (CORPS)
373	Operate Turbine units at 1% efficiency range (Hydro) (CORPS)
374	Priest Rapids Flow Objective (Hydro) (CORPS)
375	Remove Obstructions from Turbine Environments (Hydro) (CORPS)
376	Separator Evaluation (Hydro) (CORPS)
377	Shift Flood Control to Maximize Snake River Water Storage (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
381	Improve Operations of Adult Fishway Main Entrances (Hydro) (CORPS)
382	Water Management Plan (Hydro) (CORPS)
439	Reclamation Water Contracts (Hydro) (USBR)
440	Pursue water conservation at USBR projects (Hydro) (USBR)
441	Investigate Unauthorized Use of USBR Water (Hydro) (USBR)
449	Water Acquisition from Reclamation's Snake River Projects (Hydro) (USBR)
458	Effectiveness Monitoring Prioritization Project (RME) (USBR)
460	Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)
466	Regional Database (RME) (CORPS)
483	1990-077-00 Northern Pikeminnow Management Program (Hydro) (BPA)
486	Water Quality Plan (Hydro) (CORPS)
487	Bonneville Spillway Flow Deflectors (Hydro) (CORPS)
499	Report on use of Additional Canadian Storage To support mainstream flow objectives (Hydro) (BPA)
500	Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
501	Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)

All Snake River Spring

502	Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)
503	Bonneville 2nd PH fish unit trash rake (Hydro) (CORPS)
504	Bonneville 2nd PH FGE improvements (Hydro) (CORPS)
505	Bonneville 2nd PH emergency AWS (Hydro) (CORPS)
506	Bonneville adult fallback (Hydro) (CORPS)
507	Bonneville flat plate detector (Hydro) (CORPS)
508	Bonneville juvenile fish studies (Hydro) (CORPS)
509	Bonneville 2nd PH gatewell debris removal (Hydro) (CORPS)
510	Estuary study (CRFM) (RME) (CORPS)
511	John Day salmon holding and jumping (Hydro) (CORPS)
512	John Day Ladder Temperature (Hydro) (CORPS)
513	John Day N. Shore AWS (Hydro) (CORPS)
514	John Day surface bypass spillway improvements (Hydro) (CORPS)
515	John Day Screens (Hydro) (CORPS)
516	John Day survival and passage efficiency studies (Hydro) (CORPS)
517	Adult Lamprey Passage (Hydro) (CORPS)
518	The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
519	The Dalles project survival study (Hydro) (CORPS)
520	Turbine passage studies (Hydro) (CORPS)
521	Adult migration studies (Hydro) (CORPS)
522	Adult PIT tag program (Bonn, The dalles, John Day) (Hydro) (CORPS)
523	Bonneville 1st PH FGE (Hydro) (CORPS)
526	Bonneville 2nd PH JBS improvements (Hydro) (CORPS)
527	The Dalles spillway survival improvement s (Hydro) (CORPS)
529	The Dalles adult entrance channel dewatering mods (Hydro) (CORPS)
530	The Dalles surface bypass (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
533	Brownsmead, Clatsop County OR, Section 1135 (Habitat) (CORPS)
534	Estuary Restoration 536 Program (Habitat) (CORPS)
536	Estuary General Investigation Study (Habitat) (CORPS)
537	Estuary Mapping (Habitat) (CORPS)
539	Research: Columbia River Estuary (Habitat) (CORPS)
540	Evaluate Flood Control Operations to Reduce River Ecosystem Effects (Hydro) (CORPS)
546	Request/Negotiate 1 MAF of Treaty storage with BC Hydro (Hydro) (CORPS)
547	Up to 3.5 MAF flow augmentation from Candian storage in July and August (Hydro) (CORPS)
548	Revise Storage Diagrams for Libby (Hydro) (CORPS)

All Snake River Spring

549	Rooster Rock Wetlands (Habitat) (CORPS)
550	Redudant TDG Monitors - Dworshak to McNary Dam (Hydro) (CORPS)
551	Review of Forebay Monitors Lower Granite to McNary (Hydro) (CORPS)
552	Dworshak Dissolved Gas Abatement Study (Hydro) (CORPS)
553	Temperature Modeling Plan Alternative Snake River Operations (Hydro) (CORPS)
557	Spill for Juvenile Fish Passage (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)

All Snake River Summer

145	1983-319-00	New Marking and Monitoring Techniques (Hydro) (BPA)
147	2001-010-00	Using Induced Turbulence to Assist Juvenile Migrating Salmon (Hydro) (BPA)
148	1996-021-00	Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (Hydro) (BPA)
235	1989-107-00	Statistical Support for Salmonid Survival Studies (Hydro) (CORPS)
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324		Dworshak Operations (Hydro) (CORPS)
328		Fish Passage Plan Development and Implementation (Hydro) (CORPS)
329		Flow Objectives at McNary (Hydro) (CORPS)
330		Flow Objectives at Lower Granite (Hydro) (CORPS)
337		Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338		Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
339		John Day Minimum Pool Operation (Hydro) (CORPS)
341		Libby Operations Andromous (Hydro) (CORPS)
342		Little Goose Auxiliary Water Supply (Hydro) (CORPS)
343		Little Goose Extended Submerged Bar Screens (Hydro) (CORPS)
344		Little Goose Flow Deflectors (Hydro) (CORPS)

All Snake River Summer

347	Little Goose Trash Boom (Hydro) (CORPS)
348	Lower Granite Emergency Auxiliary Water Supply (Hydro) (CORPS)
349	Lower Granite Extended Submerged Bar Screens (Hydro) (CORPS)
350	Lower Granite Flow Deflectors (Hydro) (CORPS)
351	Lower Granite Juvenile Bypass System (Hydro) (CORPS)
354	Lower Granite Surface Bypass and Collection (Hydro) (CORPS)
355	Lower Monumental Auxiliary Water Supply (Hydro) (CORPS)
356	Lower Monumental Extended Submerged Bar Screens (Hydro) (CORPS)
357	Lower Monumental Flow Deflectors (Hydro) (CORPS)
358	Lower Monumental Juvenile Bypass System Outfall (Hydro) (CORPS)
361	Lower Snake projects Minimum Operating Pool operation (Hydro) (CORPS)
362	Lower Snake River Juvenile Bypass System Improvements (Hydro) (CORPS)
366	McNary Juvenile Bypass System Outfall (Hydro) (CORPS)
372	Multiple Bypass Accumulative Impacts (RME) (CORPS)
373	Operate Turbine units at 1% efficiency range (Hydro) (CORPS)
375	Remove Obstructions from Turbine Environments (Hydro) (CORPS)
376	Separator Evaluation (Hydro) (CORPS)
377	Shift Flood Control to Maximize Snake River Water Storage (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
381	Improve Operations of Adult Fishway Main Entrances (Hydro) (CORPS)
382	Water Management Plan (Hydro) (CORPS)
439	Reclamation Water Contracts (Hydro) (USBR)
440	Pursue water conservation at USBR projects (Hydro) (USBR)
441	Investigate Unauthorized Use of USBR Water (Hydro) (USBR)
449	Water Acquisition from Reclamation's Snake River Projects (Hydro) (USBR)
458	Effectiveness Monitoring Prioritization Project (RME) (USBR)
460	Tech Recovery Team Task Support-Columbia Basin ESU Identification (RME) (USBR)
466	Regional Database (RME) (CORPS)
483	1990-077-00 Northern Pikeminnow Management Program (Hydro) (BPA)
486	Water Quality Plan (Hydro) (CORPS)
487	Bonneville Spillway Flow Deflectors (Hydro) (CORPS)
499	Report on use of Additional Canadian Storage To support mainstream flow objectives (Hydro) (BPA)
500	Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
501	Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)
502	Bonneville 2nd PH surface bypass (corner collector) (Hydro) (CORPS)

All Snake River Summer

503	Bonneville 2nd PH fish unit trash rake (Hydro) (CORPS)
504	Bonneville 2nd PH FGE improvements (Hydro) (CORPS)
505	Bonneville 2nd PH emergency AWS (Hydro) (CORPS)
506	Bonneville adult fallback (Hydro) (CORPS)
507	Bonneville flat plate detector (Hydro) (CORPS)
508	Bonneville juvenile fish studies (Hydro) (CORPS)
509	Bonneville 2nd PH gatewell debris removal (Hydro) (CORPS)
510	Estuary study (CRFM) (RME) (CORPS)
511	John Day salmon holding and jumping (Hydro) (CORPS)
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513	John Day N. Shore AWS (Hydro) (CORPS)
514	John Day surface bypassspillway improvements (Hydro) (CORPS)
515	John Day Screens (Hydro) (CORPS)
516	John Day survival and passage efficiency studies (Hydro) (CORPS)
517	Adult Lamprey Passage (Hydro) (CORPS)
518	The Dalles sluiceway outfall relocation and emergency AWS (Hydro) (CORPS)
519	The Dalles project survival study (Hydro) (CORPS)
520	Turbine passage studies (Hydro) (CORPS)
521	Adult migration studies (Hydro) (CORPS)
522	Adult PIT tag program (Bonn, The dalles, John Day) (Hydro) (CORPS)
523	Bonneville 1st PH FGE (Hydro) (CORPS)
526	Bonneville 2nd PH JBS improvements (Hydro) (CORPS)
527	The Dalles spillway survival improvement s (Hydro) (CORPS)
529	The Dalles adult entrance channel dewatering mods (Hydro) (CORPS)
530	The Dalles surface bypass (Hydro) (CORPS)
532	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
533	Brownsmead, Clatsop County OR, Section 1135 (Habitat) (CORPS)
534	Estuary Restoration 536 Program (Habitat) (CORPS)
536	Estuary General Investigation Study (Habitat) (CORPS)
537	Estuary Mapping (Habitat) (CORPS)
539	Research: Columbia River Estuary (Habitat) (CORPS)
540	Evaluate Flood Control Operations to Reduce River Ecosystem Effects (Hydro) (CORPS)
546	Request/Negotiate 1 MAF of Treaty storage with BC Hydro (Hydro) (CORPS)
547	Up to 3.5 MAF flow augmentation from Candian storagein July and Auugst (Hydro) (CORPS)
548	Revise Storage Diagrams for Libby (Hydro) (CORPS)
549	Rooster Rock Wetlands (Habitat) (CORPS)

All Snake River Summer

550	Redudant TDG Monitors - Dworshak to McNary Dam (Hydro) (CORPS)
551	Review of Forebay Monitors Lower Granite to McNary (Hydro) (CORPS)
552	Dworshak Dissolved Gas Abatement Study (Hydro) (CORPS)
553	Temperature Modeling Plan Alternative Snake River Operations (Hydro) (CORPS)
557	Spill for Juvenile Fish Passage (Hydro) (CORPS)
586	Grand Coulee (Hydro) (USBR)
590	Hungry Horse Operations (Hydro) (USBR)

Chum Hatchery

178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)

Coho Hatchery

178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)

Columbia River Bull Trout

1	1985-062-00	Passage Improvement Evaluation - Phase II Screens (Habitat) (BPA)
2	1988-115-25	Yakima/Klickitat Fisheries Project (YKFP) Design and Const. - Yakima Basin Only (Hatchery) (BPA)
3	1988-120-25	Yakima/Klickitat Fisheries Project (YKFP) Management (Hatchery) (BPA)
4	1991-057-00	Fabricate and Install Yakima Basin Phase II Fish Screens (Habitat) (BPA)
5	1991-075-00	Yakima Phase II Screens - Construction (Habitat) (BPA)
6	1992-009-00	Operate & Maintain (O&M) Yakima Basin Phase II Fish Screens (Habitat) (BPA)
8	1995-033-00	O&M Of Yakima Phase II Fish Facilities* (Habitat) (BPA)
9	1995-063-25	Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)
10	1995-064-25	Policy/Technical Involvement and Planning in the Yakima/Klickitat Fisheries Project (Hatchery) (BPA)
12	1997-013-25	Yakima/Klickitat Fisheries Project Operations and Maintenance (Hatchery) (BPA)
13	1997-051-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (Habitat) (BPA)
14	1997-053-00	Toppenish-Simcoe Instream Flow Restoration and Assessment (Habitat) (BPA)
15	1998-033-00	Restore Upper Toppenish Watershed (Habitat) (BPA)
16	1998-034-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yakima Subbasin (Habitat) (BPA)
17	1999-013-00	Ahtanum Creek Watershed Assessment (Habitat) (BPA)
19	2002-022-00	YKFP Big Creek Passage & Screening (Habitat) (BPA)
33	1988-115-35	Yakima/Klickitat Fisheries Project Design and Construction - Klickitat ONLY (Hatchery) (BPA)
34	1995-063-35	Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)
35	1995-068-00	Preliminary Design for Passage & Habitat Improvement (Habitat) (BPA)
36	1997-056-00	Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (Habitat) (BPA)
37	2000-010-00	Klickitat River Subbasin Assessment (Habitat) (BPA)
39	1983-436-00	Umatilla Passage O&M (Habitat) (BPA)
40	1988-022-00	Umatilla River Fish Passage Operations (Habitat) (BPA)
44	1989-027-00	Repay Power for Umatilla Basin Project (Habitat) (BPA)
45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
46	1996-011-00	Juvenile Screens Smolt Traps on the WW River also reference 2000-033-00 (Habitat) (BPA)
52	2000-033-00	Walla Walla River Fish Passage Operations (Habitat) (BPA)
53	2000-039-00	Walla Walla Natural Production M&E (RME) (BPA)
54	2001-039-00	Walla Walla Basin Screening (Habitat) (BPA)
55	2001-075-00	Increase Instream Flows to Dewatered Stream Reaches in the Walla Walla Basin (Habitat) (BPA)
56	2002-036-00	Walla Walla River Flow Restoration (Habitat) (BPA)
79	1992-026-03	Upper Salmon Basin Watershed Project Administration/Implementation Support (Habitat) (BPA)
80	1993-035-01	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed (Habitat) (BPA)
82	1994-015-00	Idaho Fish Screen Improvement (Habitat) (BPA)
83	1994-017-00	Idaho Model Watershed Habitat Improvement Project (Habitat) (BPA)
84	1994-050-00	Salmon River Habitat Enhancement M & E (Habitat) (BPA)

Columbia River Bull Trout

85	1996-007-00	Upper Salmon River Diversion Consolidation Program (Habitat) (BPA)
86	1996-077-02	Protect and Restore Lolo Creek Watershed (Habitat) (BPA)
87	1996-077-03	Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Papoose) Creek Watersheds Analysis Area (Habitat) (BPA)
88	1996-077-05	Restore McComas Meadows/Meadow Creek Watershed (Habitat) (BPA)
89	1996-086-00	Clearwater Focus Program (Habitat) (BPA)
90	1997-060-00	Clearwater Subbasin Focus Watershed Program - NPT (Habitat) (BPA)
96	1999-019-00	Holistic Restoration of the Twelvemile Reach of the Salmon River near Challis, Idaho (Habitat) (BPA)
98	2000-034-00	Protect and Restore The North Lochsa Face Analysis Area Watersheds (Habitat) (BPA)
99	2000-35-00	Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (Habitat) (BPA)
100	2000-036-00	Protect & Restore Mill Creek (Habitat) (BPA)
101	2001-035-00	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning and Rearing Habitat (Habitat) (BPA)
102	2001-044-00	Conservation Easement, Baker Ranch, Salmon River East Fork (Habitat) (BPA)
103	2001-051-00	Reconnect Little Morgan Creek to the Main-stem Pahsimeroi River (Habitat) (BPA)
104	2001-052-00	Restoration of Anadromous Fish Access to Hawley Creek (Habitat) (BPA)
105	2001-067-00	Restore Passage Lower Lemhi / Salmon Rivers (Habitat) (BPA)
107	2001-068-00	Transfer Lemhi Water Users (L-6 to Salmon River (S-14) (Habitat) (BPA)
124	1998-011-00	Montana Natural Heritage Program (RME) (BPA)
127	1993-066-00	NE Oregon Pump Screening (Habitat) (BPA)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
143	2002-006-00	Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers (Resident Fish) (BPA)
144	2002-033-00	John Day Recovery Monitoring (RME) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
185	1998-021-00	Hood River Fish Habitat Project (Habitat) (BPA)
187	2001-020-00	Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)
197	1992-026-01	Little Sheep Creek Lg Wood Placement and Culvert Replacement (Habitat) (BPA)
201	1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)
237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
255	1987-100-01	Umatilla River Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-001-00, 1999-057-00) (Habitat) (BPA)
264	1994-046-01	Walla Walla River Basin Fish Habitat Enhancement (Habitat) (BPA)
265	1998-020-00	Assess Fish Habitat and Salmonids in the Walla Walla Watershed in Washington (RME) (BPA)
268	2001-038-00	Gourlay Creek Dam Fish Ladder (Habitat) (BPA)
269	2000-055-00	Nutrient enhancement studies (RME) (BPA)
270	2001-061-00	Touchet River Flow Acquisition (Habitat) (BPA)
271	2001-064-00	Improve Stream Flow and Passage for Simcoe Creek Steelhead (Habitat) (BPA)
272	2002-020-00	Fabricate and Install New Huntsville Mill Fish Screen (Habitat) (BPA)

Columbia River Bull Trout

316	Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
317	Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
333	Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334	Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
337	Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
338	Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
345	Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352	Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359	Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
371	Monitoring of Bull Trout at Mainstem Projects (Hydro) (CORPS)
379	Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
380	Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
383	Beaver Creek Water Acquisitions (Habitat) (USBR)
384	Campbell Diversions (Habitat) (USBR)
385	Chelan County/Wenatchee IFIM Study (Habitat) (USBR)
387	Chewuch Ditch Diversion Structure (Habitat) (USBR)
388	Chumstick Diversions (Habitat) (USBR)
389	Entiat IFIM Studies (Habitat) (USBR)
390	Fort-Thurlow Pump Exchange (Habitat) (USBR)
391	Fulton Diversion Structure (Habitat) (USBR)
392	Gold Creek Screen and Diversion (Habitat) (USBR)
408	Marracci/Washington Department of Fish and Wildlife Diverson (Habitat) (USBR)
410	Methow Valley Irrigation District Methow River Screen (Habitat) (USBR)
411	Methow Valley Irrigation District Twisp River Screen (Habitat) (USBR)
413	Middle Fork John Day Gaging Stations (Habitat) (USBR)
414	Middle Fork John Day IFIM Study (Habitat) (USBR)
415	Mission Diversions (Habitat) (USBR)
416	Methow Valley Irrigation District Methow River Diversion (Habitat) (USBR)
417	Methow Valley Irrigation District Twisp River Diversion (Habitat) (USBR)
418	North Fork John Day River IFIM Studies (Habitat) (USBR)
420	Panama Ditch Screen Replacement (Habitat) (USBR)
421	Strawberry Creek Complex Screen Replacement (Habitat) (USBR)
422	Upper John Day Gaging stations (Habitat) (USBR)

Columbia River Bull Trout

423		Upper John Day IFIM study (Habitat) (USBR)
424		USBR Entiat Subbasin Program Management (Habitat) (USBR)
427		USBR Methow program management (Habitat) (USBR)
429		USBR Middle Fork John Day program management (Habitat) (USBR)
430		USBR North Fork John Day Program Management (Habitat) (USBR)
431		USBR Upper John Day Program Management (Habitat) (USBR)
432		USBR Upper Salmon program management (Habitat) (USBR)
433		USBR Wenatchee Subbasin Program Management (Habitat) (USBR)
435		Williams Creek Headgate Projects (Habitat) (USBR)
436		Williams Creek Screens (Habitat) (USBR)
461		Draw down Albeni Falls for kokanee egg-to fry-study (Resident Fish) (CORPS)
462		Libby Operations Bull Trout (Resident Fish) (CORPS)
464		Seek USFWS concurrence on water storage (Resident Fish) (CORPS)
471	2002-008-00	Reconnection of floodplain slough habitat to the Kootenai River (Resident Fish) (BPA)
472		Restoring Bull Trout Habitat in The Blackfoot River's North Fork (Resident Fish) (BPA)
473		Secure and Restore Critical Fish and Wildlife Habitats (Resident Fish) (BPA)
474	1991-019-01	Hungry Horse Mitigation - Flathead Lake (Resident Fish) (BPA)
475		Purchase Conservation Easement from Plum Creek Timber Company (PCT) along Fisher River (Habitat) (BPA)
488	1987-407-00	Dworshak Integrated Rule Curves/M&E (Resident Fish) (BPA)
491	1994-047-00	Lake Pend Oreille Fishery Recovery Project (Resident Fish) (BPA)
496	2002-009-00	Lake Pend Oreille Predation Research (Resident Fish) (BPA)
497	2002-010-00	Acquire and conserve high priority bull and westslope cutthroat trout habitat in Trestle Creek (Resident Fish) (BPA)
532		Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
563		Assess Salmonids in the Asotin Creek Watershed (RME) (BPA)
564		Protect and Restore the Asotin Creek Watershed (Habitat) (BPA)
565		Oregon Plan Blue Mountain Province Fish Screening/Fish Passage (Habitat) (BPA)
568		Riparian Conservation Easement Purchase of Scarrow Property on Lake Creek a Tributary to the Secesh River, Idaho (Habitat) (BPA)
569		Restoration of the Yankee Fork Salmon River (Habitat) (BPA)
571		Potlatch River Watershed Restoration (Habitat) (BPA)
573		Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho (Habitat) (BPA)
574		Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (Habitat) (BPA)
575		Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho (Habitat) (BPA)
576		Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (Habitat) (BPA)
577		Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (Habitat) (BPA)
578		Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (RME) (BPA)
579		Protect and Restore Little Salmon River (Habitat) (BPA)

Columbia River Bull Trout

581		Evaluation of 1872 Water Rights to Supplement Flows Between Basins (Habitat) (BPA)
583		Restore Passage on Private Lands in Beaver Creek Drainage to Benefit Spring Chinook, Steelhead and Bulltrout (Habitat) (BPA)
584	1995-004-00	Libby Mitigation Plan (Resident Fish) (BPA)
585	1991-019-03	Hungry Horse Mitigation - Habitat (Resident Fish) (BPA)
587		Entiat IFIM Studies (Habitat) (USBR)
588		Lemhi Subbasin IFIM studies (Habitat) (USBR)
590		Hungry Horse Operations (Hydro) (USBR)

Columbia River Chum

68	1999-003-00	Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (RME) (BPA)
69	2000-012-00	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (Habitat) (BPA)
250	2001-053-00	Re-Introduction of Lower Columbia River Chum Salmon into Duncan Creek (Habitat) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
318		Chum Flows Below Bonneville Dam (Hydro) (CORPS)
319		Coordinate Water Management Decisions with TMT (Hydro) (CORPS)
484	2000-012-00	Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (RME) (BPA)
531		Improve spawning conditions for chum salmon in the vicinity of Pierce/Ives Islands. (Habitat) (CORPS)
559		SW Washington Streams Section 206 (Habitat) (CORPS)

Deshutes River Summer/Fall-run Chinook

476	2002-017-00	Regional Stream Conditions and Stressor Evaluation (RME) (BPA)
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Fall Chinook Hatchery

178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)
233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)

Flathead River Bull Trout

301		Hungry Horse Transmission Stability Study (Hydro) (BPA)
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Kootenai River Bull Trout

302		Libby Transmission Stability Study (Hydro) (BPA)
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Kootenai River White Sturgeon

124	1998-011-00	Montana Natural Heritage Program (RME) (BPA)
301		Hungry Horse Transmission Stability Study (Hydro) (BPA)
302		Libby Transmission Stability Study (Hydro) (BPA)
319		Coordinate Water Management Decisions with TMT (Hydro) (CORPS)
382		Water Management Plan (Hydro) (CORPS)
463		Libby Operations Sturgeon (Resident Fish) (CORPS)
464		Seek USFWS concurrence on water storage (Resident Fish) (CORPS)
471	2002-008-00	Reconnection of floodplain slough habitat to the Kootenai River (Resident Fish) (BPA)
489	1988-064-00	Kootenai River White Sturgeon Study and Experimental Aquaculture (Resident Fish) (BPA)
490	1988-065-00	Kootenai River Fisheries Recovery Investigations (Resident Fish) (BPA)
492	1994-049-00	Improving the Kootenai River Ecosystem (Resident Fish) (BPA)
493	2001-013-00	Evaluate the effects of nutrient supplementation on benthic periphyton, macroinvertebrates, and juvenile sturgeon in the Kootenai River (Resident Fish) (BPA)
494	2002-002-00	Assess Feasibility of Enhancing White Sturgeon Spawning Substrate Habitat, Kootenai R., Idaho (Resident Fish) (BPA)
498	2002-011-00	Implement Floodplain Operational Loss Assessment, Protection, Mitigation and Rehabilitation on the Lower Kootenai River Watershed Ecosystem (Resident Fish) (BPA)
500		Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (Hydro) (BPA)
501		Non-Treaty Storage Agreement with Canada-Request Additional Storage (Hydro) (BPA)

Lower Columbia River Chinook

68	1999-003-00	Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (RME) (BPA)
119	2002-018-00	Tapteal Bend Riparian Corridor Restoration (Habitat) (BPA)
183	1993-040-00	Fifteenmile Creek Habitat Restoration Project (Habitat) (BPA)
187	2001-020-00	Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)
188	2001-021-00	Fifteenmile Creek Riparian Buffers - Wasco County (Habitat) (BPA)
190	2002-015-00	Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon (Habitat) (BPA)
191	2002-019-00	Establish Riparian Buffer Systems (Habitat) (BPA)
192	2002-026-00	Morrow County Buffer Initiative (Habitat) (BPA)
193	2002-034-00	Wheeler SWCD Riparian Buffer Planning and Implementation (Habitat) (BPA)
194	2002-035-00	Gilliam SWCD Riparian Buffers (Habitat) (BPA)
248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
309		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)
336		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)

Lower Columbia River Steelhead

130	1998-019-01	Wind River Watershed USGS (RME) (BPA)
131	1998-019-02	Wind River Watershed Monitoring (RME) (BPA)
181	1988-053-03	Hood River Production Program - CTWSRO M&E (RME) (BPA)
182	1988-053-04	Hood River Production Program - ODFW M&E (RME) (BPA)
183	1993-040-00	Fifteenmile Creek Habitat Restoration Project (Habitat) (BPA)
184	1994-042-00	Trout Creek Habitat Restoration Project (Habitat) (BPA)
185	1998-021-00	Hood River Fish Habitat Project (Habitat) (BPA)
186	1998-028-00	Trout Creek Watershed Improvement Project (Habitat) (BPA)
187	2001-020-00	Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (Habitat) (BPA)
188	2001-021-00	Fifteenmile Creek Riparian Buffers - Wasco County (Habitat) (BPA)
189	2001-054-00	Emergency Flow Augmentation for Buck Hollow (Habitat) (BPA)
190	2002-015-00	Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon (Habitat) (BPA)
191	2002-019-00	Establish Riparian Buffer Systems (Habitat) (BPA)
192	2002-026-00	Morrow County Buffer Initiative (Habitat) (BPA)
193	2002-034-00	Wheeler SWCD Riparian Buffer Planning and Implementation (Habitat) (BPA)
194	2002-035-00	Gilliam SWCD Riparian Buffers (Habitat) (BPA)
268	2001-038-00	Gourlay Creek Dam Fish Ladder (Habitat) (BPA)
294	1998-056-00	NMFS Net Exchange Program (Harvest) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
309		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)
443		Deschutes Project ESA Consultation with NMFS (Hydro) (USBR)
445		Tualatin Project ESA Consultation with NMFS (Hydro) (USBR)
446		Umatilla Project ESA Consultation with NMFS (Hydro) (USBR)
447		Yakima Project ESA Consultation with NMFS (Hydro) (USBR)
559		SW Washington Streams Section 206 (Habitat) (CORPS)

Lower Columbia River/Southwest Washington Coho

292	1993-060-00	Select Area Fishery Evaluation (Harvest) (BPA)
309		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)
559		SW Washington Streams Section 206 (Habitat) (CORPS)

Mid Columbia River Spring-run Chinook

1	1985-062-00	Passage Improvement Evaluation - Phase II Screens (Habitat) (BPA)
2	1988-115-25	Yakima/Klickitat Fisheries Project (YKFP) Design and Const. - Yakima Basin Only (Hatchery) (BPA)
3	1988-120-25	Yakima/Klickitat Fisheries Project (YKFP) Management (Hatchery) (BPA)
4	1991-057-00	Fabricate and Install Yakima Basin Phase II Fish Screens (Habitat) (BPA)
5	1991-075-00	Yakima Phase II Screens - Construction (Habitat) (BPA)
6	1992-009-00	Operate & Maintain (O&M) Yakima Basin Phase II Fish Screens (Habitat) (BPA)
7	1992-062-00	Yakama Nation - Riparian/Wetlands Restoration (Habitat) (BPA)
8	1995-033-00	O&M Of Yakima Phase II Fish Facilities* (Habitat) (BPA)
9	1995-063-25	Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)
10	1995-064-25	Policy/Technical Involvement and Planning in the Yakima/Klickitat Fisheries Project (Hatchery) (BPA)
11	1996-035-00	Satus Watershed Restoration (Habitat) (BPA)
12	1997-013-25	Yakima/Klickitat Fisheries Project Operations and Maintenance (Hatchery) (BPA)
13	1997-051-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (Habitat) (BPA)
14	1997-053-00	Toppenish-Simcoe Instream Flow Restoration and Assessment (Habitat) (BPA)
15	1998-033-00	Restore Upper Toppenish Watershed (Habitat) (BPA)
16	1998-034-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yakima Subbasin (Habitat) (BPA)
17	1999-013-00	Ahtanum Creek Watershed Assessment (Habitat) (BPA)
18	2000-011-00	Rock Creek Watershed Assessment and Restoration project. (Habitat) (BPA)
19	2002-022-00	YKFP Big Creek Passage & Screening (Habitat) (BPA)
20	2002-023-00	Yakima-Klickitat Fisheries Project - Wilson Creek Snowden Parcel Acquisition (Habitat) (BPA)
21	2002-025-00	Yakima Tributary Access and Habitat Program (Objective 1: Early Actions) (Habitat) (BPA)
22	2002-038-00	Protect Normative Structure and Function of Critical Aquatic and Terrestrial Habitat (Habitat) (BPA)
33	1988-115-35	Yakima/Klickitat Fisheries Project Design and Construction - Klickitat ONLY (Hatchery) (BPA)
34	1995-063-35	Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)
35	1995-068-00	Preliminary Design for Passage & Habitat Improvement (Habitat) (BPA)
36	1997-056-00	Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (Habitat) (BPA)
37	2000-010-00	Klickitat River Subbasin Assessment (Habitat) (BPA)
38	2001-024-00	Klickitat River Salmon Exertion Study - Determination of difficult passage areas, migration patterns and energetic use of upriver migrating salmon and steelhead (RME) (BPA)
45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
120	2002-029-00	Fish Passage on WDFW Lands in Yakima (Habitat) (BPA)
126	1984-021-00	Protect and Enhance John Day Anadromous Fish (Habitat) (BPA)
128	1998-017-00	Eliminate Gravel Push-up Dams in Lower North Fork John Day (Habitat) (BPA)
129	1998-018-00	John Day Watershed Restoration Program (Habitat) (USBR)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
135	2000-031-00	North Fork John Day River Subbasin Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
137	2001-040-00	Wagner Ranch Acquisition (Habitat) (BPA)

Mid Columbia River Spring-run Chinook

140	1999-008-00	Columbia Plateau Water Rights Acquisition (Habitat) (BPA)
141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau Province (RME) (BPA)
144	2002-033-00	John Day Recovery Monitoring (RME) (BPA)
157	1990-052-00	Performance/Stock Productivity Impacts of Hatchery Supplementation (RME) (BPA)
267	2001-011-00	Habitat Diversity in Alluvial Rivers (RME) (BPA)
476	2002-017-00	Regional Stream Conditions and Stressor Evaluation (RME) (BPA)
479		Yakima-Klickitat Fisheries Project - Manastash Creek Fish Passage and Screening (Habitat) (BPA)
481	2002-028-00	Conduct Watershed Assessments for Priority Watersheds on Private Lands in the Columbia Plateau (Habitat) (BPA)
541		Evaluation of Transportation Strategies (Hydro) (CORPS)

Middle Columbia River Steelhead

1	1985-062-00	Passage Improvement Evaluation - Phase II Screens (Habitat) (BPA)
2	1988-115-25	Yakima/Klickitat Fisheries Project (YKFP) Design and Const. - Yakima Basin Only (Hatchery) (BPA)
3	1988-120-25	Yakima/Klickitat Fisheries Project (YKFP) Management (Hatchery) (BPA)
4	1991-057-00	Fabricate and Install Yakima Basin Phase II Fish Screens (Habitat) (BPA)
5	1991-075-00	Yakima Phase II Screens - Construction (Habitat) (BPA)
6	1992-009-00	Operate & Maintain (O&M) Yakima Basin Phase II Fish Screens (Habitat) (BPA)
7	1992-062-00	Yakama Nation - Riparian/Wetlands Restoration (Habitat) (BPA)
7	1992-062-00	Yakama Nation - Riparian/Wetlands Restoration (Habitat) (BPA)
8	1995-033-00	O&M Of Yakima Phase II Fish Facilities* (Habitat) (BPA)
9	1995-063-25	Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (RME) (BPA)
10	1995-064-25	Policy/Technical Involvement and Planning in the Yakima/Klickitat Fisheries Project (Hatchery) (BPA)
11	1996-035-00	Satus Watershed Restoration (Habitat) (BPA)
12	1997-013-25	Yakima/Klickitat Fisheries Project Operations and Maintenance (Hatchery) (BPA)
13	1997-051-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (Habitat) (BPA)
14	1997-053-00	Toppenish-Simcoe Instream Flow Restoration and Assessment (Habitat) (BPA)
15	1998-033-00	Restore Upper Toppenish Watershed (Habitat) (BPA)
16	1998-034-00	Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yakima Subbasin (Habitat) (BPA)
17	1999-013-00	Ahtanum Creek Watershed Assessment (Habitat) (BPA)
18	2000-011-00	Rock Creek Watershed Assessment and Restoration project. (Habitat) (BPA)
19	2002-022-00	YKFP Big Creek Passage & Screening (Habitat) (BPA)
20	2002-023-00	Yakima-Klickitat Fisheries Project - Wilson Creek Snowden Parcel Acquisition (Habitat) (BPA)
21	2002-025-00	Yakima Tributary Access and Habitat Program (Objective 1: Early Actions) (Habitat) (BPA)
22	2002-038-00	Protect Normative Structure and Function of Critical Aquatic and Terrestrial Habitat (Habitat) (BPA)
33	1988-115-35	Yakima/Klickitat Fisheries Project Design and Construction - Klickitat ONLY (Hatchery) (BPA)
34	1995-063-35	Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (RME) (BPA)
35	1995-068-00	Preliminary Design for Passage & Habitat Improvement (Habitat) (BPA)
36	1997-056-00	Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (Habitat) (BPA)
37	2000-010-00	Klickitat River Subbasin Assessment (Habitat) (BPA)
38	2001-024-00	Klickitat River Salmon Exertion Study - Determination of difficult passage areas, migration patterns and energetic use of upriver migrating salmon and steelhead (RME) (BPA)
39	1983-436-00	Umatilla Passage O&M (Habitat) (BPA)
40	1988-022-00	Umatilla River Fish Passage Operations (Habitat) (BPA)
44	1989-027-00	Repay Power for Umatilla Basin Project (Habitat) (BPA)
45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
46	1996-011-00	Juvenile Screens Smolt Traps on the WW River also reference 2000-033-00 (Habitat) (BPA)
52	2000-033-00	Walla Walla River Fish Passage Operations (Habitat) (BPA)
53	2000-039-00	Walla Walla Natural Production M&E (RME) (BPA)

Middle Columbia River Steelhead

54	2001-039-00	Walla Walla Basin Screening (Habitat) (BPA)
55	2001-075-00	Increase Instream Flows to Dewatered Stream Reaches in the Walla Walla Basin (Habitat) (BPA)
56	2002-036-00	Walla Walla River Flow Restoration (Habitat) (BPA)
119	2002-018-00	Tapteal Bend Riparian Corridor Restoration (Habitat) (BPA)
120	2002-029-00	Fish Passage on WDFW Lands in Yakima (Habitat) (BPA)
128	1998-017-00	Eliminate Gravel Push-up Dams in Lower North Fork John Day (Habitat) (BPA)
129	1998-018-00	John Day Watershed Restoration Program (Habitat) (USBR)
132	1998-022-00	Pine Creek Ranch Acquisition (Habitat) (BPA)
133	1999-010-00	Mitigate Effects of Erosion on Salmonid Habitat - Pine Hollow (Habitat) (BPA)
134	2000-015-00	Oxbow Ranch Acquisition (Habitat) (BPA)
135	2000-031-00	North Fork John Day River Subbasin Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
136	2001-023-00	15 Mile Water Rights Acquisition (Habitat) (BPA)
137	2001-040-00	Wagner Ranch Acquisition (Habitat) (BPA)
139	2001-069-00	Oregon Water Trust Early Action Project (Habitat) (BPA)
140	1999-008-00	Columbia Plateau Water Rights Acquisition (Habitat) (BPA)
141	1998-016-00	Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Portion of the Columbia Plateau Province (RME) (BPA)
142	2000-017-00	Kelt Reconditioning Research (Hydro) (BPA)
144	2002-033-00	John Day Recovery Monitoring (RME) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
180	1987-100-02	Umatilla Subbasin Fish Habitat Improvement (Habitat) (BPA)
248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
255	1987-100-01	Umatilla River Anadromous Fish Habitat Enhancement Project (Habitat) (BPA)
264	1994-046-01	Walla Walla River Basin Fish Habitat Enhancement (Habitat) (BPA)
265	1998-020-00	Assess Fish Habitat and Salmonids in the Walla Walla Watershed in Washington (RME) (BPA)
267	2001-011-00	Habitat Diversity in Alluvial Rivers (RME) (BPA)
269	2000-055-00	Nutrient enhancement studies (RME) (BPA)
270	2001-061-00	Touchet River Flow Acquisition (Habitat) (BPA)
271	2001-064-00	Improve Stream Flow and Passage for Simcoe Creek Steelhead (Habitat) (BPA)
272	2002-020-00	Fabricate and Install New Huntsville Mill Fish Screen (Habitat) (BPA)
273	2002-030-00	Develop Progeny Marker for Salmonids to Evaluate Supplementation (RME) (BPA)
294	1998-056-00	NMFS Net Exchange Program (Harvest) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
363		McNary Extended Submerged Bar Screens (Hydro) (CORPS)
366		McNary Juvenile Bypass System Outfall (Hydro) (CORPS)

Middle Columbia River Steelhead

367	McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
368	Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
370	McNary Juvenile Survival (Hydro) (CORPS)
378	Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
413	Middle Fork John Day Gaging Stations (Habitat) (USBR)
414	Middle Fork John Day IFIM Study (Habitat) (USBR)
418	North Fork John Day River IFIM Studies (Habitat) (USBR)
420	Panama Ditch Screen Replacement (Habitat) (USBR)
421	Strawberry Creek Complex Screen Replacement (Habitat) (USBR)
422	Upper John Day Gaging stations (Habitat) (USBR)
423	Upper John Day IFIM study (Habitat) (USBR)
429	USBR Middle Fork John Day program management (Habitat) (USBR)
430	USBR North Fork John Day Program Management (Habitat) (USBR)
431	USBR Upper John Day Program Management (Habitat) (USBR)
450	Columbia Basin Project Wasteway and Drain Investigation (Hydro) (USBR)
451	Return Flow Quality from Columbia Basin Project (Hydro) (USBR)
454	Pushup Dam Research - John Day Basin (RME) (USBR)
455	John Day Basin Steelhead Data and Information Compilation (RME) (USBR)
476 2002-017-00	Regional Stream Conditions and Stressor Evaluation (RME) (BPA)
479	Yakima-Klickitat Fisheries Project - Manastash Creek Fish Passage and Screening (Habitat) (BPA)
481 2002-028-00	Conduct Watershed Assessments for Priority Watersheds on Private Lands in the Columbia Plateau (Habitat) (BPA)
560	Trout Creek Section 206 (Habitat) (CORPS)
561	Walla Walla GI Feasibility Study (Habitat) (CORPS)

Okanogan River Sockeye

246 2000-013-00	Evaluate An Experimental Re-Introduction of Sockeye Salmon into Skaha Lake (BPA Short Title: Eval Reintroduction Sockeye Salmon Skaha Lake) (Habitat) (BPA)
582	Adult Passage Counting and Trapping at Zosel Dam (Hydro) (BPA)

Snake River Basin Steelhead

41	1988-053-04	Northeast Oregon Hatchery Project (Hatchery) (BPA)
43	1988-053-05	Northeast Oregon Hatchery Project (Hatchery) (BPA)
57	1988-053-01	Northeast Oregon Hatchery Project (Hatchery) (BPA)
79	1992-026-03	Upper Salmon Basin Watershed Project Administration/Implementation Support (Habitat) (BPA)
80	1993-035-01	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed (Habitat) (BPA)
81	1993-062-00	Custer Soil & Water Conservation District Salmon River Fish Passage Enhancement (Habitat) (BPA)
82	1994-015-00	Idaho Fish Screen Improvement (Habitat) (BPA)
83	1994-017-00	Idaho Model Watershed Habitat Improvement Project (Habitat) (BPA)
84	1994-050-00	Salmon River Habitat Enhancement M & E (Habitat) (BPA)
85	1996-007-00	Upper Salmon River Diversion Consolidation Program (Habitat) (BPA)
86	1996-077-02	Protect and Restore Lolo Creek Watershed (Habitat) (BPA)
87	1996-077-03	Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Papoose) Creek Watersheds Analysis Area (Habitat) (BPA)
88	1996-077-05	Restore McComas Meadows/Meadow Creek Watershed (Habitat) (BPA)
89	1996-086-00	Clearwater Focus Program (Habitat) (BPA)
90	1997-060-00	Clearwater Subbasin Focus Watershed Program - NPT (Habitat) (BPA)
91	1999-014-00	Little Canyon Creek Subwatershed-Steelhead Trout Habitat Improvement Project (Habitat) (BPA)
92	1999-015-00	Restoring Anadromous Fish Habitat in Big Canyon Watershed (Habitat) (BPA)
93	1999-016-00	Protect and Restore Big Canyon Creek Watershed (Habitat) (BPA)
94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
95	1999-018-00	Characterize and quantify residual steelhead in the Clearwater River, Idaho (RME) (BPA)
96	1999-019-00	Holistic Restoration of the Twelvemile Reach of the Salmon River near Challis, Idaho (Habitat) (BPA)
98	2000-034-00	Protect and Restore The North Lochsa Face Analysis Area Watersheds (Habitat) (BPA)
99	2000-35-00	Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (Habitat) (BPA)
100	2000-036-00	Protect & Restore Mill Creek (Habitat) (BPA)
101	2001-035-00	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning and Rearing Habitat (Habitat) (BPA)
102	2001-044-00	Conservation Easement, Baker Ranch, Salmon River East Fork (Habitat) (BPA)
103	2001-051-00	Reconnect Little Morgan Creek to the Main-stem Pahsimeroi River (Habitat) (BPA)
104	2001-052-00	Restoration of Anadromous Fish Access to Hawley Creek (Habitat) (BPA)
105	2001-067-00	Restore Passage Lower Lemhi / Salmon Rivers (Habitat) (BPA)
107	2001-068-00	Transfer Lemhi Water Users (L-6 to Salmon River (S-14) (Habitat) (BPA)
142	2000-017-00	Kelt Reconditioning Research (Hydro) (BPA)
146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
154	2002-027-00	Lower Snake Hydrodynamics and Water Quality (RME) (BPA)
156	1989-096-00	Genetic Monitoring and Evaluation Program for Supplemented Populations of Salmon and Steelhead in the Snake River Basin (RME) (BPA)
157	1990-052-00	Performance/Stock Productivity Impacts of Hatchery Supplementation (RME) (BPA)
164	2001-049-00	Safety-Net Coordinator (Hatchery) (BPA)

Snake River Basin Steelhead

165	2002-004-04	Safety-Net Artificial Propagation Program - WDFW (Hatchery) (BPA)
166	2002-004-00	Safety-Net Artificial Propagation Program - CRITFC (Hatchery) (BPA)
167	2002-004-01	Safety-Net Artificial Propagation Program - NPT (Hatchery) (BPA)
168	2002-004-02	Safety-Net Artificial Propagation Program - IDFG (Hatchery) (BPA)
169	2002-004-03	Safety-Net Artificial Propagation Program - SBT (Hatchery) (BPA)
172	1997-038-00	Listed Stock Chinook Salmon Gamete Preservation (Hatchery) (BPA)
195	1984-025-00	Joseph Creek, Grande Ronde River (Habitat) (BPA)
196	1992-026-01	Grande Ronde Model Watershed - Planning (Habitat) (BPA)
197	1992-026-01	Little Sheep Creek Lg Wood Placement and Culvert Replacement (Habitat) (BPA)
198	1992-026-01	Lostine River/Carcass Supplementation and Evaluation (RME) (BPA)
199	1992-026-01	Grouse Creek Restoration (Habitat) (BPA)
200	1992-026-01	GRMWS - LaGrande Ranger District FY01 Projects (Habitat) (BPA)
201	1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)
202	1992-026-01	GRMWS - Union County Bridges (Habitat) (BPA)
203	1992-026-01	GRMWP - Bue Road Improvement (Habitat) (BPA)
204	1992-026-01	GRMWP - Lostine Watershed Assessment (Habitat) (BPA)
205	1992-026-01	GRMWP - Clark Creek/Bryant Alternative Watering System (Habitat) (BPA)
207	1992-026-01	GRMWP - Rangeland Drill/Watershed Restoration and Enhancement (Habitat) (BPA)
208	1992-026-01	GRMWP - Eisminger/CREP Dike Relocation (Habitat) (BPA)
209	1996-083-01	McCoy Meadows Watershed Restoration (Habitat) (BPA)
210	1997-078	Catherine Creek Irrigation Stabilization (Habitat) (BPA)
211	1999-043-00	Union County Technical Engineering Assistance (Habitat) (BPA)
212	1999-044-00	Wallowa County Technical Engineering Assistance (Habitat) (BPA)
213	1999-047-00	Wet Meadow Inventory and Assessment (Habitat) (BPA)
214	1999-058-00	Upper Grande Ronde and Catherine Creek Watershed Restoration (Habitat) (BPA)
215	1999-061	Mill Creek Fish Passage/Union County SWCD Channel Road (Habitat) (BPA)
216	1999-070-00	Wallowa County Gaging Station (RME) (BPA)
217	1999-071-00	Hagedorn Road Relocation/Stream Restoration (Habitat) (BPA)
218	1999-072-00	Wildcat Creek Culvert Replacement (Habitat) (BPA)
219	1999-074-00	Little Fly Creek Headcut Rehabilitation (Habitat) (BPA)
220	1999-079-00	Beaver Creek Fish Passage (Habitat) (BPA)
221	1999-081-00	East End Road Obliteration and Sediment Reduction (Habitat) (BPA)
222	2000-059-00	USFS Marr Flat Allotment and Big Sheep/Imnaha Fisheries Enhancement (Habitat) (BPA)
223	2000-061-00	Upper Wildcat and Joseph Creek Watershed improvement (Habitat) (BPA)
224	2000-062-00	Imnaha/Park Ditch Water Conservation (Habitat) (BPA)
225	2000-063-00	Meadow Creek Riparian Pasure Fence (Habitat) (BPA)

Snake River Basin Steelhead

226	2000-064-00	Conservation Reserve Enhancement Program Incentive (Habitat) (BPA)
227	2000-065-00	Meadow Creek/Habberstad fish habitat Enhancement (Habitat) (BPA)
228	2000-066-00	McCoy Creek-Alta Cunha Rances Riparian Restoration (Habitat) (BPA)
229	2000-069-00	Grande Ronde River Basin - Culvert Replacements (Habitat) (BPA)
230	2001-018-00	Phillips-Gordon Watershed Assessment (Habitat) (BPA)
231	2001-019-00	Little Catherine and Lick Creek Restoration (Habitat) (BPA)
260	1990-055-00	Idaho Supplementation Studies - steelhead - previously 1989-098-00 (RME) (BPA)
261	1991-073-00	Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (RME) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-001-00, 1999-057-00) (Habitat) (BPA)
263	1994-018-07	Garfield County Sediment Reduction and Riparian Improvement Program - (proposal) - funded under: 1999-021-00, 1999-059-00, 1997-088-00 (closed, but some 088 activities carried into 021 and 059 contracts) (Habitat) (BPA)
275	1992-026-04	Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin (RME) (BPA)
281	1997-080-00	Asotin Creek Upland Sedimentation Reductin (Habitat) (BPA)
282	1997-086-00	Asotin Watershed Upland BMP's (Habitat) (BPA)
283	1999-002-00	Asotin Watershed Project Implementation (Habitat) (BPA)
284	1999-052-00	Asotin Creek Five Year Minimum Till Program (Habitat) (BPA)
285	1999-060-00	Asotin Watershed Upland BMP Implementation (Habitat) (BPA)
286	2000-046-00	ISCO Water Sampling and Macroinvertebrate Samples (RME) (BPA)
287	2000-047-00	GIS Mapping of Asotin Creek Watershed Habitat Projects (Habitat) (BPA)
288	2000-053-00	Asotin Creek Riparian Planting (Habitat) (BPA)
289	2000-054-00	Asotin Creek Riparian Fencing Projects (Habitat) (BPA)
290	2000-067-00	Asotin Creek Channel, Floodplain and Riparian Restoration (Habitat) (BPA)
294	1998-056-00	NMFS Net Exchange Program (Harvest) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
312		Adult Temperature Evaluation (Hydro) (CORPS)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
320		Cylindrical Dewatering Evaluation (Hydro) (CORPS)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
323		Modify Dworshak National Fish Hatchery System 1 Reuse System (Hydro) (CORPS)
326		Fish Ladder Temperature Evaluation (Hydro) (CORPS)
331		Ice Harbor Adult Pit (Hydro) (CORPS)
332		Ice Harbor Emergency Auxiliary Water Supply (Hydro) (CORPS)
333		Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334		Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Snake River Basin Steelhead

335	Ice Harbor Survival Studies (RME) (CORPS)
340	Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
345	Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352	Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359	Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
363	McNary Extended Submerged Bar Screens (Hydro) (CORPS)
364	McNary Flow Deflectors (Hydro) (CORPS)
367	McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
370	McNary Juvenile Survival (Hydro) (CORPS)
378	Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
393	L-13 Diversion Replacement (Habitat) (USBR)
394	L-13 Headgate (Habitat) (USBR)
395	L-13 Screen (Habitat) (USBR)
396	L-18 Headgate (Habitat) (USBR)
397	L-20 Headgate (Habitat) (USBR)
398	L-3 Diversion Replacement (Habitat) (USBR)
399	L-35A Diversion Replacement (Habitat) (USBR)
400	L-35A Headgate (Habitat) (USBR)
401	L-35A Screen (Habitat) (USBR)
402	L-3A Diversion Replacement (Habitat) (USBR)
403	L-3A0 Diversion Replacement (Habitat) (USBR)
404	L-3 Headgate (Habitat) (USBR)
405	L-6/S14 Water Exchange (Habitat) (USBR)
406	L-9 Diversion Replacement (Habitat) (USBR)
407	L-9 Headgate (Habitat) (USBR)
425	USBR Lemhi program management (Habitat) (USBR)
426	USBR Little Salmon Subbasin Program Management (Habitat) (USBR)
428	USBR Middle Clearwater Subbasin Program Management (Habitat) (USBR)
432	USBR Upper Salmon program management (Habitat) (USBR)
434	Williams Creek Diversion Replacements (Habitat) (USBR)
436	Williams Creek Screens (Habitat) (USBR)
452	Fish Production/Flow Analysis (RME) (USBR)

Snake River Basin Steelhead

541	Evaluation of Transportation Strategies (Hydro) (CORPS)
542	Juvenile Salmon Temperature Studies (RME) (CORPS)
544	Juvenile salmon transportation evaluations (Hydro) (CORPS)
545	Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
555	Salmon River Aquatic Ecosystem Restoration (Habitat) (CORPS)
562	Asotin County Riparian Buffer and Couse and Tenmile Creeks Protection and Implementation Project (Habitat) (BPA)
563	Assess Salmonids in the Asotin Creek Watershed (RME) (BPA)
564	Protect and Restore the Asotin Creek Watershed (Habitat) (BPA)
565	Oregon Plan Blue Mountain Province Fish Screening/Fish Passage (Habitat) (BPA)
566	Adult Steelhead Status Monitoring - Imnaha River Subbasin (RME) (BPA)
568	Riparian Conservation Easement Purchase of Scarrow Property on Lake Creek a Tributary to the Secesh River, Idaho (Habitat) (BPA)
569	Restoration of the Yankee Fork Salmon River (Habitat) (BPA)
570	Nez Perce Tribe Harvest Monitoring Program (RME) (BPA)
571	Potlatch River Watershed Restoration (Habitat) (BPA)
573	Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho (Habitat) (BPA)
574	Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (Habitat) (BPA)
575	Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho (Habitat) (BPA)
576	Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (Habitat) (BPA)
577	Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (Habitat) (BPA)
578	Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (RME) (BPA)
579	Protect and Restore Little Salmon River (Habitat) (BPA)
580	Restoring anadromous fish habitat in the Lapwai Creek watershed (Habitat) (BPA)
588	Lemhi Subbasin IFIM studies (Habitat) (USBR)

Snake River Fall-run Chinook

59	1991-029-00	The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall chinook salmon (RME) (BPA)
63	1994-034-00	Assessing Summer And Fall Chinook Salmon Restoration In The Clearwater, Lower Salmon, Grande Ronde, And Imnaha Rivers (RME) (BPA)
66	1998-010-03	Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower Granite Dam (RME) (BPA)
67	1998-010-04	Monitoring and Evaluation of Yearling Snake River Fall Chinook Salmon Outplanted Upstream of Lower Granite Dam (RME) (BPA)
77	2002-032-00	Investigating passage of ESA-listed juvenile fall chinook salmon at Lower Granite Dam during winter when the fish bypass system is inoperable (RME) (BPA)
93	1999-016-00	Protect and Restore Big Canyon Creek Watershed (Habitat) (BPA)
94	1999-017-00	Protect and Restore Lapwai Creek Watershed (Habitat) (BPA)
146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
154	2002-027-00	Lower Snake Hydrodynamics and Water Quality (RME) (BPA)
170	1983-350-03	New Perce Tribal Hatchery; M & E (RME) (BPA)
173	1996-010-05	Pittsburgh Landing Fall Chinook Acclimation Facility (Hatchery) (BPA)
175	1996-010-07	Capt. John Rapid's Fall Chinook Acclimation Facility (Hatchery) (BPA)
176	1996-010-08	Big Canyon Fall Chinook Acclimation Facility (Hatchery) (BPA)
205	1992-026-01	GRMWP - Clark Creek/Bryant Alternative Watering System (Habitat) (BPA)
208	1992-026-01	GRMWP - Eisminger/CREP Dike Relocation (Habitat) (BPA)
210	1997-078	Catherine Creek Irrigation Stabilization (Habitat) (BPA)
211	1999-043-00	Union County Technical Engineering Assistance (Habitat) (BPA)
212	1999-044-00	Wallowa County Technical Engineering Assistance (Habitat) (BPA)
248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-001-00, 1999-057-00) (Habitat) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)
312		Adult Temperature Evaluation (Hydro) (CORPS)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
320		Cylindrical Dewatering Evaluation (Hydro) (CORPS)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
326		Fish Ladder Temperature Evaluation (Hydro) (CORPS)
331		Ice Harbor Adult Pit (Hydro) (CORPS)
332		Ice Harbor Emergency Auxiliary Water Supply (Hydro) (CORPS)
333		Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334		Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
335		Ice Harbor Survival Studies (RME) (CORPS)
336		HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (Hatchery) (CORPS)
340		Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
345		Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Snake River Fall-run Chinook

346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352	Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359	Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
363	McNary Extended Submerged Bar Screens (Hydro) (CORPS)
364	McNary Flow Deflectors (Hydro) (CORPS)
365	McNary Forebay Temperature Improvements (Hydro) (CORPS)
367	McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
368	Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
370	McNary Juvenile Survival (Hydro) (CORPS)
378	Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
435	Williams Creek Headgate Projects (Habitat) (USBR)
465	AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
541	Evaluation of Transportation Strategies (Hydro) (CORPS)
542	Juvenile Salmon Temperature Studies (RME) (CORPS)
544	Juvenile salmon transportation evaluations (Hydro) (CORPS)
545	Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
570	Nez Perce Tribe Harvest Monitoring Program (RME) (BPA)
571	Potlatch River Watershed Restoration (Habitat) (BPA)
578	Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (RME) (BPA)
580	Restoring anadromous fish habitat in the Lapwai Creek watershed (Habitat) (BPA)
589	Banks Lake Operations (Hydro) (USBR)

Snake River Sockeye

146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
154	2002-027-00	Lower Snake Hydrodynamics and Water Quality (RME) (BPA)
158	1990-093-00	Genetic Analysis of <i>Onchorhynchus nerka</i> (Modified to Include Chinook Salmon) (Hatchery) (BPA)
159	1991-071-00	Snake River Sockeye Salmon Habitat and Limmological Research (RME) (BPA)
160	1991-072-00	Redfish Lake Sockeye Salmon Captive Broodstock Program (Hatchery) (BPA)
161	1992-040-00	Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research (Hatchery) (BPA)
162	1993-056-00	Research on Captive Broodstock Programs for Pacific Salmon (RME) (BPA)
312		Adult Temperature Evaluation (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
326		Fish Ladder Temperature Evaluation (Hydro) (CORPS)
331		Ice Harbor Adult Pit (Hydro) (CORPS)
332		Ice Harbor Emergency Auxiliary Water Supply (Hydro) (CORPS)
333		Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334		Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
335		Ice Harbor Survival Studies (RME) (CORPS)
340		Corps of Engineers' Juvenile Fish TransportationProgram (Hydro) (CORPS)
345		Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346		Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352		Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353		Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359		Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360		Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
363		McNary Extended Submerged Bar Screens (Hydro) (CORPS)
364		McNary Flow Deflectors (Hydro) (CORPS)
367		McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
368		Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
432		USBR Upper Salmon program management (Habitat) (USBR)
435		Williams Creek Headgate Projects (Habitat) (USBR)
436		Williams Creek Screens (Habitat) (USBR)
465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
542		Juvenile Salmon Temperature Studies (RME) (CORPS)
544		Juvenile salmon transportation evaluations (Hydro) (CORPS)
545		Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
555		Salmon River Aquatic Ecosystem Restoration (Habitat) (CORPS)

Snake River Spring/Summer-run Chinook

41	1988-053-04	Northeast Oregon Hatchery Project (Hatchery) (BPA)
43	1988-053-05	Northeast Oregon Hatchery Project (Hatchery) (BPA)
47	1998-007-02	Grande Ronde Supplementation - Lostine River Spring Chinook (Hatchery) (BPA)
48	1998-007-02	Grande Ronde Supplementation - Lostine River Spring Chinook M&E (RME) (BPA)
49	1998-007-03	Grande Ronde Satellite Facility O&M (Hatchery) (BPA)
50	1998-007-03	Grande Ronde Supplementation - Catharine Creek and Upper Grande Ronde M&E (RME) (BPA)
51	1998-007-04	Grande Ronde Spring Chinook Supplementation Program (Hatchery) (BPA)
57	1988-053-01	Northeast Oregon Hatchery Project (Hatchery) (BPA)
63	1994-034-00	Assessing Summer And Fall Chinook Salmon Restoration In The Clearwater, Lower Salmon, Grande Ronde, And Imnaha Rivers (RME) (BPA)
65	1997-030-00	Listed Stock Chinook Salmon Escapement Monitoring (RME) (BPA)
79	1992-026-03	Upper Salmon Basin Watershed Project Administration/Implementation Support (Habitat) (BPA)
80	1993-035-01	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed (Habitat) (BPA)
81	1993-062-00	Custer Soil & Water Conservation District Salmon River Fish Passage Enhancement (Habitat) (BPA)
82	1994-015-00	Idaho Fish Screen Improvement (Habitat) (BPA)
83	1994-017-00	Idaho Model Watershed Habitat Improvement Project (Habitat) (BPA)
84	1994-050-00	Salmon River Habitat Enhancement M & E (Habitat) (BPA)
85	1996-007-00	Upper Salmon River Diversion Consolidation Program (Habitat) (BPA)
87	1996-077-03	Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Papoose) Creek Watersheds Analysis Area (Habitat) (BPA)
89	1996-086-00	Clearwater Focus Program (Habitat) (BPA)
90	1997-060-00	Clearwater Subbasin Focus Watershed Program - NPT (Habitat) (BPA)
91	1999-014-00	Little Canyon Creek Subwatershed-Steelhead Trout Habitat Improvement Project (Habitat) (BPA)
92	1999-015-00	Restoring Anadromous Fish Habitat in Big Canyon Watershed (Habitat) (BPA)
96	1999-019-00	Holistic Restoration of the Twelvemile Reach of the Salmon River near Challis, Idaho (Habitat) (BPA)
97	1999-020-00	Analyze the Persistence and Spatial Dynamics of Snake River Chinook Salmon (RME) (BPA)
98	2000-034-00	Protect and Restore The North Lochsa Face Analysis Area Watersheds (Habitat) (BPA)
99	2000-35-00	Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (Habitat) (BPA)
100	2000-036-00	Protect & Restore Mill Creek (Habitat) (BPA)
101	2001-035-00	Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning and Rearing Habitat (Habitat) (BPA)
102	2001-044-00	Conservation Easement, Baker Ranch, Salmon River East Fork (Habitat) (BPA)
103	2001-051-00	Reconnect Little Morgan Creek to the Main-stem Pahsimeroi River (Habitat) (BPA)
104	2001-052-00	Restoration of Anadromous Fish Access to Hawley Creek (Habitat) (BPA)
105	2001-067-00	Restore Passage Lower Lemhi / Salmon Rivers (Habitat) (BPA)
107	2001-068-00	Transfer Lemhi Water Users (L-6 to Salmon River (S-14) (Habitat) (BPA)
154	2002-027-00	Lower Snake Hydrodynamics and Water Quality (RME) (BPA)
156	1989-096-00	Genetic Monitoring and Evaluation Program for Supplemented Populations of Salmon and Steelhead in the Snake River Basin (RME) (BPA)

Snake River Spring/Summer-run Chinook

158	1990-093-00	Genetic Analysis of <i>Onchorhynchus nerka</i> (Modified to Include Chinook Salmon) (Hatchery) (BPA)
162	1993-056-00	Research on Captive Broodstock Programs for Pacific Salmon (RME) (BPA)
164	2001-049-00	Safety-Net Coordinator (Hatchery) (BPA)
165	2002-004-04	Safety-Net Artificial Propagation Program - WDFW (Hatchery) (BPA)
166	2002-004-00	Safety-Net Artificial Propagation Program - CRITFC (Hatchery) (BPA)
167	2002-004-01	Safety-Net Artificial Propagation Program - NPT (Hatchery) (BPA)
168	2002-004-02	Safety-Net Artificial Propagation Program - IDFG (Hatchery) (BPA)
169	2002-004-03	Safety-Net Artificial Propagation Program - SBT (Hatchery) (BPA)
170	1983-350-03	New Perce Tribal Hatchery; M & E (RME) (BPA)
171	1996-043-00	Johnson Creek Artificial Propagation & Enhancement (Hatchery) (BPA)
172	1997-038-00	Listed Stock Chinook Salmon Gamete Preservation (Hatchery) (BPA)
174	1998-010-06	Captive Broodstock Artificial Propagation (Hatchery) (BPA)
195	1984-025-00	Joseph Creek, Grande Ronde River (Habitat) (BPA)
196	1992-026-01	Grande Ronde Model Watershed - Planning (Habitat) (BPA)
198	1992-026-01	Lostine River/Carcass Supplementation and Evaluation (RME) (BPA)
199	1992-026-01	Grouse Creek Restoration (Habitat) (BPA)
200	1992-026-01	GRMWS - LaGrande Ranger District FY01 Projects (Habitat) (BPA)
201	1992-026-01	GRMWS - Wallowa Valley Ranger District FY01 Projects (Habitat) (BPA)
202	1992-026-01	GRMWS - Union County Bridges (Habitat) (BPA)
203	1992-026-01	GRMWP - Bue Road Improvement (Habitat) (BPA)
204	1992-026-01	GRMWP - Lostine Watershed Assessment (Habitat) (BPA)
205	1992-026-01	GRMWP - Clark Creek/Bryant Alternative Watering System (Habitat) (BPA)
207	1992-026-01	GRMWP - Rangeland Drill/Watershed Restoration and Enhancement (Habitat) (BPA)
208	1992-026-01	GRMWP - Eisminger/CREP Dike Relocation (Habitat) (BPA)
209	1996-083-01	McCoy Meadows Watershed Restoration (Habitat) (BPA)
210	1997-078	Catherine Creek Irrigation Stabilization (Habitat) (BPA)
211	1999-043-00	Union County Technical Engineering Assistance (Habitat) (BPA)
212	1999-044-00	Wallowa County Technical Engineering Assistance (Habitat) (BPA)
213	1999-047-00	Wet Meadow Inventory and Assessment (Habitat) (BPA)
214	1999-058-00	Upper Grande Ronde and Catherine Creek Watershed Restoration (Habitat) (BPA)
216	1999-070-00	Wallowa County Gaging Station (RME) (BPA)
217	1999-071-00	Hagedorn Road Relocation/Stream Restoration (Habitat) (BPA)
218	1999-072-00	Wildcat Creek Culvert Replacement (Habitat) (BPA)
221	1999-081-00	East End Road Obliteration and Sediment Reduction (Habitat) (BPA)
222	2000-059-00	USFS Marr Flat Allotment and Big Sheep/Imnaha Fisheries Enhancement (Habitat) (BPA)
223	2000-061-00	Upper Wildcat and Joseph Creek Watershed improvement (Habitat) (BPA)

Snake River Spring/Summer-run Chinook

224	2000-062-00	Imnaha/Park Ditch Water Conservation (Habitat) (BPA)
225	2000-063-00	Meadow Creek Riparian Pasure Fence (Habitat) (BPA)
226	2000-064-00	Conservation Reserve Enhancement Program Incentive (Habitat) (BPA)
227	2000-065-00	Meadow Creek/Habberstad fish habitat Enhancement (Habitat) (BPA)
228	2000-066-00	McCoy Creek-Alta Cunha Rances Riparian Restoration (Habitat) (BPA)
229	2000-069-00	Grande Ronde River Basin - Culvert Replacements (Habitat) (BPA)
230	2001-018-00	Phillips-Gordon Watershed Assessment (Habitat) (BPA)
231	2001-019-00	Little Catherine and Lick Creek Restoration (Habitat) (BPA)
238	1991-028-00	Monitoring Smolt Migrations of Wild Snake River Spring/Summer Salmon (RME) (BPA)
245	1997-015-01	Title Present Scope: Imnaha River Smolt Monitoring Program. Title for proposed expanded scope: Imnaha Smolt Survival and Smolt to Adult Return Rate Quantification (RME) (BPA)
248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
256	1989-098-00	Idaho Supplementation Studies - salmon (RME) (BPA)
257	1989-098-01	Idaho Supplementation Studies - salmon (RME) (BPA)
258	1989-098-02	Idaho Supplementation Studies - salmon (RME) (BPA)
259	1989-098-03	Idaho Supplementation Studies - salmon (RME) (BPA)
262	1994-008-06	Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-001-00, 1999-057-00) (Habitat) (BPA)
266	2000-019-00	Tucannon River Spring Chinook Captive Broodstock Program (Hatchery) (BPA)
269	2000-055-00	Nutrient enhancement studies (RME) (BPA)
275	1992-026-04	Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin (RME) (BPA)
276	1998-010-01	Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program (Hatchery) (BPA)
277	1997-001-00	Idaho Chinook Salmon Captive Rearing (Hatchery) (BPA)
279	1996-067-00	Manchester Spring Chinook Broodstock Project (Hatchery) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
312		Adult Temperature Evaluation (Hydro) (CORPS)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
320		Cylindrical Dewatering Evaluation (Hydro) (CORPS)
321		Delayed Mortality of Juveniles (Hydro) (CORPS)
323		Modify Dworshak National Fish Hatchery System 1 Reuse System (Hydro) (CORPS)
323		Modify Dworshak National Fish Hatchery System 1 Reuse System (Hydro) (CORPS)
326		Fish Ladder Temperature Evaluation (Hydro) (CORPS)
331		Ice Harbor Adult Pit (Hydro) (CORPS)
332		Ice Harbor Emergency Auxiliary Water Supply (Hydro) (CORPS)
333		Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
334		Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (Hydro) (CORPS)

Snake River Spring/Summer-run Chinook

335	Ice Harbor Survival Studies (RME) (CORPS)
340	Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
345	Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
346	Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
352	Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
353	Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
359	Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
360	Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
363	McNary Extended Submerged Bar Screens (Hydro) (CORPS)
364	McNary Flow Deflectors (Hydro) (CORPS)
367	McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
368	Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369	Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
370	McNary Juvenile Survival (Hydro) (CORPS)
378	Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
393	L-13 Diversion Replacement (Habitat) (USBR)
394	L-13 Headgate (Habitat) (USBR)
395	L-13 Screen (Habitat) (USBR)
396	L-18 Headgate (Habitat) (USBR)
397	L-20 Headgate (Habitat) (USBR)
398	L-3 Diversion Replacement (Habitat) (USBR)
399	L-35A Diversion Replacement (Habitat) (USBR)
400	L-35A Headgate (Habitat) (USBR)
401	L-35A Screen (Habitat) (USBR)
402	L-3A Diversion Replacement (Habitat) (USBR)
403	L-3A0 Diversion Replacement (Habitat) (USBR)
404	L-3 Headgate (Habitat) (USBR)
405	L-6/S14 Water Exchange (Habitat) (USBR)
406	L-9 Diversion Replacement (Habitat) (USBR)
407	L-9 Headgate (Habitat) (USBR)
425	USBR Lemhi program management (Habitat) (USBR)
426	USBR Little Salmon Subbasin Program Management (Habitat) (USBR)
428	USBR Middle Clearwater Subbasin Program Management (Habitat) (USBR)
432	USBR Upper Salmon program management (Habitat) (USBR)
434	Williams Creek Diversion Replacements (Habitat) (USBR)
435	Williams Creek Headgate Projects (Habitat) (USBR)

Snake River Spring/Summer-run Chinook

436	Williams Creek Screens (Habitat) (USBR)
452	Fish Production/Flow Analysis (RME) (USBR)
465	AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
541	Evaluation of Transportation Strategies (Hydro) (CORPS)
542	Juvenile Salmon Temperature Studies (RME) (CORPS)
544	Juvenile salmon transportation evaluations (Hydro) (CORPS)
545	Lower Monumental Survival/Efficiency Study (Hydro) (CORPS)
555	Salmon River Aquatic Ecosystem Restoration (Habitat) (CORPS)
563	Assess Salmonids in the Asotin Creek Watershed (RME) (BPA)
564	Protect and Restore the Asotin Creek Watershed (Habitat) (BPA)
565	Oregon Plan Blue Mountain Province Fish Screening/Fish Passage (Habitat) (BPA)
567	Evaluate Factors Influencing Bias and Precision of Chinook Salmon Redd Counts (RME) (BPA)
568	Riparian Conservation Easement Purchase of Scarrow Property on Lake Creek a Tributary to the Secesh River, Idaho (Habitat) (BPA)
569	Restoration of the Yankee Fork Salmon River (Habitat) (BPA)
570	Nez Perce Tribe Harvest Monitoring Program (RME) (BPA)
571	Potlatch River Watershed Restoration (Habitat) (BPA)
572	Chinook Salmon Smolt Survival and Smolt to Adult Return Rate Quantification, South Fork Salmon River, Idaho (RME) (BPA)
573	Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho (Habitat) (BPA)
574	Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (Habitat) (BPA)
575	Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho (Habitat) (BPA)
576	Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (Habitat) (BPA)
577	Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (Habitat) (BPA)
578	Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (RME) (BPA)
579	Protect and Restore Little Salmon River (Habitat) (BPA)
588	Lemhi Subbasin IFIM studies (Habitat) (USBR)

Sockeye Hatchery

178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)
295	2000-058-00	Effects of Gas on the Reproductive Success of Adult Salmonids (Hydro) (BPA)

Southwestern Washington/Columbia River Cutthroat

237	1990-080-00	Columbia River Basin PIT Tag Information System (Hydro) (BPA)
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Spring Chinook Hatchery

61	1992-022-00	Physiological Assessment and Behavioral Interactions of Wild and Hatchery Juvenile Salmonids (RME) (BPA)
73	2000-072-00	Phenotypic Correlations between Prevalence of Renibacterium salmoninarum among Spring Chinook Salmon and Resistance/Susceptibility of their Progeny to Infectious Bacteria and Bacterial Kidney Disease (BKD) (Hatchery) (BPA)
76	2002-031-00	Growth Rate Modulation in Spring Chinook Salmon Supplementation (RME) (BPA)
178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)
233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)

Steelhead Hatchery

178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)
233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)
280	2001-047-00	Reintroduction success of steelhead from captive propagation and release strategies (RME) (BPA)

Summer Chinook Hatchery

178	1982-013-02	Annual Stock Assessment - Coded Wire Tag Program (ODFW) (Hatchery) (BPA)
179	1982-013-04	Annual Stock Assessment-Coded Wire Tag Program (WDFW) (Hatchery) (BPA)
233	1987-401-00	Assessment of Smolt Condition: Biological and Environmental Interactions (RME) (BPA)

Unlisted Resident Fish - Coastal Cutthroat

297	2001-026-00	Evaluate Status of Coastal Cutthroat Trout in the Columbia River Basin above Bonneville Dam (Resident Fish) (BPA)
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Unlisted Resident Fish - White Sturgeon

291	1986-050-00	White Sturgeon Mitigation and Restoration in the Columbia And Snake Rivers Upstream from Bonneville Dam (Resident Fish) (BPA)
293	1997-009-00	Evaluate Potential Means of Rebuilding Sturgeon Populations in the Snake River Between Lower Granite and Hells Canyon Dams (Resident Fish) (BPA)

Upper Columbia River Spring-run Chinook

108	1996-034-01	Methow Valley Irrigation District Rehabilitation (Habitat) (BPA)
109	1996-040-00	Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (Hatchery) (BPA)
110	1996-042-00	Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (Habitat) (BPA)
111	1998-025-00	Restore Steelhead and Chinook habitat in Early Winters Creek (Habitat) (BPA)
112	1998-029-00	Goat Creek In-Stream Restoration for Salmonids (Habitat) (BPA)
115	2000-002-00	Remove Barriers/Restore Instream Habitat on Chumstick Creek (Habitat) (BPA)
116	2001-063-00	Methow River Basin Screening (Habitat) (BPA)
119	2002-018-00	Tapteal Bend Riparian Corridor Restoration (Habitat) (BPA)
121	2002-041-00	Columbia Cascade Stream Gauging (RME) (BPA)
146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
150	1998-035-01	Watershed Scale Response of Habitat to Abandoned Mine Waste (Habitat) (BPA)
153	2002-021-00	Reduce Water Temperatures in Teanaway (Habitat) (BPA)
248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
315		Avian Predation Measures at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
320		Cylindrical Dewatering Evaluation (Hydro) (CORPS)
340		Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
363		McNary Extended Submerged Bar Screens (Hydro) (CORPS)
364		McNary Flow Deflectors (Hydro) (CORPS)
366		McNary Juvenile Bypass System Outfall (Hydro) (CORPS)
367		McNary Juvenile Fish Facility Debris (Hydro) (CORPS)
368		Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369		Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
370		McNary Juvenile Survival (Hydro) (CORPS)
378		Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
383		Beaver Creek Water Acquisitions (Habitat) (USBR)
384		Campbell Diversions (Habitat) (USBR)
385		Chelan County/Wenatchee IFIM Study (Habitat) (USBR)
387		Chewuch Ditch Diversion Structure (Habitat) (USBR)
388		Chumstick Diversions (Habitat) (USBR)
389		Entiat IFIM Studies (Habitat) (USBR)
390		Fort-Thurlow Pump Exchange (Habitat) (USBR)
391		Fulton Diversion Structure (Habitat) (USBR)
392		Gold Creek Screen and Diversion (Habitat) (USBR)
408		Marracci/Washington Department of Fish and Wildlife Diverson (Habitat) (USBR)

Upper Columbia River Spring-run Chinook

409	USGS Hydrologic Model Upgrades (Habitat) (USBR)
410	Methow Valley Irrigation District Methow River Screen (Habitat) (USBR)
411	Methow Valley Irrigation District Twisp River Screen (Habitat) (USBR)
412	Methow Valley Irrigation District Twisp River Pump Exchange (Habitat) (USBR)
415	Mission Diversions (Habitat) (USBR)
416	Methow Valley Irrigation District Methow River Diversion (Habitat) (USBR)
417	Methow Valley Irrigation District Twisp River Diversion (Habitat) (USBR)
419	Okanogan Gaging Stations (Habitat) (USBR)
424	USBR Entiat Subbasin Program Management (Habitat) (USBR)
427	USBR Methow program management (Habitat) (USBR)
433	USBR Wenatchee Subbasin Program Management (Habitat) (USBR)
437	HGMP Funding & Development-Leavenworth (Hatchery) (USBR)
438	HGMPs Implementation - Leavenworth (Hatchery) (USBR)
442	Chief Joseph Project ESA Consultation with NMFS (Hydro) (USBR)
444	Okanogan Project ESA Consultation with NMFS (Hydro) (USBR)
453	John Day Basin Aerial Imagery Project (RME) (USBR)
459	TRT Digital Satellite Imagery Project (RME) (USBR)
465	AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
465	AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
541	Evaluation of Transportation Strategies (Hydro) (CORPS)
542	Juvenile Salmon Temperature Studies (RME) (CORPS)
544	Juvenile salmon transportation evaluations (Hydro) (CORPS)
581	Evaluation of 1872 Water Rights to Supplement Flows Between Basins (Habitat) (BPA)
582	Adult Passage Counting and Trapping at Zosel Dam (Hydro) (BPA)
583	Restore Passage on Private Lands in Beaver Creek Drainage to Benefit Spring Chinook, Steelhead and Bulltrout (Habitat) (BPA)
587	Entiat IFIM Studies (Habitat) (USBR)

Upper Columbia River Steelhead

108	1996-034-01	Methow Valley Irrigation District Rehabilitation (Habitat) (BPA)
109	1996-040-00	Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (Hatchery) (BPA)
110	1996-042-00	Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (Habitat) (BPA)
111	1998-025-00	Restore Steelhead and Chinook habitat in Early Winters Creek (Habitat) (BPA)
112	1998-029-00	Goat Creek In-Stream Restoration for Salmonids (Habitat) (BPA)
114	2000-001-00	Anadromous Fish Habitat & Passage in Omak Creek (Habitat) (BPA)
115	2000-002-00	Remove Barriers/Restore Instream Habitat on Chumstick Creek (Habitat) (BPA)
116	2001-063-00	Methow River Basin Screening (Habitat) (BPA)
117	2001-065-00	Hancock Springs Passage and Habitat Restoration Improvements (Habitat) (BPA)
117	2001-065-00	Hancock Springs Passage and Habitat Restoration Improvements (Habitat) (BPA)
118	2002-001-00	Colville Confederated Tribes Ellisford Acclimation (Hatchery) (BPA)
121	2002-041-00	Columbia Cascade Stream Gauging (RME) (BPA)
146	2001-003-00	Installation of Adult PIT-tag Detection Systems (Hydro) (BPA)
150	1998-035-01	Watershed Scale Response of Habitat to Abandoned Mine Waste (Habitat) (BPA)
294	1998-056-00	NMFS Net Exchange Program (Harvest) (BPA)
314		Adult Fish Counting at Mainstem Columbia and Snake River Projects (Hydro) (CORPS)
320		Cylindrical Dewatering Evaluation (Hydro) (CORPS)
340		Corps of Engineers' Juvenile Fish Transportation Program (Hydro) (CORPS)
364		McNary Flow Deflectors (Hydro) (CORPS)
366		McNary Juvenile Bypass System Outfall (Hydro) (CORPS)
368		Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
369		Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (Hydro) (CORPS)
370		McNary Juvenile Survival (Hydro) (CORPS)
378		Spare Parts for Fish Passage Facilities (Hydro) (CORPS)
383		Beaver Creek Water Acquisitions (Habitat) (USBR)
384		Campbell Diversions (Habitat) (USBR)
385		Chelan County/Wenatchee IFIM Study (Habitat) (USBR)
387		Chewuch Ditch Diversion Structure (Habitat) (USBR)
388		Chumstick Diversions (Habitat) (USBR)
389		Entiat IFIM Studies (Habitat) (USBR)
390		Fort-Thurlow Pump Exchange (Habitat) (USBR)
391		Fulton Diversion Structure (Habitat) (USBR)
392		Gold Creek Screen and Diversion (Habitat) (USBR)
408		Marracci/Washington Department of Fish and Wildlife Diverson (Habitat) (USBR)
409		USGS Hydrologic Model Upgrades (Habitat) (USBR)
410		Methow Valley Irrigation District Methow River Screen (Habitat) (USBR)

Upper Columbia River Steelhead

411		Methow Valley Irrigation District Twisp River Screen (Habitat) (USBR)
412		Methow Valley Irrigation District Twisp River Pump Exchange (Habitat) (USBR)
415		Mission Diversions (Habitat) (USBR)
416		Methow Valley Irrigation District Methow River Diversion (Habitat) (USBR)
417		Methow Valley Irrigation District Twisp River Diversion (Habitat) (USBR)
419		Okanogan Gaging Stations (Habitat) (USBR)
424		USBR Entiat Subbasin Program Management (Habitat) (USBR)
427		USBR Methow program management (Habitat) (USBR)
433		USBR Wenatchee Subbasin Program Management (Habitat) (USBR)
442		Chief Joseph Project ESA Consultation with NMFS (Hydro) (USBR)
444		Okanogan Project ESA Consultation with NMFS (Hydro) (USBR)
448		Banks Lake Drawdown Study (Hydro) (USBR)
453		John Day Basin Aerial Imagery Project (RME) (USBR)
459		TRT Digital Satellite Imagery Project (RME) (USBR)
465		AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (RME) (CORPS)
541		Evaluation of Transportation Strategies (Hydro) (CORPS)
542		Juvenile Salmon Temperature Studies (RME) (CORPS)
544		Juvenile salmon transportation evaluations (Hydro) (CORPS)
581		Evaluation of 1872 Water Rights to Supplement Flows Between Basins (Habitat) (BPA)
582		Adult Passage Counting and Trapping at Zosel Dam (Hydro) (BPA)
583		Restore Passage on Private Lands in Beaver Creek Drainage to Benefit Spring Chinook, Steelhead and Bulltrout (Habitat) (BPA)
587		Entiat IFIM Studies (Habitat) (USBR)

Upper Columbia River Summer/Fall-run Chinook

45	1990-005-01	Umatilla Natural Production M&E (RME) (BPA)
64	1994-069-00	Estimate production potential of fall chinook salmon in the Hanford Reach of the Columbia River (RME) (BPA)
74	2001-008-00	Genetic sex of chinook salmon in the Columbia River Basin (RME) (BPA)

Upper Willamette River Chinook

248	1998-014-00	Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (RME) (BPA)
251	2002-012-00	Lower Columbia River Habitat Assessment and Mapping (Habitat) (BPA)
296	2001-007-00	Evaluate Live Capture Selective Harvest Methods (Harvest) (BPA)

Upper Willamette River Steelhead

298	2001-036-00	Ames Creek Restoration (Habitat) (BPA)
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Table 3 - Report 5: Action Agency Project Summaries

1 1985-062-00 Passage Improvement Evaluation - Phase II Screens (BPA)

Evaluation of 7 Phase I sites in the Yakima Basin from 1985 through 1990 relied heavily on the use of release-and-recapture tests with hatchery fish to monitor major fisheries concerns such as the potential for injury, migration delay, and screen integrity. Measurements of approach and sweep velocity in front of the screens and flow through the fish bypass system were completed at 8 sites to determine if screening facilities satisfied design criteria established to ensure safe fish passage conditions. The methods and results of Phase I evaluations are presented in BPA annual reports (Abernethy et al. 1989, 1990; Neitzel et al. 1985, 1986, 1988, 1990 a,b,c).

Due to the large number of Phase II screening facilities, the expense of conducting release-and-recapture tests with fish, and other constraints, such as gaining approval to acquire and release fish stocks for research, we developed new methods and strategies to evaluate Phase II fish screens. Using the new methods and technologies, we determined if screening facilities protect fish by monitoring if the sites were; 1) properly equipped to provide safe fish passage; 2) operated within their design limits; and 3) properly maintained in a "fish-tight" condition.

Using these 3 benchmarks, we streamlined the evaluation process and documented the performance of 9 Phase II fish screening facilities in Washington and dozens more in Idaho in 1994 and up to 23 Phase II fish screening facilities in Washington in 1997, 1998, 1999, 2000, and 2001 (Blanton et al. 1998; 1999; 2001; Carter et al. 2002). We also were able to identify fish species and monitor and fish behavior, document sedimentation and debris buildup, and document aberrant flow patterns in the screen forebay by observing particle drift and eddies. Although the techniques provide the groundwork for monitoring and documenting screening facility performance, data collection procedures must be further refined and improved in order to develop a monitoring and evaluation (M&E) process to "certify" or "audit" fish screen facilities.

APPROACH:

The approach to evaluating Phase II screens includes two types of tasks; in-field, on-site evaluation of operating screens; and implementation of a problem identification, correction, and follow up protocol.

Task I-A, Field Evaluations – During 2002, we will examine up to 23 fish screening facilities in the Yakima Basin and evaluate their operation using the 3-step approach (Table 1). We will determine if sites are properly equipped to provide safe, efficient fish bypass by reviewing design drawings, operating procedures, and components installed and in use at the facility. We will monitor approach and sweep velocities in front of the screens and in the fish bypass to determine if the facilities meet fish passage criteria. Screen integrity will be monitored by completing "real-time" inspections of sites using underwater video technology. The second and third evaluations will include a reduced number of sites, with emphasis being placed on those that showed some indication of problems during the initial round of evaluations. Evaluation results will be placed on electronic networks that are linked to BPA and PNNL homepages (<http://www.bpa.gov/> and <http://www.pnl.gov/ecology/Projects/Screen/Reports.htm>, respectively). Open lines of communication among cooperating agencies will result in a more rapid response to correct failures or deficiencies.

Task I-B, Problem identification protocol task – We propose to implement a standardized protocol for identifying, correcting, and following up any problems that may be discovered during our evaluations. As in the past, problems identified in the field will be reported to the WDFW or USBR screen shop immediately via email with voice phone confirmation. In addition problems identified in the laboratory during review of the underwater video tapes and velocity data will be reported to the WDFW screen shop. We will document the problem on a problem identification/reporting form and perform follow-up visits to determine whether the problem has been rectified within one week after the screens O&M staff has informed us that the problem has been fixed. Timing of the follow-up evaluation will depend on the time of year, with more rapid follow-ups occurring when anadromous smolts are emigrating. All follow-ups for field-identified problems will occur within one week of the identification of the problem. If screens O&M staff has not responded to the problem identification within one week, a repeat notification will be issued. Response times and effectiveness of repairs/modifications will be included as a separate section in the annual reports. From the 2001 Annual Report:

In the summer and fall of 2001 the Pacific Northwest National Laboratory (PNNL) evaluated 23 Phase II fish screen sites in the Yakima River Basin as part of a multi-year study for the Bonneville Power Administration (BPA) on the effectiveness of fish screening devices. Data were collected to determine if velocities in front of the screens and in the bypasses met current National Marine Fisheries Service (NMFS) criteria to promote safe and timely fish passage and whether bypass outfall conditions allowed fish to safely return to the river.

Based on our studies in 2001, we concluded that in general, water velocity conditions at the screen sites met fish passage criteria set forth by the NMFS. Most facilities efficiently protected juvenile fish from entrainment, impingement, or migration delay. Automated cleaning brushes generally functioned properly; chains and other moving parts were well greased and operative. Removal of sediment build-up and accumulated leafy and woody debris are areas that continue to improve.

Continued periodic screen evaluations will increase the effectiveness of screen operation and maintenance practices by confirming the effectiveness (or ineffectiveness) of screen operating procedures at individual sites. Where procedures are being followed and problems still occur, evaluation results can be used to suggest means to better protect fish at screening facilities. There has been a progressive improvement in the maintenance and effectiveness of fish screen facilities in the Yakima River Basin during the last several years, in part, as a result of regular screen

evaluations and the rapid feedback of information necessary to improve operations and design of these important fish protection devices.

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2 1988-115-25 Yakima/Klickitat Fisheries Project (YKFP) Design and Const. - Yakima Basin Only (

This project supports the design and construction activities associated with the YKFP within the Yakima Subbasin.

The YKFP was identified in the NPPC's 1982 Program. See Measures 704(i)(3) and 904(e)(1). A draft Master Plan was presented to the NPPC in 1987 and the Preliminary Design Report in 1990. In both circumstances, the NPPC instructed the Yakama Nation, WDFW and BPA to carry out planning functions that addressed uncertainties in regard to the adequacy of supplementation in the areas of meeting production objectives and limiting adverse ecological and genetic impacts. At the same time, the NPPC underscored the importance of adopting "adaptive management" principles for use in managing the direction of the Project. Under the Council's direction, significant planning and design work was accomplished between 1990 and 1994.

In 1994, the Council reiterated its mandate that BPA "fund [the] design, construction, operation and maintenance of a hatchery to enhance the fishery for the Yakama Indian Nation as well as other harvesters". See NPPC Fish and Wildlife Program, Section 7.4K. As directed, the Yakama Nation, WDFW and BPA continued to plan and design the Project.

Upon the completion of BPA's NEPA process, construction of the Cle Elum Research and Supplementation Facility (CERSF) began in May of 1996. With the exception of its water chiller and miscellaneous details, the CERSF was completed and began operations on August 1, 1997. In 1998, the Project completed construction of three acclimation facilities in the upper Yakima subbasin.

Other facilities designed and constructed by the YKFP include the broodstock collection facility at Roza Dam, the juvenile and adult monitoring stations at Roza and Prosser dams, the Prosser and Marion Drain Hatcheries and various acclimation facilities. See section b. above for a complete list of YKFP facilities.

Earlier fishery and habitat mitigation efforts in the basin include fish passage improvements at numerous irrigation facilities. In addition, the Yakima River Basin and Conservation Act, Public Law 103-434 (1994) authorizes the dedication of water conserved as a result of federally funded improvements to irrigation facilities and practices to enhance instream flows.

Nelson Springs Office Complex

The Yakima/Klickitat Fisheries Project (YKFP) proposes to construct new office space at the Nelson Springs site to accommodate their needs. This proposal is necessary to continue the accomplishment of the YKFP's goals and objectives. For FY2002, the YKFP proposes to construct replacement facilities, which were planned/designed in 2001.

The specific objectives of this proposal are as follows: 1) Demolish the existing facilities at Nelson Springs site; 2) Secure temporary facilities for Yakima/Klickitat Fisheries Project (YKFP or Project) personnel currently stationed at the Nelson Springs Facility; 3) Construct adequate replacement facilities consistent with planning and design completed in FY2001.

Cle Elum Supplementation and Research Facility - Interpretive Center

Also, the YKFP proposes to construct the Interpretive signs at CERSF as designed in 2000 to meet the educational goals established for the YKFP, "open" the facility to the general public, and address the public's inquiries as to facility purpose and operations.

An interpretative building (center) was proposed to the Council for construction at the Cle Elum hatchery. After extensive review, the Council declined to approve the construction of the center. Only interpretative signage was approved the facility.

3 1988-120-25 Yakima/Klickitat Fisheries Project (YKFP) Management (BPA)

This proposal provides for all YN management functions associated with the Yakima/ Klickitat Fisheries Project (YKFP or Project) in the Yakima and Klickitat Subbasins. The Yakama Nation serves as the Project's "Lead Agency", and is responsible for the implementation of Project programs and activities, in coordination with the Washington's Department of Fish and Wildlife (WDFW). Given its size and complexity, the Project requires significant management and administrative resources. The Yakama Nation's management responsibilities (identified herein) are expected to carry forward beyond FY2006.

In broad categories, the Yakama Nation is responsible to implement or coordinate:

Project planning activities, including those pertaining to facility construction; Operation and maintenance activities at all YKFP facilities; Project research activities; Design and development of a centralized database for Project use and dissemination to others. Habitat improvement and acquisition projects intended to improve habitat conditions within the target ecosystem. This proposal has eight primary objectives:

Provide comprehensive management oversight of the implementation of YKFP activities. Support YN policy development related to YKFP activities in the Yakima and Klickitat Subbasins. Coordinate and/or perform all tasks necessary to the development of project planning documents. Provide required administrative support for Project operations, including financial management and accountability. Design, develop and manage YKFP's Data and Information System. Schedule and conduct the YKFP's Project Annual Review (PAR), which includes presentations by project scientists and provides for peer review of research activities. Coordinate participation in water and habitat planning/development initiatives by various agencies, groups and committees. Coordinate, plan and implement habitat improvement projects in the Yakima and Klickitat Subbasins.

4 1991-057-00 Fabricate and Install Yakima Basin Phase II Fish Screens (BPA)

Obsolete Yakima basin fish screens constructed in the 1930's, 40's, 50's, 60's, and 70's must be replaced or updated to comply with current regional fish screen biological protection criteria adopted by Columbia Basin Fish and Wildlife Authority (CBFWA), Fish Screening Oversight Committee (FSOC) in 1995. The project objective is to provide 100 percent protection from mortality and/or injury for all species and life stages of anadromous and resident salmonids, including bull trout and steelhead trout which are now listed as "threatened" under ESA (6/98 and 3/99, respectively). Old screens in the Yakima basin, and in other Columbia River sub basins, may provide fair protection for large (4-6 inch long) yearling smolts, but provide poor protection for fry and fingerling life stages. Mortality of fry and fingerlings by irrigation diversions may reduce subsequent smolt production, and hampers efforts to restore depressed salmon and steelhead trout populations through natural production or hatchery supplementation. Biological evaluation of completed Yakima basin Phase II fish screen facilities by Battelle, Pacific Northwest National Laboratory (PNNL), under Project# 198506200, has quantified survival and guidance rates approaching 100% (ranging from 90 to 99%). Consequently, the state and federal fish agencies and Yakama Indian Nation (YIN) have proposed under Phase II to complete replacement or upgrade of all obsolete fish screen facilities in the Yakima basin by the end of FY 2003. No additional work under this project is anticipated after the final screen is installed in FY 2003.

5 1991-075-00 Yakima Phase II Screens - Construction (BPA)

The on-going Yakima Phase II screen construction program is replacing obsolete Yakima basin fish screens constructed in the 1930's, 40's, 50's, 60's, and 70's. The new screens comply with current regional fish screen biological protection criteria adopted by the Columbia Basin Fish and Wildlife Authority (CBFWA) in 1995. The target objectives of the program are designed to meet three criteria which will: (1) reduce delay to a degree approaching zero; (2) reduce the possibility of injury or mortality to a degree approaching zero; and (3) allow fish to pass with little additional expenditure of energy. The new screens protect all species and life stages of anadromous and resident salmonids, including bull trout and steelhead which are now listed as "threatened" under ESA. Old screens in the Yakima basin, and in other Columbia River subbasins, may provide fair protection for large (4-6 inch long) yearling smolts, but provide poor protection for fry and fingerling life stages. Mortality of fry and fingerlings by irrigation diversions may reduce subsequent smolt production, and hamper efforts to restore depressed salmonid populations through natural production or hatchery supplementation. Battelle Pacific Northwest National Laboratory (PNNL), under Project# 198506200, has evaluated and quantified survival and guidance rates at Phase II sites approaching 100% (ranging from 90 to 99%). The Phase II program directly addresses measure 7.11B.1 of the 1994 Columbia Basin Fish and Wildlife Program as amended in 1995. Phase II is consistent with the High Priority Projects listed in the 2000 CBFWA program and addresses RPA 149 of the National Marine Fisheries Service (NMFS) 2000 Biological Opinion on operations of the Federal Columbia River Power System (FCRPS). The Phase II program is outlined in the Yakima Subbasin Summary (Feb 2000). This funding proposal will allow completion of the few remaining Phase II diversion screens by the year 2004.

6 1992-009-00 Operate & Maintain (O&M) Yakima Basin Phase II Fish Screens (BPA)

The Yakima Basin Phase II O&M program provides preventive and emergency maintenance and operational adjustments on completed Yakima basin Phase II fish screening facilities. The main objective of this project is to assure that the potential benefits of BPA's capital investment in fish screens are realized by performing operations that assure optimal fish protection and long facility life through a rigorous preventative maintenance program, while helping to restore ESA listed fish stocks.

7 1992-062-00 Yakama Nation - Riparian/Wetlands Restoration (BPA)

This project has been designed to restore wetlands and riparian habitats along anadromous fish-bearing streams in the agricultural portion of the Yakama Nation Reservation. Overall goals include the protection, restoration and management of 27,000 acres of floodplain lands along the Yakima River, Satus and Toppenish Creeks. Direct mitigation is being realized for losses identified in the Columbia Basin Fish and Wildlife Program relating to the construction and operation of the lower Columbia River Hydropower System. Extensive partnership and cost-share components provide savings to this project. Land securing methods include purchase, easement, or long-term lease depending on the nature of the land ownership and the cost-effectiveness of the activity. Approximately 2,000 - 3,000 acres are secured each year. By the end of FY01 over 16,000 acres will be secured into the project. At the current rate of implementation, nearly 24,000 acres of floodplain habitats should be protected and restored by the end of FY06. Restoration activities seek to restore historic conditions. Land disturbing activities are subject to cultural and archaeological surveys, and are used only on properties which have suffered past disturbances. Native vegetation re-establishment, and a return to some semblance of historic floodplain hydrology are the goals on the restoration sites. Restoration efforts are designed to be as self-sustaining as possible to minimize the O&M needed to maintain habitat values. The outcomes of the project are native riparian and wetland floodplain complexes along the anadromous fish-bearing streams on the Yakama Nation Reservation. Results are monitored using HEP to account for the direct mitigation earned toward the construction, operation and cumulative effect wildlife impacts of the Columbia River hydropower system. Specific vegetational, population and hydrologic results are also monitored at each property to ensure that restoration goals are being met in a cost-effective manner.

8 1995-033-00 O&M Of Yakima Phase II Fish Facilities* (BPA)

This project represents support functions the BOR provides toward the O&M of the Phase II screens. These activities complement the WDFW O&M activities under project number 1992-009-00. The BOR provides full service O&M for six screens located on the Yakama Nation Reservation. This proposal provides for continuation of funding for the existing comprehensive operation & maintenance program by the USBR of BPA owned Yakima Phase II fish screening and trapping facilities. USBR currently operates and maintains twenty-four sites, with an estimated 3 more sites due to be added by the end of the Phase II construction program in 2004. These facilities are located at irrigation diversions throughout the Yakima River Basin, and were constructed to bring the old screen sites into compliance with current regional fish screen biological protection criteria adopted by the Columbia Basin Fish and Wildlife Authority (CBFWA) in 1995. The target objectives of that program are (1) reduce fish delay to a degree approaching zero; (2) reduce the possibility of injury or mortality to a degree approaching zero; and (3) allow fish to pass with little additional expenditure of energy.

9 1995-063-25 Yakima/Klickitat Fisheries Project Monitoring And Evaluation - Yakima Subbasin (BPA)

Note: For implementation (contract) the list of deliverables and accomplishments are divided between the Yakama Nation (YN) and Washington Department of Wildlife (WDFW) into project numbers 1995-063-25 and 1995-064-24, respectively. They are shown here consistent with the proposal that was submitted under project number 1995-063-25 where no specific distinction is made between the YN and WDFW. The YKFP is an effort to increase natural production and harvest opportunity of salmon and steelhead in the Yakima and Klickitat Subbasins using supplementation and habitat improvements. The project includes all stocks historically present in both basins. Currently, stock-specific plans are at widely differing levels of development: Yakima coho and fall chinook programs are in feasibility stages, while Yakima steelhead and all Klickitat programs involve only habitat/life history inventory, passage improvements and stock-status monitoring. The most complete program is the upper Yakima spring chinook supplementation program (Busack et al. 1997). We will monitor each program in terms of natural production, harvest, genetics and ecological interactions. Studies of defined statistical power in these areas will guide project adaptive management and provide critical information for regional enhancement efforts. Expected outcomes include evaluations of: Impacts on natural production of targeted stocks; ecological impacts on nontarget stocks; identification of factors determining success or failure for each program. Relative survival between different experimental groups of hatchery fish and between hatchery fish and wild conspecifics. Project success is defined as a significant increase in natural production with limited adverse impacts on non-target stocks. Natural production is monitored in terms of natural origin recruits and its components (adult reproductive performance and survival from egg to fry, fry to smolt, and smolt to adult). Genetic impacts will be monitored in terms of domestication and within- and between-population variability. Ecological impacts on nontarget stocks will be monitored by comparing abundance, size structure, geographic distribution and interaction indices before and after supplementation. Impacts of nontarget species on project fish will be assessed by indices of predation, competition, prey abundance, mutualism and disease.

10 1995-064-25 Policy/Technical Involvement and Planning in the Yakima/Klickitat Fisheries Project

The Yakima/Klickitat Fisheries Project (YKFP) is a major supplementation research project being conducted in the Yakima River Basin under the auspices of the Northwest Power Planning Council's Fish and Wildlife Program. Washington Department of Fish and Wildlife (WDFW), in partnership with the Yakama Nation (YN; lead entity) manages the YKFP. Project management is conducted through a Policy Group (PG) supported by the Scientific and Technical Advisory Committee (STAC). The Policy Group (comprised of YN and WDFW representatives) along with YN/WDFW scientists from STAC are responsible for ensuring that all YKFP activities are implemented efficiently and effectively. This proposal describes WDFW participation in Project management as it relates to Project policy and the impact of technical matters on Project policy. Participation in management of the YKFP is consistent with direction of the Northwest Power Planning Council (letter Brusett to Jura, 1987, Attachment 2, task 8). The PG manages the YKFP within an adaptive management framework supported by an annual planning cycle. The annual cycle includes a Project Annual Review wherein results from ongoing studies are used to update the Project Status Report and the Uncertainty Resolution Plan. The process results in an annual work plan which produces scientifically-robust results to feed back into the annual adaptive management cycle. WDFW will, in accord with the YN and Bonneville Power Administration (BPA), foster policy development and coordination with tribal, state and federal fisheries agencies having a vested interest in the YKFP; coordinate efforts specifically addressing fishery management policies; and assist in development, oversight and review of technical issues involved in experimental design, monitoring, evaluation, facility design, operations, and project implementation.

11 1996-035-00 Satus Watershed Restoration (BPA)

Satus Creek, contained entirely within the Yakama Reservation, is one of the two most productive steelhead stream in the Yakima Subbasin - in recent years accounting for more than 1/3 of returning adults. The Satus watershed, comprising approximately 10% of the Yakima subbasin, is largely undeveloped and has no irrigation diversions. This setting offers a unique opportunity to continue the landscape-scale restoration and monitoring undertaken by the Yakama Nation Satus Watershed Project. Several major complementary projects, funded by six state and federal agencies, are also underway within the watershed. Project staff work closely with BIA and Tribal programs to assure that management activities in the watershed will be complementary. The Satus Watershed Project was conceived as a long-term, large-scale restoration and monitoring effort designed to develop, apply, and evaluate cost-effective methods for restoring fish habitat degraded by impaired watershed functioning. This approach was accepted by the BPA, and the project was initiated in June 1996. We are increasing the productivity of fish and wildlife habitat by improving ecological function of the watershed (Brooks et al., 1991; FWP 1995). Restoration activities also favor reestablishment of coho and spring chinook. Upcoming activities will improve channel stability and complexity, and riparian structure, diversity and productivity along key reaches of Satus Creek and several of its tributaries. We are continuing to improve grazing management. Restoration is proceeding in upland source areas as grazing pressure is reduced. Through our project activities we will continue to restore natural riparian and upland vegetation patterns, reduce erosion, moderate the flow regime on fish bearing streams and improve aquatic and wildlife habitat. We will also continue to monitor changes in fish populations, watershed behavior and results of restoration treatments

12 1997-013-25 Yakima/Klickitat Fisheries Project Operations and Maintenance (BPA)

The Yakima/Klickitat Fisheries Project (YKFP or Project) is a supplementation project designated by the NPPC as the principle means of protecting, mitigating, and enhancing the anadromous fish populations in the Yakima and Klickitat Subbasins. The Project's production and research activities will be brought on-line in stages. The first phase (tier) includes the supplementation of upper Yakima River spring chinook. This initial phase also includes research designed to determine the feasibility of re-establishing a naturally spawning population of coho salmon in the Yakima Subbasin. YKFP fish production also includes fall chinook, which are being studied to determine those aspects of the supplementation program which may be applicable. The O & M sub-proposal currently covers the following YKFP's fish production and research facilities: the Cle Elum Supplementation and Research Facility (CESRF); the Prosser Fish Facility (PFF); and the Marion Drain Fish Facility (MDFF). Policy direction and planning for each facilities operation is accomplished through the joint efforts of the YN and WDFW. All facilities are operated by the YN. All of the YKFP's fish production activities are covered by the O & M sub-proposal. These activities include: broodstock collection, spawning, incubation, rearing, and acclimation/release for fall and spring chinook and coho.

13 1997-051-00 Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Yakima Side Channels (BPA)

This project strives to rebuild fall and spring chinook, coho summer steelhead and bull trout populations through protecting and restoring some of the most critical off-channel rearing habitats associated with the Yakima and Naches mainstems. The project has protected several productive shoreline parcels to date. Levees have been removed or setback, informational fliers have been sent to over 400 floodplain landowners, and numerous meetings with affected or interested individuals have occurred along streams and in conference rooms. Five key reaches which have been identified by the University of Montana – Flathead Biological Station as highly productive rearing habitat areas, are targeted by this project for protection/restoration actions. These reaches are located immediately upstream of geologic features that restrict down-gradient movement of groundwater. As a result groundwater upwells to the stream channel, resulting in a productive hyporheic zone. Specific reaches include the Easton (near the headwaters of the Yakima mainstem), the Cle Elum (from the vicinity of the Cle Elum River confluence to the Teanaway River confluence), the Ellensburg (above the Ellensburg-Yakima Canyon), Union Gap (above the Union Gap divide), and Glead, in the lower Naches River. It is important to note that the project focuses primarily on passive restoration. Protection of habitat prevents further degradation. In many areas of the basin, salmonid rearing habitat has already been lost through irrigation development, diking, flow regulation, and a myriad of construction actions that effectively removed floodplain area. The project is relevant to the 2000 Columbia Basin Fish and Wildlife program in that it will contribute to the protection and restoration of anadromous fish stocks in the Yakima Basin. Further, the project will also benefit terrestrial wildlife species through the same actions described above.

14 1997-053-00 Toppenish-Simcoe Instream Flow Restoration and Assessment (BPA)

The Toppenish Creek basin comprises only 10% of the Yakima River subbasin, but contributes 20% of the Yakima's summer steelhead run (Mid-Columbia ESU, Threatened, March, 1999). The Toppenish Simcoe-Unit (Unit) of the Wapato Irrigation Project (WIP) diverts streamflow from Toppenish Creek and its tributaries to irrigate roughly 2,000 acres. In doing so, these and other private diversions can desiccate long reaches of streams, killing juvenile steelhead. Land status, water use and the extent of steelhead utilization within the Unit must be determined to identify parcels of land with water that can be leased or purchased to return diverted streamflow into natal streams, maintaining aquatic species assemblages. In addition, a comprehensive accounting of the Unit will allow us to identify possible sources for water substitution, leaving flows instream for aquatic species. The main objectives and approach of this Project are to monitor all steelhead life stages as to location and timing of habitat utilization, quantify and locate all sources of diversion and augmentation, model consumptive use, and identify land status. This will lead to the development of an adaptive Management Plan and decision support system to actively pursue lands available for acquisition to return irrigation water for instream use. If land acquisition is not possible, we hope to work with landowners to restrict diversion timing to periods when surface discharge is not limiting (spring runoff), or identify alternative water sources for substitution. We expect that providing perennial flow to all stream reaches in the Project area will have a positive effect on steelhead populations, measured by yearly spawner surveys and juvenile censuses. By FY2002, we will have completed four seasons of field data collection, the Project GIS, and the Project Management Plan. Integrating Project products and those of other activities in the basin will supply us with a decision support system to begin implementing and adaptively evolving the Management Plan early in FY2002.

15 1998-033-00 Restore Upper Toppenish Watershed (BPA)

Restoration of the Toppenish watershed (comprising more than 10% of the Yakima sub-basin) is critical to restoring healthy runs of steelhead to the Yakima River. Recent spawning ground surveys and smolt trap data indicate that Toppenish Creek and its tributaries contribute far more to the Yakima River summer steelhead run than was previously believed. Combined, the steelhead runs in Satus and Toppenish Creeks account for 60%-70% of the steelhead in the entire Yakima Subbasin. The upper Toppenish Creek Watershed Restoration Project was originally conceived as an extension of the Satus Watershed Restoration Project in the adjacent Satus Creek Watershed. This proposal addresses degradation in the upper watershed, complementing three major restoration efforts underway in the lower, agricultural area. Proposed activities are those recommended in the FY98-99 watershed assessment. Our goal is to improve steelhead habitat by moderating flows from the upper watershed and reestablishing the watershed's natural recuperative processes. The methods identified in the watershed assessment for achieving these goals include: 1) improving grazing management, 2) rehabilitating degraded channels – including stabilizing headcuts, removing dikes, etc., 3) revegetating meadows, floodplains and denuded uplands, 4) reestablishing beaver habitat, 5) participating in land use management planning efforts (e.g. prescribed burning, transportation, timber harvest, ...), and 6) monitoring the effectiveness of the various treatments. Restoration treatments will also favor riparian dependent wildlife species and reestablishment of coho and spring chinook. Meeting these objectives will gradually increase the hydrologic retentiveness of the upper watershed, thereby moderating flow regimes in the fish bearing reaches of Toppenish and Simcoe Creeks. This proposal is consistent with the 1994 Columbia Basin Fish and Wildlife Program, Measures (principles 1-5, pp.15, and habitat strategies, pp. 25-26), Wy-Kan-Ush-Me-Wa-Kish-Wit, and the Yakima River Subbasin Summary, Statement of Fish and Wildlife Needs, pp. 353-375 which emphasize the importance of healthy watershed functioning to both aquatic and terrestrial habitat.

16 1998-034-00 Yakama Nation Yakima/Klickitat Fisheries Project (YKFP) Reestablish Safe Access into Tributaries of the Yakima Subbasin (BPA)

The project goal is to contribute to the rebuilding of Yakima River spring and fall chinook, coho, bull trout and steelhead populations, by reconnecting productive tributary habitats. Project objectives include reestablishing safe passage into tributary habitats that have artificial barriers at or near their confluence. The target tributaries historically provided several hundred miles of habitat for anadromous species. Some ten miles of productive habitat has now been reconnected. As work progresses up-drainage habitat connectivity will be gained incrementally. Target tributaries have tremendous rearing potential in comparison to the mainstem. Many miles of tributary habitat still express healthy channel sinuosity, width/depth ratios, and thermally benign winter temperatures due to groundwater inflow. In contrast, the mainstem Yakima's hydrograph is regulated to convey irrigation water, e.g. flows are too high during summer releases, and too low during the winter to provide optimal rearing habitat. Work will include implementation of fishway and screen construction plans that were developed in previous years, and data collection to facilitate future projects. Beginning in the lower reaches of each tributary, habitat will be reconnected where the greatest benefit for the resource will be realized. Efforts to consolidate diversions or modernize irrigation systems will be considered during planning to improve in-stream flow conditions. Habitat protection/restoration in priority reaches is also a goal of this project. Methods will include fencing, revegetation, easement and/or property purchases. Such protection will augment the emphasis on fish access by including healthy riparian vegetation in project areas. Purchase or easement may eliminate the need to irrigate in some areas, thus providing water conservation as an ancillary benefit. Items to be funded in FY 2002 include: a. Implementation of fishway and screen construction plans developed in previous years. b. Fencing, conservation easement or land purchase in project areas. It is anticipated that the project will continue in FY 2003 through 2006 as in FY 02.

17 1999-013-00 Ahtanum Creek Watershed Assessment (BPA)

Ahtanum Creek was historically important for production of salmon and steelhead. The creek and its southernmost tributaries form part of the north boundary of the Yakama Indian Reservation. Spring chinook and coho are found in small numbers today; steelhead (Threatened, March 1999) smolts have been captured in the Project screw trap and have recently been observed spawning in upper tributaries. Bull trout (Threatened, June 1998) have been found as far downstream as the lowermost major irrigation diversion. Water withdrawal, diking and channelization, grazing practices and residential development on the floodplain adversely affect the lower, largely agricultural portion of the watershed. Streamflow is diverted from Ahtanum Creek by both south-side (BIA-Wapato Irrigation Project (WIP)) and north-side (Ahtanum Irrigation District) users to grow a variety of crops. Restoration of significant salmon and steelhead production in the watershed can be accomplished, but science-based strategies are needed for protecting streamflow, stream channels and floodplains. We have mapped irrigated lands and water delivery systems, measured water discharge and temperature, compared water diversion and loss with on-farm water needs, and estimated the efficiency of irrigation water conveyance and use. At the same time we have gathered historic and current data on stream channel condition, riparian function and salmonid populations. We have analyzed this data to determine how water use and riparian management in lower Ahtanum Creek may be limiting production of anadromous salmonids in the watershed as a whole, and have begun to determine the most effective measures for salmon and steelhead restoration. After completing data analyses and the Project Assessment document in FY2002, we will begin to recommend restoration measures that could include improved irrigation facilities, land and water management changes, and purchase or lease of land and water rights sometime in FY2002.

18 2000-011-00 Rock Creek Watershed Assessment and Restoration project. (BPA)

The project was delayed over one year pending the completion of the Yakima River subbasin summary. Project was initiated in February 2002. Funding for the first year is "carry over" funding approved in FY 2000. The project is funded for the development of an assessment only. Funding beyond the first year (development of an assessment) will depend on review and approval by the Council of the assessment and implementation plan prepared by the project sponsors.

The overall goal of the project is assessment of limiting factors to fish and wildlife in the drainage, and correction of those problems. The overall objectives of the project include acquisition of existing information, further assessment of conditions in the watershed, development of prescriptions to allow resource recovery, implementation of prescriptions, development of restoration plans to accelerate recovery and implementation of restoration work. The project seeks to work closely with landowners and governmental agencies. Through this strategy, the project supports the goals, policies and objectives of the FWP (sections 7.1, 7.6, 7.7, 7.8). In the first year of this project, the objectives of the work will be to compile existing information, assess stream and riparian conditions, determine effects of natural processes and land management on fish and wildlife resources, and develop land management prescriptions that allow recovery of resources. In future years, the project plans to direct efforts toward restoration and recovery of habitats, and thereby enhance fish and wildlife production in the drainage.

19 2002-022-00 YKFP Big Creek Passage & Screening (BPA)

An new FY 2002 project. The proposal is to provide salmonid passage over a barrier dam, and screen its associated water diversions to restore anadromous fish access and productivity to the Big Creek watershed in the Yakima River basin. Big Creek drains a 22 square mile watershed which lies largely within the Wenatchee National Forest and private, commercial forest lands. Although salmonid habitat in the lower 1.6 miles of Big Creek has been degraded, the upper ten miles are in good condition. Big Creek is known to have produced steelhead historically (BPA, 1990), and presumably produced significant numbers of bull trout, coho and spring chinook salmon. The primary factors limiting anadromous fish production in Big Creek are the impassable dam and its associated unscreened diversions. Production of steelhead, coho and spring chinook can be significantly restored in this sub-basin by providing access to currently inaccessible rearing and spawning habitat (BPA, 1990). The confluence of Big Creek with the Yakima River is located four miles downstream from the BPA Yakima Fisheries Project's Acclimation Easton Facility. Restoration of salmonid passage into this tributary watershed complements the BPA Yakima Fisheries Project. Anadromous fish restoration in Big Creek was identified early on as an element needed in the BPA Salmon and Steelhead Production Plan (Supplement 1, September, 1990). The 2001 Yakima Sub-basin summary identifies the need to restore historical production areas such as Big Creek (see C. Rational and relevance to regional programs).

20 2002-023-00 Yakima-Klickitat Fisheries Project - Wilson Creek Snowden Parcel Acquisition (BPA)

The proposal is to acquire a portion of Wilson Creek, and its associated floodplain in Ellensburg, Washington. The parcel is currently a pasture and is grazed by sheep. The creek has been channelized in the past, and due to current land management, the riparian zone has minimal woody vegetation and shade. The stream lacks pools, instream cover and large woody debris. The riparian zone and in-channel habitat could be readily restored if the parcel were acquired and managed for fish and wildlife objectives. The parcel is adjacent to the newly completed Bull Ditch fish passage and screening project constructed by BPA and the Yakama Nation. It is also adjacent to WDFW's Matoon Lake fishing pond. Wilson Creek is a tributary of the Yakima River and provides habitat for steelhead and spring chinook. Research associated with the BPA Yakima Fisheries Project has identified Wilson Creek as being an important rearing area for juvenile salmonids. Objective 6 of the Yakima Sub-basin Summary recommends securing "for restoration key habitats through purchase, easement, lease or other appropriate means."

21 2002-025-00 Yakima Tributary Access and Habitat Program (Objective 1: Early Actions) (BPA)

(Note: FY 2002 Funding approved per 2001 Action Plan. Funding for FY 2003-2005 is pending completion of Strategic Plan and review and approval by the Council under the Columbia Plateau Province.) The goal of the Yakima Tributary Access and Habitat Program (YTAHP) is to restore fish access to Yakima River tributaries that historically supported anadromous salmonids but are currently blocked due to passage barriers, including unscreened diversions. Objective 1 of the YTAHP is to implement Early Action items that have been previously identified as necessary, have biological priority and/or represent extraordinary opportunity for success, such as supplemental funding, strong local support, that address specific compliance matters, and may have preliminary or final designs and permits. NOTE: In April 2001, the Kittitas County Water Purveyors submitted a funding request for the entire YTAHP. This proposal contains excerpts from that proposal as well as additional information. Funding for FY 2002 is based on "Action Plan", funding for FY 2003 and beyond is based on Col. Plateau decisions.....per Council. The YTAHP program will identify, prioritize and address (correct) fish passage barriers, including unscreened diversions, on Yakima River tributaries. In addition, the program will offer landowners assistance with efforts to enhance water quality, riparian habitat and water reliability for in-stream flow through improved on-farm water use efficiency. The program is also described in a draft strategic plan, entitled Yakima Tributary Access and Habitat Program, under development through a collaborative effort of local, state, federal and tribal partners. This entire YTAHP has also been called "Phase III," as it follows the Phase I and II mainstem screening and passage program managed by the US Bureau of Reclamation (BOR) with Bonneville Power Administration (BPA) funding (1983 to present). The KCWP are preparing this application in cooperation with Washington State Department of Fish and Wildlife (WDFW), Kittitas County Conservation District (KCCD), North Yakima Conservation District (NYCD), Ahtanum Irrigation District (AID), and the BOR. These entities, and many of the same individuals, with expertise in screening and passage from Phase I and II technical work group will be participating in this Phase III effort.

22 2002-038-00 Protect Normative Structure and Function of Critical Aquatic and Terrestrial Habitat

Direct purchase of lands within 25 feet of either side of existing streams, creeks, and rivers, and purchase of "development rights" for lands between 25 feet and 50 feet of either side of existing streams, creeks and rivers within the Yakima Urban Area Boundary. This project would initiate a long term commitment to the preservation, protection, and future opportunity to restore the normative structure and function to aquatic and terrestrial habitat. This acquisition program will be directed to purchases along the Yakima River, Naches River, Wide Hollow Creek, Bachelor Creek, Hutton Creek, Ahtanum Creek, Cowiche Creek and tributaries within the Yakima Urban Area Boundary. Initial efforts will be directed to lands within the City of Yakima and within the lands designated for Urban Growth of the City. The Yakima Urban Area Boundary also includes lands under the jurisdiction of Yakima County (Terrace Heights and West Valley) and the City of Union Gap. If funding remains available following completion of the initial efforts, these resources will be utilized for purchases in these areas. This acquisition program also includes lands at the outfall of existing storm drainage pipelines and ditches to surface waters within the Yakima Urban Area Boundary as identified in the City of Yakima 1993 DRAFT Comprehensive Stormwater Management Plan. Direct purchase of lands and "development rights" will provide immediate protection of the aquatic and terrestrial habitat from the pressure of growth. As resources become available, and/or as community volunteer efforts are organized and implemented, the protected riparian corridors will be enhanced and/or restored through water quantity and water quality improvements, channel and substrate improvements, removal of fish access restrictions, and restoration of ecological interactions. This project was part of the Jim Waldo Yakima Basin packet submitted to Governor Gary Locke and was recommended for BPA funding.

33 1988-115-35 Yakima/Klickitat Fisheries Project Design and Construction - Klickitat ONLY (BPA)

This project becomes the main project for Klickitat River Design and Construction effort effective in FY 2003. Early design work was funded under project number 1995-068-00, Preliminary Design for Passage and Habitat Improvement. Funding for FY 2004 forward is subject to Master Plan review and approval by the Council. FY2002 and outyear costs reflect design of Klickitat Hatchery modifications FY2003 outyear costs reflect design of supplementation acclimation site, and construction of Klickitat Hatchery modifications FY2004 outyear costs reflect construction of supplementation acclimation sites. As its title implies, the Yakima/Klickitat Fisheries Project (YKFP or Project) encompasses both the Yakima and Klickitat subbasins. It is the only major project in the Northwest Power Planning Council's (NPPC) Fish and Wildlife Program that covers two major subbasins, each within a separate province. Since inception, the Yakima Nation (YN) has managed Project operations in both subbasins as one undertaking. As required under the NPPC's provincial proposal format, this proposal "unbundles" Project design and construction activities. It covers the Klickitat subbasin only. Objectives - The objectives of this proposal are as follows: To complete the construction of the Lyle Falls Broodstock Collection and Adult Monitoring Facility at RM 2.2 (estimated completion date 2003). To design and construct one acclimation facility at the Klickitat Hatchery and four at sites off the hatchery grounds (estimated completion date of 2003 for production stocks and 2004 for supplementation stocks). The on-site acclimation facility and two of the off-site facilities are to be used for production stocks. To reconstruct the Klickitat Hatchery's water delivery system (completed 2003); to construct new housing and a personnel training facility at the Klickitat Hatchery (completed 2003). To construct a new hazardous waste storage building at the Klickitat Hatchery (completed 2003). Needs Lyle Falls Broodstock Collection and Adult Monitoring Facility. The Lyle Falls Broodstock Collection Facility must be completed to institute a genetically sound supplementation program in the Klickitat subbasin for spring chinook and steelhead. At this time, design of the facility is 30% complete. Currently, fish production in the basin is not managed to ensure genetic integrity. This is because no facility exists that allows hatchery personnel to select or reject an individual fish for hatchery production. In a YKFP supplementation program, broodstock are randomly selected over the entire run, to ensure preservation of genetic variability, and marked hatchery fish are excluded from the breeding pool, to lessen the likelihood of domestication. The Klickitat Hatchery's current production protocol calls for capturing all fish that enter its voluntary trap. When enough fish to meet production goals are trapped, the trap is closed. No genetic management scheme is in place to defend against domestication or the elimination of fish from the beginning or end of the run. The development of the Lyle Falls Broodstock Collection Facility will enable the implementation of genetics management protocol similar to that employed in the Yakima subbasin for spring chinook. In addition, the Adult Monitoring Facility will enable the Project to monitor and enumerate migrating adults. With the addition of the Lower Klickitat Trap (see M & E proposal), this facility will allow smolt to adult survival rates to be estimated, which provides information needed to evaluate Project effectiveness. The design for Lyle Falls Facility is 33% complete. On- and Off-Site Acclimation Sites. New acclimation sites are needed to improve survival of production coho and to provide optimal rearing conditions for spring chinook and steelhead in the supplementation program. It is now known that acclimation can increase smolt-to-adult survival of anadromous salmonids substantially. Moreover, the current hatchery facility could not accommodate the anticipated number of spring chinook and steelhead without subjecting them to severe crowding stresses. Currently, only about 30% of Klickitat production coho are acclimated. The addition of one site at the Klickitat Hatchery and two sites off station will allow all coho to be acclimated and will provide adequate rearing facilities for the spring chinook and steelhead. The allocation of these acclimation facilities by stock is as follows. The on-site facility, as well as two sites on the lower Klickitat, are earmarked for production coho. Two additional acclimation sites for spring chinook and steelhead will be located in the middle basin (above RM 42), and are not needed until 2003. Klickitat Hatchery Water Delivery System. The Klickitat Hatchery's water delivery system, which crosses the Klickitat River from Indian Ford Springs, is badly in need of repair. CH2MHill has reviewed the pipeline, and concluded that it must be replaced. As replacement significantly decreases risk of catastrophic loss for fish produced at the facility, the YN and WDFW agree that this work is a high priority. Klickitat Housing. New housing for the Klickitat Hatchery is needed to accommodate the addition of employees to assist in facility operation. Hazardous Waste Storage Building. There is no hazardous waste storage building at the Klickitat Hatchery. The construction of a hazardous waste storage building will improve working conditions at the hatchery, while ensuring compliance with environmental regulations. For more information regarding the YKFP's management, operation and maintenance and monitoring and evaluation activities in the Klickitat subbasin, the reader is directed to the following projects: Project # 198812025: YKFP-Management, Data and Habitat (Klickitat Only), Project # 199506325: YKFP-Monitoring and Evaluation (Klickitat Only), Project # 199701725: YKFP-Operations and Maintenance (Klickitat Only).

34 1995-063-35 Yakima/Klickitat Fisheries Project Monitoring And Evaluation (Klickitat Only) (BPA)

(Note: This proposal was initially reviewed and approved by the Council under Project No. 1995-063-25 - Klickitat Only. The M&E for Klickitat is now being forecasted and accounted for under Project No. 1996-063-35). The YKFP is an effort to increase natural production of and opportunity to harvest salmon and steelhead in the Yakima and Klickitat subbasins using supplementation, harvest augmentation and habitat improvements. The project includes all stocks historically present in both basins. Currently, stock-specific plans are at widely differing levels of development. The most complete M&E program is the upper Yakima spring chinook supplementation program (Busack et al. 1997). A conceptual outline to monitor and evaluate fish, habitat and passage aspects of the Klickitat program (Everson 1995) has been developed, and work has begun to determine logistical requirements to implement it. Spring chinook and steelhead (the "supplemented stocks") will be monitored in terms of natural production, harvest, genetics and ecological interactions. Studies of defined statistical power in these areas will guide project adaptive management. Fall chinook and coho (the "production stocks") will be monitored in terms of harvest, ecological interactions and natural production. Habitat restoration projects will be monitored to determine if project-specific environmental goals are met (e.g., whether a specific reduction in maximum water temperatures occurs). Project success is defined as a significant increase in natural production and/or harvest opportunity with limited adverse impacts on non-target stocks.

35 1995-068-00 Preliminary Design for Passage & Habitat Improvement (BPA)

This project initially served as the overall project under the Yakima Klickitat Fisheries Project for integrated watershed analysis to produce information on passage and habitat improvement opportunities, evaluate fisheries enhancement potential through supplementation and conduct baseline fisheries monitoring and evaluation. Ecosystem Diagnosis and Treatment Method formed the basis for the development of plans for fisheries enhancement, habitat protection, and passage improvements. The fisheries monitoring and evaluation activities have been reassigned to a new project, 1995-063-35. This project today focuses on implementing engineering designs for passage improvements at Castile Falls Fishway (RM 64) and designs for the Lyle Falls Broodstock Collection and Adult Monitoring Facility (RM 2.2). The implementation of passage improvements for Castile Falls will be funded outside of BPA's fish and wildlife program (NOAA "flood" funding). The design work for the Lyle Falls facility tie to the development of "master plan" for the overall production program proposed by the Yakama Nation and Washington Department of Fish and Wildlife. The project will serve to support the master planning for production enhancement of steelhead and salmon. The master plan will be reviewed through the Council's Three-step Process. Once the design work for Lyle Fall is complete, this project will end. It is being replaced with Project No. 1988-115-35, YKFP Design and Construction – Klickitat ONLY. No out-year funds for construction have been "approved" for Lyle Falls until the Council reviews and approves the master plan. The master planning process, NEPA EIS and additional design work for the Klickitat Production program, as well as the construction estimates for Lyle Fall Broodstock Collection and Adult Monitoring facility are contained under Project No. 1988-115-35, YKFP Design and Construction – Klickitat ONLY.

36 1997-056-00 Lower Klickitat Riparian and In-Channel Habitat Enhancement Project (BPA)

This project focuses the lower Klickitat River (river miles (RM) 1-43) and its tributaries that provide or affect salmonid habitat. An emphasis is placed on identifying and prioritizing reaches for restoration and protection. Restoration activities will be aimed at returning stream processes by removing or mitigating watershed perturbances and improving habitat conditions and water quality. Habitat improvements will primarily benefit both anadromous (steelhead, chinook and coho salmon) and resident (rainbow trout and bull trout) salmonid populations and will enhance wildlife habitat for many terrestrial and amphibian species as well. Protection activities will compliment restoration efforts within the subbasin by securing refugia and prevention of degradation. Maximum effectiveness will be accomplished via cooperation with state, federal, tribal, and private entities. The project augments goals and objectives presented in the Klickitat Subbasin Summary, the 1994 NWPCC Fish and Wildlife Program (FWP), and the National Marine Fisheries Service (NMFS) Biological Opinion (All-H paper).

37 2000-010-00 Klickitat River Subbasin Assessment (BPA)

The Klickitat River sub-basin, currently one of the most productive anadromous fisheries in the mid-Columbia River ESU now produces a small fraction of its former runs. Though efforts have been made to understand and address problems causing the decline of fish runs in the Klickitat subbasin no effort has been made which systematically address the entire subbasin as a watershed, and develop prioritized solutions for the whole subbasin. In accordance with the NPPC's intention to coordinate fisheries restoration efforts within sub-basins, and consistent with their Fish and Wildlife Program, we propose to perform an assessment of the Klickitat River sub-basin, with the goal of providing a framework for future fisheries restoration activities. We will: compile existing information on past and present watershed functioning, fisheries resources, and land and water use; subdivide the watershed by groundwater subbasins; subdivide the subbasins by climate/vegetation factors into watershed units; identify watershed units with high existing or anadromous fishery potential; identify factors limiting fish production. Following field verification, we will synthesize the information to prioritize protection and restoration of habitat, reestablishment of passage, and further analysis needs. A report summarizing the assessment results will be completed in September, 2000.

38 2001-024-00 Klickitat River Salmon Exertion Study - Determination of difficult passage areas, migration patterns and energetic use of upriver migrating salmon and steelhead (BPA)

This is a short-term research project that is implemented by two contracts, the first with PNL, representing the major study plan, and the second with the Yakama Nation, supporting in-river work required to complete the study. The total cost reflects the combined contracts for this work. The goal of this project is to pin-point areas of difficult fish passage by implanting fish with electromyogram (EMG) transmitters and monitoring swimming activities as fish ascend fish ladders and waterfalls. Another goal is to aid in proper operation of fishways by determining ease of passage at different flows under the presence of different attraction flows. Movements, habitat use, and energetic consumption of fish during the upstream migration within the Klickitat River watershed will also be examined. Since the output of EMG transmitters is highly correlated with the swimming speeds of implanted fish, swimming activity of fish can be monitored as they ascend difficult passage and the amount of effort needed to pass particular areas of the passage can be quantified. This information can be passed on to related projects to provide information to guide improvements of passage areas, and fine tune their operations. Movement rates, habitat use, and energetic consumption during the spawning migration can identify key habitat types and areas which can be protected or provide information for enhancing instream habitat. This project is not intended to supercede or delay any currently proposed construction in the subbasin, but instead to aid in planning and operation of fishways. The Klickitat River sub-basin, currently one of the most productive anadromous fisheries in the mid-Columbia River ESU now produces a small fraction of its former runs. Though efforts have been made to understand and address problems causing the decline of fish runs in the Klickitat subbasin no effort has been made which systematically address the entire subbasin as a watershed, and develop prioritized solutions for the whole subbasin. In accordance with the NPPC's intention to coordinate fisheries restoration efforts within sub-basins, and consistent with their Fish and Wildlife Program, we propose to perform an assessment of the Klickitat River sub-basin, with the goal of providing a framework for future fisheries restoration activities. We will: compile existing information on past and present watershed functioning, fisheries resources, and land and water use; subdivide the watershed by groundwater subbasins; subdivide the subbasins by climate/vegetation factors into watershed units; identify watershed units with high existing or anadromous fishery potential; identify factors limiting fish production. Following field verification, we will synthesize the information to prioritize protection and restoration of habitat, reestablishment of passage, and further analysis needs. A report summarizing the assessment results will be completed in September, 2000.

39 1983-436-00 Umatilla Passage O&M (BPA)

In the 1980's, CTUIR and ODFW began implementing the Umatilla Fisheries Restoration Plan. An integral part of that effort was to address the inadequate flow and migration conditions by constructing fish passage facilities, initiating a trap and haul program, and implementing the Umatilla Basin flow enhancement project. The Umatilla Passage Facilities O&M Project main objective is to increase adult and juvenile migrant survival in the Umatilla Basin. The project provides survival benefits for both hatchery and natural production by operating and maintaining ladders, bypasses, screen sites and trap facilities according to design criteria. A secondary objective of the project is to support the basin artificial production program by assisting CTUIR in the maintenance of the adult holding and spawning facilities and juvenile acclimation sites. The project began in 1989 under the U.S. Bureau of Reclamation and an irrigation district component began in 1990 as part of the Umatilla Trap and Haul Project. The two portions of the project were combined under the Bureau of Reclamation in 1992 and were transferred to Westland Irrigation District in 1997. The project is viewed as a long term O& M project required for maintaining the survival advantages achieved by implementation of the fish passage and satellite facility projects in the Umatilla Basin.

40 1988-022-00 Umatilla River Fish Passage Operations (BPA)

The Problem: The lower 30 miles of the Umatilla River is heavily diverted for agricultural use. Historically, inadequate flow and passage conditions in this section of river during critical portions of both adult and juvenile migration periods contributed to the extirpation of salmon and decline of summer steelhead populations in the Umatilla River. BPA funded passage improvements have been completed at all five of the major irrigation diversions in the lower 30 miles of the Umatilla. In addition, Phase I and II of the Umatilla Basin Project flow enhancement effort have been completed to ameliorate flow conditions in the lower river. However, at certain times of the year, inadequate fish passage conditions may still exist due to low flows, primarily between Westland and Threemile Dam diversions. Adult and juvenile trapping facilities have been provided at these two diversions to allow for the trapping and hauling of fish past this low flow area when river conditions are less than desirable for passage. In addition, these trapping facilities also provide opportunity for monitoring of adults and juveniles. The Goal: To assist in the restoration of salmon and steelhead in the Umatilla River by increasing the survival of migrating juvenile and adult salmon and steelhead. Objective: To increase the survival of migrating juvenile and adult salmon and summer steelhead in the Umatilla River. The Approach: Over the past decade, many passage projects have been completed in the Umatilla Basin to enhance migration conditions for adult and juvenile salmonids. These include physical passage facilities such as ladders, screens, and bypasses, trapping and transportation facilities, and the Umatilla Basin Project flow enhancement program. Our approach focuses on the project objective of increasing the survival of migrating juvenile and adult salmon and summer steelhead by concentrating efforts in three areas: 1) Monitoring of flow and passage conditions; 2) Operation of passage facilities, trapping facilities, and transport equipment and 3) Coordination of passage and trapping facilities, transportation, and flow enhancement operations to ensure adequate passage conditions exist.

41 1988-053-04 Northeast Oregon Hatchery Project (BPA)

Co-managers are utilizing this project to plan and develop salmon conservation and recovery programs, and the facilities necessary for implementation, in the Imnaha and Grande Ronde River subbasins. These programs are aimed at preventing extinction, reintroducing and restoring anadromous salmonid species native to the subbasins. Actions authorizing and directing this project are found in the Columbia Basin Fish and Wildlife Program (NPPC 1994) Measure 7.4. The Northwest Power Planning Council (NPPC) has implemented a Three-Step Review Process for restoration programs that utilize supplementation and are funded through the Fish and Wildlife Program. The Process involves: 1) development of a comprehensive master plan for artificial production, necessary facilities, monitoring and evaluation, harvest, and essentially all facets of a management plan, 2) preliminary design, cost estimation, and National Environmental Protection Act (NEPA) analysis, and 3) final design. Through this project, the Grande Ronde and Imnaha Spring Chinook Master Plan (Ashe et al. 2000) was developed and submitted to the NPPC in April, 2000. The Master Plan received public and peer review and approval by the Independent Scientific Review Panel (ISRP 2000). In September 2000, the NPPC authorized proceeding with preliminary design and NEPA (Step 2) activities for spring chinook (Cassidy 2000). Preliminary design documents will be submitted for review in August, 2001 to coincide with the Blue Mountain Provincial Review. Completion of the NEPA process is expected by Spring 2003. The Council also authorized development of a Grande Ronde coho salmon master plan for submittal in November 2001 and a Grande Ronde and Imnaha steelhead master plan for submittal in October 2002. Development of a master plan for Wallowa Lake sockeye is proposed for 2003. This proposal identifies activities that will occur in each step of the planning process, for each species, should these plans successfully complete the Three-Step Review Process. Forward progress on planning and implementation will be dependent upon completion of the Step Process.

43 1988-053-05 Northeast Oregon Hatchery Project (BPA)

Co-managers are utilizing this project to plan and develop salmon conservation and recovery programs, and the facilities necessary for implementation, in the Imnaha and Grande Ronde River subbasins. These programs are aimed at preventing extinction, reintroducing and restoring anadromous salmonid species native to the subbasins. Actions authorizing and directing this project are found in the Columbia Basin Fish and Wildlife Program (NPPC 1994) Measure 7.4. The Northwest Power Planning Council (NPPC) has implemented a Three-Step Review Process for restoration programs that utilize supplementation and are funded through the Fish and Wildlife Program. The Process involves: 1) development of a comprehensive master plan for artificial production, necessary facilities, monitoring and evaluation, harvest, and essentially all facets of a management plan, 2) preliminary design, cost estimation, and National Environmental Protection Act (NEPA) analysis, and 3) final design. Through this project, the Grande Ronde and Imnaha Spring Chinook Master Plan (Ashe et al. 2000) was developed and submitted to the NPPC in April, 2000. The Master Plan received public and peer review and approval by the Independent Scientific Review Panel (ISRP 2000). In September 2000, the NPPC authorized proceeding with preliminary design and NEPA (Step 2) activities for spring chinook (Cassidy 2000). Preliminary design documents will be submitted for review in August, 2001 to coincide with the Blue Mountain Provincial Review. Completion of the NEPA process is expected by Spring 2003. The purpose of this contract is to fund Oregon Department of Fish and Wildlife's (Department) participation in association with these efforts. Issues the Northwest Power Planning Council has asked be addressed over this contract period by co-managers are: 1) Resolving any remaining co-manager differences with the "Currently Permitted Program" (CPP); 2) Conduct final site analysis and selection; 3) Develop preliminary design of proposed facilities for the Imnaha and Lostine river spring chinook CPP as well as improvements needed to Lookingglass Hatchery to conduct the CPP; 4) Conduct NEPA analysis of proposed siting and designs for the CPP; 5) Address issues identified by the Independent Scientific Review Panel in their review of the Nez Perce Imnaha/Lostine Master Plan. Included is develop a comprehensive monitoring and evaluation and a long-term harvest plans; 6) Develop a co-manager MOU outlining respective responsibilities in the Grande Ronde and Imnaha rivers; and, 7) Provide progress updates to NWPPC members and staff as needed. Additionally the Department has been notified that the Nez Perce expect to produce a Grande Ronde Coho Master Plan and Steelhead Master Plan and the Confederated Tribes of the Umatilla Indian Reservation Umatilla and Walla Walla Master Plans. APPROACH: The Department, Nez Perce and others will work together with the support of an engineering consultant to address Step 2 issues. Department Northeast Region Management, Fish Research and Fish Propagation leadership will assume responsibilities for activities under this Statement of Work. Department Fish Division and Engineering staffs will provide technical, policy and engineering support as necessary. Some of this support (i.e. review of draft siting and engineering documents, development of fish health and culture recommendations, etc) may be provided through the use of Department consultants and contract engineers. Department Regional staffs will meet with Nez Perce and others early in this contract to determine specific responsibilities and activities necessary to meet the Council's Master Plan findings. At this point the Department assumes others will be assuming responsibility for administering primary siting and engineering work. Some modest level of activity is expected under this contract in association with review of draft Grande Ronde coho and Umatilla and Walla Walla salmon and steelhead Master Plans. This proposal identifies activities that will occur in each step of the planning process, for each species, should these plans successfully complete the Three-Step Review Process. Forward progress on planning and implementation will be dependent upon completion of the Step Process.

44 1989-027-00 Repay Power for Umatilla Basin Project (BPA)

The lower 30 miles of the Umatilla River is heavily diverted for agricultural use. There are five major irrigation diversions located in the lower Umatilla River between river miles 4 and 32.5. Historically, inadequate passage conditions in this river reach during critical portions of both adult and juvenile migration periods were the primary contributor to the extirpation of salmon and decline of summer steelhead populations in the Umatilla River. Typically, the reaches below Westland Dam (rm 27.5) and Threemile Dam (rm 4) would have little or no flow during irrigation season. These low or no flow conditions commonly occurred during both the spring and fall migration periods which would preclude returning adults from passing upstream and result in the stranding of outmigrating juveniles. Beginning in the early 1980's, CTUIR and ODFW began implementing a comprehensive plan to supplement steelhead and reestablish salmon runs in the Umatilla River basin. A key component of the Umatilla Fisheries Restoration Plan was a threefold approach to addressing the inadequate migration conditions. This approach included construction of physical passage facilities, providing trap and haul capabilities, and flow enhancement. Modern fish screen systems were built at the five major irrigation canals to protect downstream migrants. Juvenile bypasses and adult ladders were also constructed to provide better passage conditions. Trapping facilities were built for both adults and juveniles so fish could be captured and transported around critical river reaches when inadequate flows were present. Finally, the Umatilla Basin Project flow enhancement effort was implemented to provide flows during critical migration periods. This specific project is responsible for providing power associated with operation of the Umatilla Basin Project Columbia River pumping plants. The Umatilla Basin Project was developed in phases. Phase I exchanges Columbia River water with West Extension Irrigation District (WEID) for instream flows historically diverted by WEID to provide passage flows below Threemile Dam. Phase II of the Umatilla Basin Project is divided into three components: 1) exchange of Columbia River water with Hermiston Irrigation District (HID) for instream flows historically diverted by HID to provide passage flows below rivermile 28.5; 2) exchange of Columbia River water with Stanfield Irrigation District (SID) for instream flows historically diverted by SID to provide passage flows below rivermile 32; and 3) exchange of Columbia River water with SID for reservoir storage capacity in McKay Reservoir which can be released for fish passage during critical migration periods. Under Phase I and the first two components of Phase II, natural flows are exchanged with WEID, HID, and SID on a "bucket for bucket" basis so that for every portion of flow left instream that same amount is pumped to the irrigation districts. Under the third component of Phase II, storage capacity in McKay Reservoir (approximately 25,000 acre-feet) is exchanged for a set amount of water supplied to SID through a combination of Umatilla River live flow and/or Columbia River pumped water. The project provides flow enhancement to maximize passage conditions during critical migration periods. It is assumed that these efforts provide more adequate passage conditions and increase survival for both migrating juveniles and adults. Now that the Umatilla Basin Project has been implemented, it is important that long-term operation occur in order to maintain the annual survival advantages achieved by flow enhancement. Improvement of migration conditions have been identified in the Subbasin Summary and every other Umatilla Basin planning document as a critical component in the restoration effort for salmon and steelhead in the basin by ensuring that flow conditions are no longer a limiting factor. In addition to the subbasin planning documents (referenced in Section 9.h.), the Council, in Section 7.9B of the 1994 Fish and Wildlife Program, identified this flow enhancement effort as necessary to restore fish populations in the Umatilla Basin. The flow enhancement effort has also been identified by NMFS in their 1995 Hatchery Biological Opinion as being necessary to reduce straying of Umatilla fall chinook into the Snake River. The Power Repay Project was an outcome of the Umatilla Basin Project Act passed by Congress in 1998. As part of the Act, BPA was required to provide power to operate the fish/flow exchanges. This is a non-discretionary requirement and BPA has entered into retail service agreements with Umatilla Electric Co-op and Pacific Power to fulfill this obligation. The fish/flow exchange program is the critical component in the Umatilla River fisheries restoration effort. Without the Umatilla Basin Project flow enhancement effort, the fisheries restoration program would be greatly compromised, as flows would continue to limit survival of adult and juvenile migrants as occurred historically. As the key component of the Umatilla River fisheries restoration effort, all other fisheries projects in the basin are dependent on the continued operation of this project. The Project has been ongoing since 1990 and has retained the same project number over that period. The project itself does not produce any type of reports. However, the Bureau of Reclamation does file an annual report on Umatilla Basin Project exchange activities with the NWPPC. Project costs have totaled \$4,366,809 over the past 12 years. However, over half the total project costs have been expended over the last three years. The Umatilla Basin Project began in 1993 when Phase I was completed and began operations. The Phase II Columbia River pumping plant was completed in 1994. The Phase II – Hermiston Exchange component was finished in 1995 and the Phase II – Stanfield Exchange was completed in 1999. Prior to completion of these facilities, BPA funded an interim pumping program for several years beginning in 1990 using existing irrigation pumps to exchange water at Three Mile Dam. The amount of water exchanged through the project, and the associated costs, vary from year to year depending on water availability in the Umatilla Basin. Both the natural flow and reservoir storage exchanges are directly related to annual flow conditions. The water available from the Umatilla Basin Project has led to a reduction of over 90% in the number of adults and juveniles trapped and hauled on an annual basis. Along with water availability, power costs also directly affects the project budget. It is anticipated that the current major increases in power costs will significantly affect the project budget in FY 2001 and 2002. For planning assumptions, the FY2002 budget assumes a 100% power rate increase from the providing utilities. Recent indications are that Bonneville may raise rates by as much as 250-300% in October 2001. We are assuming that extreme increases such as these will be avoided, but caution that if such increases do materialize, additional power costs will need to be added for the project, as this is a congressionally mandated, non-discretionary project. Rates for outyears (2004 and beyond) are expected to decline in response to greater supply of electricity as new resources come on line. Outyear estimates do not reflect the possibility of an exorbitant power increase in the fall of 2001 or future cost reductions. Costs will modified as this information becomes available.

45 1990-005-01 Umatilla Natural Production M&E (BPA)

Natural production monitoring began in the Umatilla Basin during the fall of 1992, ten years after the hatchery program started with the construction of two juvenile acclimation facilities in 1982 and releases of hatchery fall chinook in 1983. The approach to the Umatilla monitoring plan included three phases (Lichatowich, 1992). Phase 1 included collecting baseline data about salmonid life histories, survival, and natural production potential (1991-1997). Phase 2 involves adaptive management and development of a monitoring program (1997 to present). Phase 3 consists of deploying the monitoring program (1997 to present). Based on the recommendations of the Independent Scientific Review Panel (ISRP), this monitoring and evaluation (M&E) project proposal has been enhanced and modified to meet the ISRP's recommendations. Modifications include the addition of methods recently developed and implemented by the Oregon Department of Fish and Wildlife (ODFW) for the Oregon Plan on the West Coast (Jacobs et al. 2001, Solazzi et al. 2001, Dalton 2001, Rodgers 2000, Susac and Jacobs 1999, Riggers et al. 1999, Jacobs and Nickelson 1998). We will integrate the stratified-random panel sample design (as summarized by Firman and Jacobs 2001) to our existing fixed sites for spawning surveys and juvenile abundance surveys. Habitat surveys will be limited to areas where juvenile abundance is estimated until the need for extensive habitat surveys are evaluated on a regional basis. We will continue evaluating juvenile salmonid out-migration, age and growth, and life histories of naturally produced salmonids. We will also continue to work in coordination with ODFW's PIT tagging efforts in the lower basin (project No. 8902401, Evaluation of Juvenile Salmonid Out-migration and Survival in the Lower Umatilla River). In addition, we have responded to ISRPs criticism of our current harvest monitoring effort by improving the sample design and increasing monitoring effort. Tribal fishing seasons have been extended as the number of returning adult salmon and steelhead have increased. We will expand and improve the stratified-random roving creel survey and telephone interviews to provide a more reliable estimate of salmon and steelhead harvest. To ensure that our M&E methods and protocols meet ISRP's requirements in the most cost effective, statistically valid, and regionally compatible manner a Regional Monitoring Oversight Team is being developed. Preliminary discussions with state, federal and tribal organizations are encouraging and we hope to have the regional team established and meeting by mid January 2002. The team will likely include (but will not be limited to) ODFW, Washington Department of Fish and Wildlife (WDFW), U.S. Forest Service (USFS), National Marine Fisheries Service (NMFS), Bonneville Power Administration (BPA), U.S. Fish and Wildlife Service (USFWS) and the Columbia River Inter-Tribal Fisheries Commission (CRITFC). We propose that the Monitoring Oversight Team will develop and coordinate regional sampling protocols and establish regional reporting formats and forums for sharing and evaluating data on a regional scale. The efforts must also be compatible with ESA needs and the long-term assessment of salmonid restoration and recovery efforts in the Umatilla River Basin. Historically, native spring and fall chinook salmon, coho salmon, and summer steelhead were present in the Umatilla River Basin. In the Umatilla Basin, all anadromous species except summer steelhead were extirpated by agricultural development in the basin in the early 1900's (BOR 1988). The most notable events were the construction and operation of Three Mile Falls Dam (TMD) and other irrigation projects. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Oregon Department of Fish and Wildlife (ODFW) developed the Umatilla Hatchery Master Plan to restore salmon to the basin (CTUIR 1984 and ODFW 1986). The plan was completed in 1990 and included the following five objectives: 1) Establish hatchery and natural runs of chinook and coho salmon. 2) Enhance existing summer steelhead populations through a hatchery program. 3) Provide sustainable tribal and non-tribal harvest of salmon and steelhead. 4) Maintain the genetic character of salmonids native to and re-established in the Umatilla River Basin. 5) In 1991, the goal was to produce almost 48,000 adult returns to TMD annually. The goals were reviewed in 1999 and were changed to 31,500 adult returns. The monitoring and evaluation project evaluates the implementation of the Umatilla River Basin Fisheries Restoration Plans with respect to natural production and tribal harvest. Project objectives and tasks outlined below include the improvements recommended by ISRP.

46 1996-011-00 Juvenile Screens Smolt Traps on the WW River also reference 2000-033-00 (BPA)

In the 1990's, CTUIR and ODFW along with many other agencies began implementing fisheries restoration activities in the Walla Walla Basin. An integral part of this effort, as outlined in Section 7.11B of the 1994 Fish and Wildlife Program, is to alleviate the inadequate migration conditions in the basin. Fish populations in the Walla Walla River have been heavily impacted by inadequate passage facilities at diversions and resultant dewatering associated with agricultural demands and are a primary factor in the decline of native summer steelhead runs and extirpation of spring chinook salmon in the basin. The Passage Improvements Project goal is to assist in the restoration of salmonid populations in the Walla Walla Basin by increasing adult and juvenile migrant survival. The project provides survival benefits for migrating juveniles and adults by removing passage barriers, improving fish ladders and canal screens, and operating and maintaining passage facilities. This project will integrate with other fisheries restoration activities in the basin by addressing passage issues imperative to the continued survival and reintroduction of salmonid fish within the basin. It is expected that by providing safe passage to juvenile and adult salmonid fish, naturally spawning populations of salmonids will be elevated, and juvenile outmigration increased. The Walla Walla River is heavily diverted for agricultural use. There are two major irrigation diversions located in the mid Walla Walla River at river miles 36 and 47, along with numerous smaller diversions. Historically, inadequate flow and passage conditions during critical portions of both adult and juvenile migration periods was the primary contributor to the extirpation of salmon and decline of summer steelhead and bull trout populations in the Walla Walla Basin. Unscreened or inadequately screened irrigation canals and inadequate passage at diversion structures played key roles in the decline of the basin fish populations. Inadequate screening resulted in the irretrievable loss of juveniles down irrigation canals or from impingement injury due to improper screen criteria. Non-existent or improper juvenile bypasses and adult ladders caused migration barriers or delays and injury. Over the last few years, this project has begun to address these passage concerns. Two decommissioned diversion dams have been removed to provide better upstream passage conditions. Modern fish screen systems have been built at the two major irrigation canals and at a few smaller diversions to protect downstream migrants. Juvenile bypasses and adult ladders have also been constructed to provide better passage conditions. Passage experts from NMFS, USFWS, WDFW, ODFW, and CTUIR participate in the planning and design of these facilities and incorporate current NMFS passage criteria guidelines. It is assumed that these efforts provide more adequate passage conditions and increase survival for both migrating juveniles and adults. Now that these passage improvement efforts have been initiated, it is important that long term operation and maintenance occur in order to maintain the survival advantages achieved by their implementation. Improvement of passage conditions has been identified in the Subbasin Summary, as well as every other Walla Walla Basin planning document, as a critical component in the restoration effort for salmon and steelhead by ensuring that passage conditions are no longer a limiting factor. In addition to the subbasin planning documents (referenced in Section 9.h.), the Council, in Section 7.11B of the 1994 Fish and Wildlife Program, identified tributary passage enhancement efforts as necessary to restore fish populations such as those in the Walla Walla Basin. Inadequate passage conditions for both upstream and downstream migrants were a primary contributor to the extirpation of salmon and decline of steelhead in the Walla Walla Basin. Although many passage improvements have been implemented there are still a number of locations where migrants encounter inadequate migration conditions. The goal and objective of the project is directly related to the goals and objectives stated in the Subbasin Summary by assisting in the restoration of salmonid populations in the Walla Walla River by increasing the tributary survival of migrating adults and juveniles through improved passage conditions. Strategy 5 (Restore or enhance fish passage for resident and anadromous upstream and downstream migrants.) in the Subbasin Summary identifies four actions which are directly related to the project. Action 5.1 is to continue to identify passage and screening needs, Action 5.3 is to implement screening of all diversions, Action 5.4 is for operating and maintaining all fish passage facilities, and Action 5.5 is to ensure adequate passage conditions exist. The project goal of assisting in the restoration and rebuilding of salmonid populations in the Walla Walla Basin is directly related to the Council's mandate to protect, mitigate, and enhance fish and wildlife affected by development and operation of the hydropower system. Though the project falls under the Columbia Plateau Ecological Province for which specific objectives and strategies will be adopted later, the project does address the Council's Basin-level biological objectives listed in the 2000 Fish and Wildlife Program. More specifically, the project objective of increasing tributary survival directly addresses the three items listed in Section III.C.2.a.1. (Anadromous fish losses); halt declining population trends, restore natural populations, and increase adult runs. The Passage Improvements Project is also directly involved in one of the RPA actions listed in the NMFS 2000 FCRPS Biological Opinion. Although the Walla Walla Basin is not specifically identified in Action 149, the project is involved in activities associated with that Action and listed under Section 9.6.2.1 (Actions Related to Tributary Habitat). The Passage Improvement Project is one of two critically linked projects that comprise the Walla Walla River tributary fish passage effort. These projects, Walla Walla Fish Passage Operations (20139) and Walla Walla River Juvenile and Adult Passage Improvements, are dependent on each other in order to meet the passage objectives in the basin. The Passage Improvements Project provides funding for construction of needed passage improvements in the basin which the Fish Passage Operations Project will operate and coordinate as well as providing for maintenance funding of those facilities after construction. In addition, the Fish Passage Operations Project monitors the facilities constructed under this project to ensure that they are operated according to designed physical and biological criteria. The project is a coordinated effort between many different interest groups in the basin. Identification and planning of passage improvements for the basin occur through such forums as the Walla Walla Technical Work Group and Walla Walla River Operations Group. Daily operation and maintenance of the fish passage facilities is conducted by local irrigation districts under the direction of the Fish Passage Operations Project. Private engineering consultants are contracted for the planning, design, and construction of the identified passage improvements. There is widespread involvement in the many restoration activities occurring in the Walla Walla Basin. This not only includes the related BPA projects listed in Section 3, but public and private habitat enhancement efforts as well. The success of these many projects and the overall effort to restore salmonid populations in the Walla Walla Basin Plan is directly related to the improvement in passage conditions and migratory survival rates in the basin. The project began in FY 1996 as two separate projects, Adult Passage Improvements in the Walla Walla River (#9601200) and Walla Walla River Juvenile Screens and Traps (#9601100). The two projects were combined under project 9601100 in FY 2000 and renamed Walla Walla River Juvenile and Adult Passage Improvements. Project costs have totaled \$6,400,000 through FY 2001, with an average annual cost of \$1,066,667. Since 1996, this project has funded the removal of Marie Dorian Dam and Maiden Dam, the construction of Burlingame Dam fish ladder, a steep pass at Cemetery Bridge, and the ongoing construction of a new ladder and adult trap at Nursery Bridge Dam. In addition, the project has funded construction of new juvenile screens at Burlingame Dam, new screens, bypass, and juvenile trap at Little Walla Walla Diversion, and has provided cost share funding for two smaller fish screening projects. The project funded a feasibility study of additional passage needs in the basin and is currently funding design of adult passage improvements at Hofer Dam, juvenile screens for Eastside/Westside Ditch, consolidation of Milton Ditch with Little Walla Walla River, and consolidation and screens for Garden City/Lowden II ditches. The project also provides funding for the operation and maintenance of these BPA facilities once constructed.

47 1998-007-02 Grande Ronde Supplementation - Lostine River Spring Chinook (BPA)

This project is for activities involving the operation and maintenance of adult collection and juvenile acclimation and release facilities for a spring chinook supplementation program on the Lostine River. These activities are an integral component of the Grande Ronde Basin Endemic Spring Chinook Supplementation Program (GRESB) which is a cooperative project between the NPT, ODFW, CTUIR, and USFWS. This program was initiated in 1994 as a conservation measure in response to severely declining runs of chinook salmon in the Grande Ronde Basin. The GRESB utilizes supplementation with conventional and captive brood production to prevent extirpation and begin rebuilding of ESA listed spring chinook. This proposal is an integral part of achieving the overall goal of the GRESB, "to prevent extinction, provide a future basis to reverse the decline in stock abundance, and ensure a high probability of population persistence". The Grande Ronde River subbasin historically supported large runs of wild chinook salmon. Adult returns to the Grande Ronde in the late 1950's were estimated at more than 10,000 fish per year. Escapement levels have since declined to what co-managers have determined is an emergency situation. The Upper Grande Ronde River, Catherine Creek and the Lostine River were historically three of the most productive spawning and rearing areas in the Grande Ronde basin. In 1958, 893 spring chinook redds were counted in the Lostine River. In contrast, 16 redds were counted in 1994 and 11 redds in 1995. In 1994, fisheries co-managers, Oregon Department of Fish and Wildlife (ODFW), Nez Perce Tribe (NPT), and Confederated Tribes of the Umatilla Indian Reservation (CTUIR) implemented a supplementation program utilizing indigenous stock in the Upper Grande Ronde, Catherine Creek, and Lostine River. This project was identified by tribal, state and federal managers as one of the 15 high priority projects warranting immediate implementation. The NPT, in coordination with ODFW, is responsible for operating supplementation facilities (adult collection and holding and juvenile acclimation and release) on the Lostine River. The Lostine River adult weir facility consists of a collapsible panel weir and trap unit consisting of picket panels and an adjustable trap/holding box installed approximately one mile upstream from the mouth of the Lostine River. The Lostine River acclimation facility is located approximately twelve miles upstream from the mouth. Facility capacity is approximately 200,000 fish at 20 fish/lb. The facility consists of a water supply intake, supply pipeline, four raceways, and drain/release pipes. Water is pumped from the Lostine River into the facility. The intakes are provided with stoplog slots and fish screens, which are designed to provide up to 1.9 cfs with a maximum approach velocity of 0.4 fps (consistent with NMFS protocols). The raceways are constructed of steel with a black PVC liner and are 8 ft. wide by 80 ft. long, 4.5 ft. high with a 3.5 ft. water depth. The raceways are fabricated in 20 foot sections and joints are flanged with a rubber gasket to minimize leakage. These facilities have the potential to be portable if necessary. Since 1997, we have operated the adult weir facility for the collection of broodstock and baseline data on adult escapement to the Lostine River. In April 1999, we released 12,000 conventionally produced smolts from the acclimation facility (the first artificially produced endemic Grande Ronde spring chinook). In April 2000 and 2001 we released approximately 35,000 and 135,000 smolts, respectively. Releases in both 2000 and 2001 were F1 captive brood produced smolts. Anticipated release in 2002 is 31,000 conventionally produced smolts and 78,000 captive produced smolts. In 2000, we captured 27 jacks (from the 1999 release) returning to the Lostine River. In 2001, we captured 25 jacks (from the 2000 release of F1 smolts) and 79 adults (from the 1999 release). Smolt to adult survival rate to the Lostine River for the age classes that have returned from the conventionally produced fish released in 1999 is almost one percent (0.9%). As a result of our activities, the 4 females removed from the natural population for the supplementation program in 1997 resulted in 41 females returning to the Lostine River in 2001- 34 to spawn naturally and 7 to contribute to the supplementation program. The overall goal of the Grande Ronde Endemic Spring Chinook Salmon Supplementation Program is to "prevent extinction, provide a future basis to reverse the decline in stock abundance, and ensure a high probability of population persistence". The Nez Perce Tribe is responsible for implementation, coordination, and facilitation of the Lostine River component of the GRESB. Activities conducted under this project are associated with operations and maintenance. O&M Goal: Operate and maintain adult collection and juvenile acclimation and release facilities necessary to implement the Lostine River portion of the Grande Ronde Endemic Spring Chinook Salmon Supplementation Program and achieve the overall program goal of increasing adult returns.

48 1998-007-02 Grande Ronde Supplementation - Lostine River Spring Chinook M&E (BPA)

Need description that describes M E

49 1998-007-03 Grande Ronde Satellite Facility O&M (BPA)

The CTUIR, Nez Perce Tribe (NPT), and Oregon Department of Fish and Wildlife (ODFW) are cooperating in a Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESOSP) to increase natural production and eventually allow harvest of spring chinook salmon in the Grande Ronde River basin. This integrated salmon program uses captive and conventional broodstock artificial propagation components in order to prevent extinction, supplement natural production and restore productive fisheries in currently underutilized habitat in the Grande Ronde River basin. A comprehensive plan developed by comanagers to more functionally combine and integrate the captive brood and conventional components of the program was completed in 1998. All aspects of the GRESOSP are fully integrated with the Lower Snake River Compensation Plan (LSRCP). Project activities are incorporated into the LSRCP/BPA Annual Operations Plan. The GRESOSP is an extension of the LSRCP which has temporarily changed the emphasis of its spring chinook programs from mitigation to conservation. Grande Ronde Basin tributaries currently being targeted for spring chinook supplementation under LSRCP include the upper Grande Ronde River, Catherine Creek and the Lostine River. The primary focus of this project are the programs directed at Catherine Creek and the upper Grande Ronde River which lie within the ceded lands boundary of CTUIR. The captive broodstock component of the program was initiated by NPT and ODFW in 1995 under initial funding from LSRCP. CTUIR became involved in the program in late 1996. Naturally-produced juvenile salmon are captured from three tributaries of the Grande Ronde River (Catherine Creek, upper Grande Ronde, and Lostine rivers) and then reared to maturity and spawned in captivity. Spawning of mature captive brood fish began in 1998. Final rearing of these captive broodstock progeny occurs at Lookingglass Hatchery. Smolts are then transferred back to their stream of origin for acclimation and release. The conventional broodstock component of the program began in 1997 on the same three Grande Ronde tributaries. Naturally-produced adult spring chinook salmon are captured at weirs on these tributaries and taken to Lookingglass Hatchery for spawning. CTUIR operates the adult collection weirs in the upper Grande Ronde River and Catherine Creek for population monitoring and collection of conventional broodstock. Due to low numbers of returning adults, no conventional broodstock were spawned from either Catherine Creek or the upper Grande Ronde River until 2001. As with the captive brood portion of the program, final rearing of the conventional progeny is expected to occur at Lookingglass Hatchery. Smolts will then be transferred back to their stream of origin for acclimation and release. CTUIR operates juvenile acclimation facilities for spring chinook salmon in the upper Grande Ronde River and Catherine Creek. The first juveniles produced from the program were 1998 brood captive brood progeny which were acclimated and released in 2000. Approximately 180,000-200,000 captive brood progeny are expected to be acclimated and released from each of the facilities in 2002. Progeny produced in the future from the conventional component of the program will also be acclimated at these facilities.

50 1998-007-03 Grande Ronde Supplementation - Catharine Creek and Upper Grande Ronde M&E (BPA)

This project is for activities involving the operation and maintenance of adult collection and juvenile acclimation and release facilities for a spring chinook supplementation program on the Lostine River. These activities are an integral component of the Grande Ronde Basin Endemic Spring Chinook Supplementation Program (GRESOSP) which is a cooperative project between the NPT, ODFW, CTUIR, and USFWS. This program was initiated in 1994 as a conservation measure in response to severely declining runs of chinook salmon in the Grande Ronde Basin. The GRESOSP utilizes supplementation with conventional and captive brood production to prevent extirpation and begin rebuilding of ESA listed spring chinook. This proposal is an integral part of achieving the overall goal of the GRESOSP, "to prevent extinction, provide a future basis to reverse the decline in stock abundance, and ensure a high probability of population persistence". The Grande Ronde River subbasin historically supported large runs of wild chinook salmon. Adult returns to the Grande Ronde in the late 1950's were estimated at more than 10,000 fish per year. Escapement levels have since declined to what co-managers have determined is an emergency situation. The Upper Grande Ronde River, Catherine Creek and the Lostine River were historically three of the most productive spawning and rearing areas in the Grande Ronde basin. In 1958, 893 spring chinook redds were counted in the Lostine River. In contrast, 16 redds were counted in 1994 and 11 redds in 1995. In 1994, fisheries co-managers, Oregon Department of Fish and Wildlife (ODFW), Nez Perce Tribe (NPT), and Confederated Tribes of the Umatilla Indian Reservation (CTUIR) implemented a supplementation program utilizing indigenous stock in the Upper Grande Ronde, Catherine Creek, and Lostine River. This project was identified by tribal, state and federal managers as one of the 15 high priority projects warranting immediate implementation. The NPT, in coordination with ODFW, is responsible for operating supplementation facilities (adult collection and holding and juvenile acclimation and release) on the Lostine River. The Lostine River adult weir facility consists of a collapsible panel weir and trap unit consisting of picket panels and an adjustable trap/holding box installed approximately one mile upstream from the mouth of the Lostine River. The Lostine River acclimation facility is located approximately twelve miles upstream from the mouth. Facility capacity is approximately 200,000 fish at 20 fish/lb. The facility consists of a water supply intake, supply pipeline, four raceways, and drain/release pipes. Water is pumped from the Lostine River into the facility. The intakes are provided with stoplog slots and fish screens, which are designed to provide up to 1.9 cfs with a maximum approach velocity of 0.4 fps (consistent with NMFS protocols). The raceways are constructed of steel with a black PVC liner and are 8 ft. wide by 80 ft. long, 4.5 ft. high with a 3.5 ft. water depth. The raceways are fabricated in 20 foot sections and joints are flanged with a rubber gasket to minimize leakage. These facilities have the potential to be portable if necessary. Since 1997, we have operated the adult weir facility for the collection of broodstock and baseline data on adult escapement to the Lostine River. In April 1999, we released 12,000 conventionally produced smolts from the acclimation facility (the first artificially produced endemic Grande Ronde spring chinook). In April 2000 and 2001 we released approximately 35,000 and 135,000 smolts, respectively. Releases in both 2000 and 2001 were F1 captive brood produced smolts. Anticipated release in 2002 is 31,000 conventionally produced smolts and 78,000 captive produced smolts. In 2000, we captured 27 jacks (from the 1999 release) returning to the Lostine River. In 2001, we captured 25 jacks (from the 2000 release of F1 smolts) and 79 adults (from the 1999 release). Smolt to adult survival rate to the Lostine River for the age classes that have returned from the conventionally produced fish released in 1999 is almost one percent (0.9%). As a result of our activities, the 4 females removed from the natural population for the supplementation program in 1997 resulted in 41 females returning to the Lostine River in 2001- 34 to spawn naturally and 7 to contribute to the supplementation program. The overall goal of the Grande Ronde Endemic Spring Chinook Salmon Supplementation Program is to "prevent extinction, provide a future basis to reverse the decline in stock abundance, and ensure a high probability of population persistence". The Nez Perce Tribe is responsible for implementation, coordination, and facilitation of the Lostine River component of the GRESOSP. Activities conducted under this project are associated with operations and maintenance. O&M Goal: Operate and maintain adult collection and juvenile acclimation and release facilities necessary to implement the Lostine River portion of the Grande Ronde Endemic Spring Chinook Salmon Supplementation Program and achieve the overall program goal of increasing adult returns.

51 1998-007-04 Grande Ronde Spring Chinook Supplementation Program (BPA)

This project was initiated as one of the Northeast Oregon Hatchery Projects to improve fish production in the Hood, Umatilla, Imnaha, Grande Ronde and Walla Walla basins via hatchery and satellite facility development. Originally this project focused on contributing to the council's doubling goal. With the listing of Snake River chinook and steelhead under the federal Endangered Species Act, efforts in the Grande Ronde and Imnaha have been refocused on contributing to recovery. Specially, the current objective is to contribute to an upward trend in spawning ground counts. This will be accomplished through increased outmigration of smolts using hatchery production while avoiding unintended changes to population structure, fitness and genetics. Without intervention, loss of biodiversity and inbreeding depression due to small population size may put these stocks further at risk. Long-term project implementation is expected to result in the return of increased numbers of wild adults, reducing those risks and hastening recovery. We expect recovery of these weak populations over the next 5+ generations (20+ years), to population sizes supporting ESA de-listing. This project is responsible for integrating Northeast Hatchery Operations (NEOH) with the spring chinook master plan submitted by the Nez Perce Tribe (Ashe et al. 2000). The Draft Grande Ronde Subbasin Summary (Nowak 2001), Draft Imnaha Subbasin Summary (Saul et al. 2001), and NPT spring chinook master plan calls for development of new conservation facilities and modifications to Lookingglass Hatchery to implement salmon recovery programs in the Imnaha and Grande Ronde subbasins. This proposal covers Oregon Dept. of Fish and Wildlife implementation of the conventional supplementation component of the Grande Ronde Endemic Spring Chinook Supplementation Program (GRESOSP). The program is a cooperative effort among ODFW, USFWS, NPT, and CTUIR to develop endemic broodstocks. NPT is primarily responsible for operating adult trapping and smolt acclimation facilities on the Lostine River. CTUIR is primarily responsible for operating adult trapping and smolt acclimation facilities on upper Grande Ronde River and Catherine Creek. This project is also responsible for integrating the GRESOSP with existing USFWS artificial propagation activities at Lookingglass Hatchery. Specially, this proposal is to supplement existing programs to implement the short-term goal of producing 360k endemic (conventional) smolt spring chinook (120k each for Catherine Creek, upper Grande Ronde, and Lostine River), monitor adult returns, and evaluate conventional to captive brood recovery approaches, and monitor fish health. The long-term goal for Lookingglass Hatchery is to return 5,800 adults by producing 900k endemic smolt spring chinook for Grande Ronde Subbasin.

52 2000-033-00 Walla Walla River Fish Passage Operations (BPA)

The Problem: The Walla Walla River is heavily diverted for agricultural use. Historically, inadequate flow and passage conditions in the river during critical portions of both adult and juvenile migration periods contributed to the extirpation of salmon and decline of summer steelhead populations in the Walla Walla River. BPA has funded numerous passage improvements in the basin. New ladders have been constructed at three diversions and screens have been provided at two major diversions in the basin. Additional juvenile screening, adult passage, and diversion consolidation projects have been identified for completion in the basin. Minimum instream flow levels were established in the summer of 2000 to provide instream flows on a year round basis. However, inadequate flow and passage conditions still exist at certain times of year, especially from Nursery Bridge Dam to the Oregon/Washington state line. A juvenile trapping facility has been provided at Little Walla Walla River for trapping and hauling of fish past this area when conditions are inadequate for passage. The Little Walla Walla River juvenile trapping facility and the Nursery Bridge Ladder also provide opportunity for monitoring of adults and juveniles. **The Goal:** To assist in the restoration of salmon and steelhead in the Walla Walla River by increasing the survival of migrating juvenile and adult salmon and steelhead. **Objective:** To increase the survival of migrating juvenile and adult salmon and summer steelhead in the Walla Walla River. **The Approach:** Over the past few years, many passage projects have been completed in the Walla Walla Basin to enhance migration conditions for adult and juvenile salmonids. These include physical passage facilities such as ladders, screens, and bypasses, and a trapping and transportation facility. Instream flow enhancement efforts are also being initiated on a limited scale with the establishment of minimum instream flow levels. There is a continuing need for basic passage condition information related to flows and irrigation diversion operations. This information is essential for developing annual operation plans for both completed and proposed passage facilities as well as to identify adequate flow levels for passage. Our approach focuses on the project objective of increasing the survival of migrating juvenile and adult salmon and summer steelhead by concentrating efforts in three areas: 1) Monitoring of flow and passage conditions; 2) Operation of passage facilities, trapping facilities, and transport equipment and 3) Coordination of passage and trapping facilities, transportation, and flow enhancement operations to ensure adequate passage conditions exist.

53 2000-039-00 Walla Walla Natural Production M&E (BPA)

In the Walla Walla River Basin, natural production evaluations began in 1998 with water temperature monitoring. In 1999 and 2000, work also included some steelhead spawning surveys, steelhead genetic sampling and salmonid abundance surveys using electrofishing techniques. We monitored the spawning activities of adult spring chinook salmon that were out-planted in 2000 and 2001. In FY 2001, the radio telemetry project began tracking the movements of steelhead and bull trout past potential migration barriers and into spawning areas. Smolt out-migration evaluations also began in the fall of 2001 for summer steelhead and the progeny of the adult spring chinook salmon out-planted in 2000. CTUIR is currently developing a Salmonid Restoration Master Plan for the Walla Walla Basin that has similar goals and objectives to the Umatilla Restoration Plan. The Walla Walla River Basin has experienced the same anthropogenic impacts and loss of anadromous salmonids as occurred in the Umatilla River Basin. Restoration efforts in the Walla Walla Basin has or will include improving flows, enhancing adult and juvenile salmonid passage facilities, rehabilitating habitat, restoring spring chinook salmon, and supplementing steelhead. The Walla Walla Subbasin Summary (James et al. 2001) includes CTUIR's goals for salmon and steelhead adult returns. The natural production monitoring and evaluation goals for the Walla Walla Basin are to determine the status and distribution of salmonids in the basin. CTUIR efforts are coordinated with ODFW, USFS, WDFW, the Walla Walla Basin Watershed Council and the irrigation districts. To maximize coordination and efficiency, WDFW researchers centered in Dayton, Washington conduct most of their research in the Touchet River, the Walla Walla River and other tributaries in the state of Washington. CTUIR's (this project) efforts are located primarily in the Oregon portion of the Walla Walla River Basin. CTUIR does conduct some M&E work in the lower Walla Walla and the Touchet Basin occasionally. The majority of this work is associated with Rainwater Ranch Property managed by CTUIR. We also coordinate with the Watershed Council and the irrigators for monitoring and salvage operations associated with irrigation diversions. Information collected will establish a baseline for evaluation and monitoring, and aid plans and actions for restoring salmon and steelhead. A Regional Monitoring Oversight Team is being developed to ensure that our M&E methods and protocols meet ISRP's requirements in the most cost effective, statistically valid, and regionally compatible manner. Preliminary discussions with State, Federal and Tribal Organizations are encouraging and we hope to have the regional team established and meeting by mid January 2002. The team will likely include (but will not be limited to) ODFW, Washington Department of Fish and Wildlife (WDFW), U.S. Forest Service (USFS), National Marine Fisheries Service (NMFS), Bonneville Power Administration (BPA), U.S. Fish and Wildlife Service (USFWS) and the Columbia River Inter-Tribal Fisheries Commission (CRITFC). We propose that the Monitoring Oversight Team will develop and coordinate regional sampling protocols and establish regional reporting formats and forums for sharing and evaluating data on a regional scale. The efforts must also be compatible with ESA needs and the long-term assessment of salmonid restoration and recovery efforts in the Walla Walla River Basin.

54 2001-039-00 Walla Walla Basin Screening (BPA)

This proposal will eliminate imminent mortality risks arising from 197 irrigation diversions in the Walla Walla Basin. Our project will provide cost share to install or upgrade 197 fish screens to meet current state and federal juvenile fish screen criteria. Walla Walla Basin bull trout were listed as threatened under the Endangered Species Act in 1998. Our steelhead were ESA-listed in 1999. From March through November, these salmonids face daily threats to health and survival from improperly screened irrigation diversions in this watershed. The potential for injury and fish mortality resulting from inadequate screening is widely understood. The 1995 Columbia River Basin Fish and Wildlife Program states that agency-approved screening efforts "have a high probability of reducing salmon and steelhead mortality" and that implementation should be accelerated (p. 7-53, 1994). Furthermore, the Washington/Oregon Bi-State Technical Workgroup has repeatedly identified screening as one of the basin's highest priorities for funding and implementation. This Workgroup is composed of broad technical and citizen representation, including: WDFW, WWCCD, USFWS, NMFS, USACE, Department of Ecology, Columbia Conservation District, Confederated Tribes (CTUIR), Walla Walla Watershed Council, ODFW, Oregon Department of Environmental Quality, Oregon Water Resources Department, local landowners, and conservation groups. To meet this obvious need for fish-protective screening, WWCCD and WDFW have formed a partnership to implement WDFW's Cooperative Compliance Review and Cost Share Program (CCRP). In this innovative program, WWCCD will provide grant administration and program coordination, while WDFW will provide permits and critical technical assistance to landowners and contractors to install diversion screens. Ecology is currently verifying water rights, so that field assessments and implementation may begin immediately upon acquisition of funding.

55 2001-075-00 Increase Instream Flows to Dewatered Stream Reaches in the Walla Walla Basin (BPA)

This proposal seeks to immediately impact in stream flows in the Walla Walla River Watershed by implementing 4 realistic, measurable solutions from willing landowners and irrigation districts in de-watered areas. Insufficient flow has been identified by NMFS, USFWS, the Bi-state technical work group, and Washington State limiting factors analysis as the primary limiting factor for production of threatened Steelhead in the watershed. Low flows also create an imminent risk to threatened Bull Trout. This project complements important efforts by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the United States Corps of Engineers (USCOE) who are studying the feasibility of longer-term solutions such as piping water from the Columbia River and off-channel storage. Also, data gap analysis, funded by three irrigation districts, as well as WDFW IFIM work, will provide the necessary data that leads to flow modeling and long-range planning. While these studies are very important for long-term solutions, it is also vital to implement on-the-ground projects that impact flows now, especially in de-watered reaches which limit fish passage and cause direct mortality. Also, because this project has a scope that is small enough to "get our hands around" with measurable, realistic goals and a strong evaluation component, we will learn which solutions have potential for future basin-wide implementation. These promising solutions, along with the previously mentioned studies, will give us the tools we need to fashion an effective long-range plan to improve in stream flows basin wide. While WWCCD is restricted to working in Washington State, this proposal is part of a coordinated effort with the Walla Walla Basin Watershed Council whose companion proposal seeks to install similar immediate impact flow improvements for the Oregon portion of the watershed. This proposal does not propose to solve all the flow problems in the watershed. Rather it will install on-the ground projects that will enhance flows in critical reaches now and identify solutions that have potential for basin-wide implementation.

56 2002-036-00 Walla Walla River Flow Restoration (BPA)

This proposal will restore flows for passage and rearing in the most critically flow impaired segment of the Walla Walla River. This project is designed to insure that conserved water is accounted for and protected by Oregon Water Law. This proposal requires cost share funding for willing landowners and irrigation districts to implement irrigation and delivery efficiency projects, thereby leaving saved water in river for bull trout, steelhead, and reintroduced spring Chinook. Additional efforts to return water to the river are being planned, however this proposal is urgently needed to avoid seasonal stranding of steelhead and bull trout. In recent years until summer of 2001, thousands of salmonids were seasonally "rescued" and transported to suitable upriver habitat from a highly impacted three-mile segment near Milton-Freewater, Oregon. This project complements, and enhances the cooperative work to increase flows and eliminate passage barriers being implemented by the Confederated Tribes of the Umatilla Indian Reservation, the Army Corps of Engineers, the Walla Walla Conservation District, the Oregon Watershed Enhancement Board, landowners, the Irrigation Districts, and the Walla Walla Basin Watershed Council. This project complements the Walla Walla Conservation District's (BPA FY 2001 High Priority) project to increase in stream flows on the Washington half of the river. This project was identified as a priority during the ongoing Bi-State Habitat Conservation Planning Process with NMFS and USFWS. Increasing flows is an identified strategy in the Walla Walla Subbasin Summary and in the Draft Bull Trout Recovery Unit Team list of actions. This project will install on-the ground projects as part of a subbasin wide collaboration to improve fish habitat, passage, and production. Insufficient flows are identified by NMFS, USFWS, the Bi-State Technical Work Group, and Washington State Limiting Factors Analysis as a primary need for production of threatened steelhead and bull trout in the Walla Walla watershed. Low flows also create an imminent risk to the reintroduced population of spring chinook (summer 2000, 2001), as well as margined sculpin, mountain whitefish, rainbow trout, and pacific lamprey. These species use the flow impaired stream segment as migratory corridor and/or rearing habitat. Over the last hundred years an over allocation of irrigation withdrawals, gravel mining, and levees have combined to leave a three mile section unsuitable for summer passage and rearing. This segment is (river mile 42 to river mile 45) from Milton-Freewater to just prior to state line. This section led to the 1998 listing of the Walla Walla as one of its 20 Most Endangered Rivers by America Rivers. This also led to the year 2000 agreement between 3 district and USFWS regarding management of irrigation diversions and inriver flows. Summer of 2001 this reach did not dry up, but additional flows are needed to improve conditions.

57 1988-053-01 Northeast Oregon Hatchery Project (BPA)

Co-managers are utilizing this project to plan and develop salmon conservation and recovery programs, and the facilities necessary for implementation, in the Imnaha and Grande Ronde River subbasins. These programs are aimed at preventing extinction, reintroducing and restoring anadromous salmonid species native to the subbasins. Actions authorizing and directing this project are found in the Columbia Basin Fish and Wildlife Program (NPPC 1994) Measure 7.4. The Northwest Power Planning Council (NPPC) has implemented a Three-Step Review Process for restoration programs that utilize supplementation and are funded through the Fish and Wildlife Program. The Process involves: 1) development of a comprehensive master plan for artificial production, necessary facilities, monitoring and evaluation, harvest, and essentially all facets of a management plan, 2) preliminary design, cost estimation, and National Environmental Protection Act (NEPA) analysis, and 3) final design. Through this project, the Grande Ronde and Imnaha Spring Chinook Master Plan (Ashe et al. 2000) was developed and submitted to the NPPC in April, 2000. The Master Plan received public and peer review and approval by the Independent Scientific Review Panel (ISRP 2000). In September 2000, the NPPC authorized proceeding with preliminary design and NEPA (Step 2) activities for spring chinook (Cassidy 2000). Preliminary design documents will be submitted for review in August, 2001 to coincide with the Blue Mountain Provincial Review. Completion of the NEPA process is expected by Spring 2003. The Council also authorized development of a Grande Ronde coho salmon master plan for submittal in November 2001 and a Grande Ronde and Imnaha steelhead master plan for submittal in October 2002. Development of a master plan for Wallowa Lake sockeye is proposed for 2003. This proposal identifies activities that will occur in each step of the planning process, for each species, should these plans successfully complete the Three-Step Review Process. Forward progress on planning and implementation will be dependent upon completion of the Step Process.

59 1991-029-00 The effects of summer flow augmentation on the migratory behavior and survival of Snake River fall chinook salmon (BPA)

Dams reduce the survival of chinook salmon smolts during early seaward migration. Summer flow augmentation is implemented annually to mitigate for Snake River fall chinook smolt mortality caused by the four dams in the lower Snake River by increasing downstream migration rate and survival. There are two philosophies regarding summer flow augmentation within the resource management community of the Columbia River basin. One philosophy embraces summer flow augmentation based on studies that show flow augmentation increases the migration rate and survival of fall chinook salmon smolts. The other questions the existing migration rate and survival studies, and advocates the use of limited reservoir water for other fishery and economic purposes. For the present and near future, summer flow augmentation will be implemented annually as one measure to recover Snake River fall chinook salmon, which are listed for protection under the Endangered Species Act. This project will forecast juvenile fall chinook salmon run timing past Lower Granite Dam to aid fishery managers develop annual water management plans. In addition we will estimate fish survival and relate it to variables such as flow and temperature as part of a continuing evaluation of the effectiveness of flow augmentation. This project will also examine water velocity effects on fall chinook salmon migration behavior, and also how cool Clearwater River water temperatures influence the thermal environment of Lower Granite Reservoir and whether migrating fish are delayed by this influx.

61 1992-022-00 Physiological Assessment and Behavioral Interactions of Wild and Hatchery Juvenile Salmonids (BPA)

The overall goal of this research is to reduce negative impacts of hatchery salmon on wild salmon and evaluate supplementation by 1) improving the smolt quality and smolt-to-adult recovery (SAR) of fish reared in hatcheries, and 2) producing a more wild-type hatchery smolt in supplementation programs. The objective of this ongoing project is to characterize the physiology of salmon reared under conventional (OCT) and semi-natural rearing systems (SNT) in the supplementation program of the Cle Elum Hatchery (Yakama Nation and WDFW). Additionally, this year we will characterize the physiology of fish reared in two separate remote acclimation sites (which have very different temperature regimes) where fish are reared prior to release. Finally, we will compare the physiology of hatchery reared fish at the Cle Elum Hatchery to that of naturally rearing fish during outmigration at lower Yakima river sites and John Day Dam on the Columbia River. Laboratory analyses and some field sampling will be conducted by Univ. Washington personnel. Additional analysis of stress response of lean wild fish and obese hatchery fish will be compared (C.B. Schreck, Oregon State University)

62 1994-026-00 LAMPREY RESEARCH AND RESTORATION (BPA)

The purpose of this study is to provide the critical information to restore Pacific lampreys *Lampetra tridentata* in the Umatilla River that is called for in the Umatilla Subbasin Summary. This information is essential for restoration of lampreys and to provide tribal members opportunities to practice cultural use and provide ecosystem function. Pacific lampreys are vital components of intact ecosystems that have been affected directly and indirectly by dams, habitat deterioration, and possibly food web shifts in the ocean. The project has objectives: (1) increase larval abundance in the Umatilla River, (2) determine reproductive success of adult lamprey outplants, (3) estimate the numbers of adult lampreys entering the Umatilla River, (4) monitor larval population trends in the Umatilla River, (5) estimate the numbers of recently metamorphosed lampreys migrating out of the Umatilla River, (6) Evaluate the potential role of bile salts released by larval lampreys as a migratory cue to upstream migrating Pacific lampreys, and (7) Describe genetic differences among Pacific lampreys.

63 1994-034-00 Assessing Summer And Fall Chinook Salmon Restoration In The Clearwater, Lower Grande Ronde, And Imnaha Rivers (BPA)

The goal of this project is to collect life history and survival information on wild Snake River fall chinook and evaluate supplementation strategies that would be favorable for recovery and restoration of summer and/or fall chinook salmon in the last remaining mainstem habitats of the Snake River Basin above Lower Granite Dam. Not including the Snake River, these mainstem habitats or study streams are the Clearwater River and principal tributaries, lower Grande Ronde, Salmon and Imnaha Rivers. Current water temperature analysis in the upper mainstem Clearwater, Middle Fork Clearwater, and lower portions of the South Fork Clearwater, Lochsa, and Selway indicate an October spawning chinook salmon with a subyearling emigration life history would be best suited for the habitat. We recommended capturing the early October spawning portion of Lyons Ferry Hatchery Snake River fall chinook stock for use as broodstock for supplementation in the upper Clearwater Subbasin. Spawning habitat quality indices from freeze-coring indicated that incubation survival would be high in all study streams as compared to samples taken on the lower Clearwater and the Snake River below Hells Canyon Dam, the primary spawning grounds for fall chinook. Spawning habitat quantity was physically measured with an estimated capacity of 10,000 spawning adults in the upper Clearwater Subbasin. We are continuing to investigate life history characteristics of naturally produced Snake River fall chinook in the Clearwater and Grande Ronde Rivers and are evaluating emigration survival and supplementation success of Lyons Ferry Hatchery fall chinook released upstream of Lower Granite Dam. Wild fall chinook emigration timing information is used in-season for Dworshak Reservoir water releases and summer flow targets set by NMFS. Our fall chinook redd surveys have shown an increase in recent years from 115 redds observed in 1995 to 579 redds in 1999, which can be attributed to supplementation efforts.

64 1994-069-00 Estimate production potential of fall chinook salmon in the Hanford Reach of the Co River (BPA)

The goal of this project is to estimate the production potential for Hanford Reach fall chinook salmon, a population that is critical for the recovery of Columbia River salmon. Achievement of this goal is needed to refine our definition of spawning habitat and develop recovery goals for Columbia River salmonids that are listed under the Endangered Species Act (ESA), especially Snake River fall chinook salmon. We will also evaluate whether the Hanford Reach functions as a healthy alluvial river. Although the Hanford Reach remains "free-flowing" and the fall chinook salmon population appears healthy, there has not been a systematic evaluation of whether the biological production of the Reach has been negatively affected by operation of the Columbia River hydropower system. Our evaluation of the Reach will include investigating the role of interstitial flow pathways and ground-water/surface-water interactions in spawning site selection by fall chinook salmon. Standard spawning habitat characteristics will be used to determine the locations of potential spawning sites and sediment permeability of spawning substrate will be used to refine spawning area estimates. We will then use a hydraulic simulation model to extrapolate the potential redd densities to the entire Reach and expect the results from this project to be published in peer reviewed journals. We will synthesize this information into a project completion report to be used by fishery managers to improve production estimates for Snake River fall chinook salmon, and to provide information to critically evaluate recovery options for Columbia River salmonids

65 1997-030-00 Listed Stock Chinook Salmon Escapement Monitoring (BPA)

Snake River spring and summer chinook salmon (*Oncorhynchus tshawytscha*) have declined to dangerously low levels and are listed as threatened under the Endangered Species Act (ESA). The National Marine Fisheries Service (NMFS), in the 2000 Biological Opinion, has proposed a list of potential recovery actions and a metric for measuring recovery actions for listed Evolutionary Significant Units (ESU) in the Snake River basin. The ability to measure an abundance metric is the basis for assessing whether listed spring and summer chinook salmon populations meet recovery thresholds and are a candidate for delisting under the ESA or further conservation actions. For listed Snake River chinook salmon, recovery efforts and recovery status are to be measured in terms of the abundance of spawning adults for each ESU. However, quantitative abundance data for listed Snake River ESU's generally does not exist. Currently there is no project, plan, or method that would allow for a quantitative measure of listed ESU spawner abundance. Current redd count data represent an index of relative abundance only, and provides no direct quantitative measure of spawner abundance. Expansions of redd counts to spawner numbers are influenced by measurement error and uncertainty of assumptions regarding estimates of fish per redd, relative numbers in surveyed and unsurveyed areas, prespawning mortality rates, age composition, and hatchery fish contribution (Beamesderfer et al. 1998). Furthermore, current redd count methods will not be able to determine when or if an ESU reaches a desired recovery threshold. We propose to use new and existing technologies that can provide accurate spawner abundance information that can be used in future long-term monitoring projects. In addition, we will integrate the identified technology into site-specific final engineering design and implement it for adult salmon abundance determination in the Secesh River and Lake and Marsh creeks. The Secesh River is an unsupplemented stream in the South Fork Salmon River in Idaho. Lake Creek is an unsupplemented tributary to the Secesh River. Both are control systems for the Idaho Salmon Supplementation Studies (ISS). Marsh Creek is located in the headwaters of the Middle Fork of the Salmon River and is unsupplemented with the exception of one release of 22,000 Rapid River fry into Cape Horn Creek by University of Idaho researchers in 1975. This approach is a critical first step towards initiating accurate and precise quantification of adult spawner abundances as required under the NMFS 2000 Biological Opinion. Salmon populations and investment of Fish and Wildlife Program funds in salmon recovery projects in the region are placed at risk by an inability to quantify adult salmon abundance in tributary streams to evaluate project effectiveness and ESA recovery alternatives. Salmon managers and the Northwest Power Planning Council need to understand with certainty if recovery thresholds are being met and if recovery alternatives (if any) build population size of critically depressed stocks.

66 1998-010-03 Spawning Distribution of Fall Chinook Salmon Released as Yearlings above Lower G Dam (BPA)

This project has two components: (1) ongoing fall chinook salmon population monitoring upriver of Lower Granite Dam, and (2) an evaluation of three juvenile fall chinook salmon acclimation-and-release facilities. Both activities are accomplished through a joint effort with other agencies and organizations. Our part in population monitoring involves conducting redd searches in the Snake, Grande Ronde, and Imnaha rivers, and producing a summary report that includes the findings of all redd searches conducted upriver of Lower Granite Dam. Since we started this work in 1991, we improved the accuracy of redd searches, developed a new search technique using underwater video, standardized the search processes, produced nine annual reports, and coauthored three publications on our findings. The need for population monitoring was described in the 1994 FWP (7.1C.), the NMFS Snake River Recover Plan (Chapter IV, page 17), and the FCRPS BIOP (9.6.5.4). Our part in evaluating acclimation facilities used for supplementation is to determine where returning adults migrate and spawn, and if the desired spawning distribution is achieved. Our approach involves radio-tagging returning adults at Lower Granite Dam, following their movements using fixed and mobile radio-tracking methods, and using redd searches to confirm where they spawn. We completed the first four years of this component (the first with funding from the Lower Snake River Compensation Plan), and submitted three annual reports to BPA. The data collected thus far indicate using the three release sites will likely meet the program objective in terms of distributing spawners throughout the areas normally used by fall chinook salmon. For our results to be conclusive we need to tag 330 fish in FY 2002. The need for this work is addressed in the 1994 FWP (7.3B.2), NMFS Snake River Recovery Plan (Chapter V-4, page 22), and the draft BIOP on Artificial Production (10.2.3.).

67 1998-010-04 Monitoring and Evaluation of Yearling Snake River Fall Chinook Salmon Outplanted of Lower Granite Dam (BPA)

Fall chinook supplementation above Lower Granite Dam includes acclimating and releasing 450,000 (150,000 at each facility) Lyons Ferry Hatchery (LFH) yearling fall chinook from facilities at Pittsburg Landing and Captain John Rapids on the Snake River and at Big Canyon Creek on the Clearwater River. In addition, subyearling fall chinook have become available for further supplementation and have been acclimated and released from these facilities since 1997. This project has been cooperating with project 9403400 to PIT tag and monitor these subyearling release groups. This proposal seeks to continue the cooperative study to monitor and evaluate fall chinook released above Lower Granite Dam as recommended in the Northwest Power Planning Council's Fish and Wildlife Program (FWP), NMFS 2000 FCRPS Biological Opinion (NMFS Bi-Op), and Wy-Kan-Ush-Mi Wa-Kish-Wit. This study provides information to promote adaptive management as directed under the FWP Scientific Principles (Principle 7) and Basinwide Provision (Strategy 9) as well as Actions 169 and 184 under NMFS Bi-Op (9.0) Reasonable and Prudent Alternative. One of the Specific Planning Assumptions in the FWP (Basinwide Provisions A.2) states "management actions must be taken in an adaptive, experimental manner...integrating monitoring and research with those management actions to evaluate their effects on the ecosystem." The NMFS Bi-Op (9.1.6) directs that "specific studies must be undertaken with rigorous monitoring and evaluation" because "monitoring programs will be a cornerstone in identifying alternative actions and refining recovery efforts." The goal of this project is to monitor and evaluate pre-release and release condition, post-release behavior, migration timing, and survival of juvenile fall chinook from release to Lower Snake River dams. We will also investigate adult returns and smolt-to-adult survival of juvenile fall chinook released at the acclimation facilities with each other and with releases at Lyons Ferry Hatchery. We will assist the US Fish and Wildlife Service (USFWS) in their evaluation of Snake River Basin fall chinook adult spawner contribution and distribution. A representative sample of all release groups will be PIT tagged and radio tagged at each acclimation facility and released at similar sizes and times as releases at LFH. Size and condition of PIT tagged fish will be evaluated during migration for fish recaptured through beach seining in the Snake and Clearwater Rivers. Emigration survival will be estimated from PIT tag interrogations at mainstem dams using the Survival Under Proportional Hazards (SURPH) model. Post-release dispersal and emigration behavior will be assessed using radio telemetry. Preliminary stages of the fall chinook supplementation program appear successful. Returns of adult fall chinook salmon to Lower Granite Dam have increased from an average of 1,038 from 1992-1996 to 3,384 in 1999 and 3,696 in 2000 and redd counts from aerial spawning ground surveys have increased correspondingly.

68 1999-003-00 Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (BPA)

The primary focus of this project is to determine what conditions must exist to provide successful spawning and rearing below main stem dams and what measures must be taken to protect those fish. Goals and objectives for this project in FY2001 are three fold; (1) continue to learn more about naturally reproducing populations of fall chinook and chum that currently exist in the mainstem Columbia River below Bonneville Dam; (2) collect, summarize, and analyze data so that the effects of the hydrosystem can be better understood and managed in a manner to protect and benefit naturally reproducing populations; (3) and verify the existence or absence of spawning populations below The Dalles, John Day, and McNary dams. The NWPPC has placed a high priority on the protection and enhancement of naturally spawning populations in the main stem Columbia River as evidenced in Measure 7.1C. In addition, BPA is directed through the NMFS ESA Section 7 Biological Opinion to evaluate the effect of power peaking operations on juvenile and adult salmon passage and on the river ecology downstream of Bonneville Dam. The methods suggested in this project have been successfully used in other areas of the Columbia River. Those methods include total population estimates generated by carcass tagging and recapture plus fish per redd estimates, spawning habitat requirements profiled in the Snake River and Hanford Reach, stranding locations of juvenile salmonids identified in the Hanford Reach, estimating emergence timing and seining juvenile salmonids plus CWT marking juvenile fall chinook in the Hanford Reach, modeling the effects of unsteady water flows in the Hanford Reach, stock identification using GSI or DNA, and quantification of habitat use and availability in the Hanford Reach and middle Snake River. The approach for determining the effects of unsteady water flows and for quantification of habitat use and availability changed during FY2000, and the change is reflected in the proposed work tasks and budget for FY2001.

69 2000-012-00 Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (BPA)

This project currently has and will continue to have two major components: smolt production and abundance and adult spawning and movement. Smolts will be monitored in Hamilton Springs with a modified fyke net or trap, Hardy Creek with a floating fyke net, Hardy Creek spawning channel with a D-frame fyke net, and Columbia River with a screw trap and/or fyke net. Abundance estimates will be calculated by: marking a sub sample of smolts in the caudal fin, calculating trap efficiency, and statistically analyzing the results. Egg-to-smolt survival will be evaluated by installing redd caps and monitoring swim-up timing. Also, installing piezometers and monitoring ground water quality will calculate temperature units for egg incubation. Weirs will be installed in Hamilton Springs, Hardy Creek, and Hardy Creek spawning channel to collect baseline biological data on adult chum salmon. Adults will be collected in the Columbia River via tangle nets and seines and fitted with radio tags. Radio receiver arrays will be installed in the various spawning areas to monitor movement. Spawning ground surveys will be conducted in Hamilton Springs, Hamilton Creek, Hardy Creek, and Hardy Creek spawning channel to evaluate spawning success and peak count. Piezometers will be installed to monitor upwelling water quality and quantify any differences with ambient water quality.

70 2000-014-00 Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek (BPA)

Pacific lampreys (*Lampetra tridentata*) in the Columbia River Basin (CRB) have declined to a remnant of their pre-1940s populations. NPPC-FWP 1994 noted this decline and requested a status report identifying research needs. This status report identified a need for information on lamprey abundance, current distribution, and habitat use. More recently, NPPC-FWP 2000 identified a need for any information necessary to restore the characteristics of healthy lamprey populations. Studying the biology, population dynamics, ecology, identification, as well as the relationships among sympatric species of lampreys (*L. ayresi*, and *L. richardsoni*) in the CRB will assist in rehabilitating Pacific lamprey populations. The U. S. Fish and Wildlife Service at the Columbia River Fisheries Program Office has been collecting quantitative baseline data including adult and larval abundance estimates, larval distribution and habitat requirements, immigration and emigration timing, and spawning habitat requirements for lamprey on Cedar Creek, Washington since 2000. Continued monitoring is vital to understanding the dynamic nature of this population, especially as it is one that is unaffected by hydropower activity.

71 2000-028-00 Status of Pacific Lamprey in the Clearwater River Drainage, Idaho (BPA)

The Pacific lamprey is an anadromous fish species facing the same migratory hazards as other anadromous fish in Idaho. While improving salmon and steelhead in-river passage will benefit passage for Pacific lamprey, maintaining critical freshwater habitat for spawning and juvenile/larval rearing is just as important for their survival. The proposed project will add to our knowledge of the lamprey's life history and habitat requirements in the Clearwater River basin. Beginning in April 2000, information collected included both juvenile/larval and adult migratory behavior and timing, and description of habitat for multi-year freshwater juvenile/larval rearing and adult spawning. Habitat parameters measured at observation sites included water depth and velocity, substrate, cover and temperature. Migratory juveniles were collected at rotary screen traps located on Red and American rivers, and a scoop trap located on Crooked River. No Pacific lamprey ammocoetes or macrothemia were captured from the traps on Crooked and American rivers. A total of 262 juvenile/larval Pacific lamprey were captured in the year 2000 with 16 of these captured in the Red River trap. Electroshocking in the Red River drainage yielded the largest number of fish. More ammocoetes were captured in lateral scour pool habitat than any other single habitat type. Individuals were mostly found inhabiting sand/silt substrate behind boulders and in water depths ranging from 0.1 to 1.0 meter. Preliminary findings indicate Pacific lamprey juveniles, while present in the South Fork Clearwater River drainage, are not numerous or widely distributed.

72 2000-029-00 Identification of larval Pacific lampreys (*Lampetra tridentata*), river lampreys (*L. ayresi*), western brook lampreys (*L. richardsoni*) and thermal requirements of early life history stages of (BPA)

Pacific lampreys (*Lampetra tridentata*) in the Columbia River Basin are believed to have declined to only a remnant of their population prior to hydropower development in the Columbia River Basin. Rehabilitation is being considered in some areas where lampreys are believed to have been extirpated. Status of sympatric lamprey populations (western brook lamprey *L. richardsoni* and river lamprey *L. ayresi*) is unknown. Identification of biological and ecological factors limiting lampreys is critical to population assessment and recovery efforts. We propose to address two fundamental aspects of lamprey biology. First, we will describe diagnostic characters of egg and larval stages of Pacific, river, and western brook lampreys and prepare an identification key. Second, we will examine the effects of temperature on the timing of developmental events and on the survival of early life history stages of lampreys. Identification of biological and ecological factors limiting lampreys in the CRB is critical to population assessment and recovery efforts. Results of this work will provide important tools necessary to evaluate the status of Pacific lampreys and assist with rehabilitation efforts.

73 2000-072-00 Phenotypic Correlations between Prevalence of *Renibacterium salmoninarum* among Chinook Salmon and Resistance/Susceptibility of their Progeny to Infectious Bacteria and Bacterial Kidney Disease (BKD) (BPA)

Genetic effects of hatchery management practices have become a major concern in recent years. In particular, questions have been raised regarding the effects of "broodstock culling" to prevent outbreaks of bacterial kidney disease (BKD) in Columbia River hatcheries. The causative agent of BKD, *Renibacterium salmoninarum*, is transmitted vertically from female parent to progeny, and a common practice - particularly for spring chinook salmon - is to screen female parents for *R. salmoninarum* using an enzyme-linked immunoabsorbent assay (ELISA) and to segregate or destroy progeny of female parents with high ELISA values. This culling practice has proven to be a powerful tool for reducing significant losses due to BKD in spring chinook salmon during hatchery rearing and after release. However, this practice could also reduce the future fitness of these populations if disease resistance or immune function is heritable and correlated genetically with high ELISA values. Such data are currently absent but are needed to assess the possible genetic impacts of broodstock culling on long-term fitness. Information is also needed concerning the efficacy of vertical transmission of *R. salmoninarum* from female fish with various levels of infection. These data are critical for optimizing broodstock maintenance procedures, particularly where artificial propagation may be necessary to help recover ESA-listed populations. The proposed study will investigate vertical transmission of *R. salmoninarum* in spring chinook salmon, and estimate the heritabilities and genetic correlations of disease resistance indicators. Adult chinook salmon, with levels of *R. salmoninarum* varying throughout the range commonly observed in hatcheries, will be mated in a nested design (1:6 male:female) to yield 120 full-sib (20 half-sib) families. We will quantify levels of *R. salmoninarum* infection among the resulting progeny and evaluate their specific and nonspecific immune functions. Quantitative genetic methods will be used to estimate genetic correlations between level of *R. salmoninarum* infection in parental fish and level of infection and immune response among progeny. The proposal addresses the following research needs of the 1994 Columbia River Basin Fish and Wildlife Program: Sections 4.2A, 7.2D.1, 7.2D.3, and 7.2D.4.

74 2001-008-00 Genetic sex of chinook salmon in the Columbia River Basin (BPA)

In 1999 we used a molecular test, based on a DNA marker specific for the Y-chromosome, to investigate whether wild male and female chinook salmon spawning in the Columbia River were faithfully expressing their genetic sex. We tested if chinook salmon from the Hanford Reach of the Columbia River with a male phenotype possessed this marker, and conversely, if phenotypic females did not. Our results showed that a high proportion (84%) of phenotypic female salmon were positive for the male-specific DNA marker. This finding is significant because these "sex-reversed" fish could produce offspring with abnormal combinations of sex chromosomes. The intent of this proposal is to investigate how widespread the occurrence of this observation is and determine the impact on salmon populations. The first objective is to determine the temporal and spatial incidence of male-specific DNA markers in female chinook salmon in the Columbia River Basin. The hypothesis is that we will find evidence for male-specific DNA markers in female-appearing fish. The second objective is to test for the presence of an abnormal YY genotype in male chinook salmon from the Columbia River Basin. The hypothesis is that we will detect male salmon with a YY genotype returning to spawn in the populations sampled. Evidence of the scope of the problem we have identified, and presence and number of YY males, will be used to predict effects upon the spawning populations sampled. This proposal addresses a key component of the Columbia River Basin ecosystem, the health of native, anadromous salmon populations. It is highly innovative because it uses a modern molecular biological approach that has not been previously used in the Basin. The information generated by this proposal will provide critical insight into the declines of anadromous salmon that have occurred recently in this watershed.

75 2002-016-00 Determine lamprey species composition, larval distribution and adult abundance in the Deschutes Subbasin (BPA)

The goals of the proposed study are: to determine Lampetra species composition, larval distribution and habitat utilization; to estimate larval and metamorphosing emigrant abundance in the Deschutes River tributaries, Warm Springs River and Shitike Creek; and to develop a method of estimating adult abundance in the Deschutes R. The objectives presented in this study attempt to address "critical uncertainties" identified by the Columbia Basin Pacific Lamprey Technical Work Group (CBPLTWG) and recommended to the Columbia Basin Fish and Wildlife Authority (CBFWA). The methods utilized in this study have been developed (or modified from methods used in the Great Lakes region) by other researchers within the Columbia River Basin (CRB) and Pacific Northwest (Torgerson and Close, CTUIR, Umatilla, Oregon pers. comm., Close 1999, Stone et al. 2001, van de Wetering 1998, Bayer et al. 2001). Therefore the results should be comparable with data collected in other basins. By assimilating the findings from this project with information from other sub-basins within the CRB the status of Lampetra sp. in the CRB may be fully assessed. The results from this project may be used to formulate recovery plans at the basin and sub-basin level.

76 2002-031-00 Growth Rate Modulation in Spring Chinook Salmon Supplementation (BPA)

Recommendations of the Columbia River Basin Fish & Wildlife Program (Nov. 14, 2000) for artificial production state: "naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics." This mirrors guidelines of the NMFS 2000 FCRPS Biological Opinion (9.6.5.3.4, Action 184). We compared the physiology and development of naturally-rearing wild and hatchery-reared spring chinook salmon in the Yakima River Basin, and found substantial differences. The most serious difference was an approximately 50% incidence of early maturation of Cle Elum Hatchery-reared males (1+ year old jacks). This is ten times our estimates of early male maturation in wild spring chinook salmon in the Yakima River. Apparently, the hatchery environment potentiates early male maturation. Hundreds of thousands of the early maturing hatchery males may residualize in the basin after release and cause negative genetic and ecological impacts. The ecological concerns include competition for space and food, food depletion and predation on emerging salmonids and other species. Furthermore, early male maturation translates into a 25% reduction in anadromous adult production. We have found recently in laboratory studies that modulation of growth rate at specific times of the year can reduce the incidence of precocious maturation. Thus, growth rate modulation at Cle Elum Hatchery may reduce early male maturation to levels similar to natural wild fish. This proposal has three central objectives: 1) estimate the incidence of precocious maturation and characterize the related maturational physiology in wild Yakima spring chinook for comparison to the hatchery fish, 2) monitor the incidence of yearling precocious maturation in the hatchery population, and 3) conduct a growth modulation experiment to control precocious maturation in the Yakima hatchery population. Our ultimate goal is to develop rearing protocols to produce fish with morphological, physiological, and life-history attributes similar to naturally reared cohorts.

77 2002-032-00 Investigating passage of ESA-listed juvenile fall chinook salmon at Lower Granite D: winter when the fish bypass system is inoperable (BPA)

Juvenile fall chinook salmon, *Oncorhynchus tshawytscha*, listed for protection under the Endangered Species Act typically have an ocean-type life history. Fry emerge in the spring, grow rapidly, and migrate from the Snake River during summer. However, some of the later emerging and slower growing juvenile fall chinook salmon fail to leave the Snake River as subyearlings, and they overwinter in the reservoirs, and then resume seaward migration the following spring. This project will explore holdover behavior of fall chinook salmon in Lower Granite Reservoir and refine existing methods of scale pattern analysis for determining age and DNA analysis for determining genetic lineage of holdover fish. In addition, we will use radio telemetry to determine where fish hold over in Lower Granite Reservoir and document passage timing Lower Granite Dam.

78 2002-037-00 Characterize Genetic Differences and Distribution of Freshwater Mussels (BPA)

The purpose of this study is to provide the critical information on the status of freshwater shellfish—especially the western pearlshell mussel, *Margaritifera falcata*—that is called for in the Umatilla Subbasin Summary. This information is essential for restoration of freshwater mussels and associated traditional and cultural uses. Freshwater mussels were vital components of intact salmonid ecosystems that have been affected directly and indirectly by dams, habitat deterioration, and decline in salmon; they are culturally important to Native Americans; and little is known about their distribution, status, and population structure to guide recovery actions. The project has three objectives: 1) to survey the distribution and status of freshwater mussels in the Umatilla River, where they may be extinct, and the Middle Fork John Day River, where they may remain using the first stage of two-stage adaptive cluster sampling; 2) to determine macro and microhabitat factors that control distribution and abundance; and 3) to test whether genetic population structure exists in *M. falcata* by examining five aggregations in the Columbia River and an outgroup using microsatellite DNA variation. Both these objectives provide information that will be useful for restoration efforts elsewhere in the Basin.

79 1992-026-03 Upper Salmon Basin Watershed Project Administration/Implementation Support (BPA)

Provide local coordination and guidance for implementation of on-the-ground projects that improve and enhance anadromous and resident fish habitat.

80 1993-035-01 Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed (BPA)

Restore physical and biological processes to create a self-sustaining river/meadow ecosystem using a holistic approach and adaptive management principles to enhance fish, riparian, and wildlife habitat and water quality within the Red River watershed

81 1993-062-00 Custer Soil & Water Conservation District Salmon River Fish Passage Enhancement

The goal of the projects identified is to improve anadromous fish passage in both specific local reaches and the overall aquatic health of the sub basin by; development of effectiveness assessment; reduce fine sediments in the spawning gravel through BMP implementation and restoration of floodplain function; reduction in the numbers of physical migration barriers; restoration of natural physical processes that will enhance geomorphic structure of channels; increase riparian vegetation adjacent to channels and provisions for adequate in stream flows for migration, spawning and rearing in the upper Salmon River Basin; reduce temperatures in the system.

82 1994-015-00 Idaho Fish Screen Improvement (BPA)

Enhance passage of juvenile and adult fish in Idaho's anadromous fish corridors by consolidation and elimination of irrigation diversions. Minimize adverse fish impacts of irrigation diversion dams by screening pump intakes and canals.

83 1994-017-00 Idaho Model Watershed Habitat Improvement Project (BPA)

The project scope is to protect, enhance and restore anadromous and resident fish habitat in a sustainable manner that balances resource protection and land use practices. Project activities include development of alternative management plans and development of grazing plans or conservation easements with private landowners. Re-establish riparian communities with willow plantings that include strategies for maintaining and enhancing fish habitat in good condition will remain in good condition.

84 1994-050-00 Salmon River Habitat Enhancement M & E (BPA)

Maintain habitat improvements and evaluate benefits; monitor salmonid populations and habitat parameters; coordinate land and water stewardship activities; coordinate planning, implementation, monitoring, and evaluation of new improvements and protections.

85 1996-007-00 Upper Salmon River Diversion Consolidation Program (BPA)

The overall objective of this multi-year project has been to reduce the number of irrigation Diversions, enhance in-stream flows through water conservation measures by converting from flood to sprinklers and reduce juvenile delay and entrapment and improve survival by construction of NMFS approved fish screens on the Upper Salmon River.

86 1996-077-02 Protect and Restore Lolo Creek Watershed (BPA)

Protect, restore, and enhance the Lolo Creek Watershed to provide quality habitat for anadromous and resident fish. This will be accomplished by watershed resotration projects such as culvert replacement, road obliteration, and streambank stabilization.

87 1996-077-03 Protecting and Restoring the Waw'aatamnima (Fishing)(Squaw) Creek to 'Imnaamatnoon (Legendary Bear)(Papoose) Creek Watersheds Analysis Area (BPA)

Protection and restoration of the Squaw Creek to Papoose Creek Watersheds Analysis Area will be done using a ridge top to ridge top watershed approach. The Nez Perce Tribal Fisheries/Watershed Program (NPTFWP) and the Clearwater National Forest (CNF) have completed a Watershed Analysis for the Area from Squaw to Papoose Creeks in 1998. This watershed analysis looked at all aspects of the watershed making recommendations for watershed restoration activities. Work includes road obliteration, replacement of a culverts, monitoring and evaluation projects and long-term watershed/stream recovery.

88 1996-077-05 Restore McComas Meadows/Meadow Creek Watershed (BPA)

Protect and restore critical riparian/stream habitat in Meadow Creek thru streambank stabilization, riparian re-vegetation, road decommissioning, culvert replacement/repair, and native plant restoration.

89 1996-086-00 Clearwater Focus Program (BPA)

Complete subbasin assessment develop subbasin plan, coordinate public review and input, and coordinate implementation projects

90 1997-060-00 Clearwater Subbasin Focus Watershed Program - NPT (BPA)

Manage and implement a comprehensive system to coordinate multiple jurisdictions, agencies, and private landowners within the Clearwater River Subbasin. These efforts will protect, restore, and enhance anadromous fisheries habitat.

91 1999-014-00 Little Canyon Creek Subwatershed-Steelhead Trout Habitat Improvement Project (BPA)

Reduce sedimentation to improve instream habitat in Lower Little Canyon Creek and the lower Clearwater River, and improve upland water storage by implementing best management practices for sediment reduction and water retention.

92 1999-015-00 Restoring Anadromous Fish Habitat in Big Canyon Watershed (BPA)

Implement agricultural and fish habitat Best Management Practices in the Big Canyon watershed with the goals of reducing sediment and nutrient delivery, improving water retention in uplands, reducing stream temperature, and restoring riparian function.

93 1999-016-00 Protect and Restore Big Canyon Creek Watershed (BPA)

This project will protect, restore and return critical spawning and rearing habitat using a ridge top to ridge top approach, based on a completed watershed assessment.

94 1999-017-00 Protect and Restore Lapwai Creek Watershed (BPA)

This project will protect, restore and return critical spawning and rearing fish habitat using a ridge top to ridge top approach, based on a completed watershed assessment.

95 1999-018-00 Characterize and quantify residual steelhead in the Clearwater River, Idaho (BPA)

Describe unsuccessful hatchery smolts released into the Clearwater basin. Assess potential negative interactions with wild steelhead and recommend modifications to hatchery practices to produce more effective smolts and reduce hatchery/wild interactions.

96 1999-019-00 Holistic Restoration of the Twelvemile Reach of the Salmon River near Challis, Idaho

Work holistically to restore the channelized Salmon River corridor to a natural meandering form in balance with watershed processes that will restore geomorphic diversity, reduce bank erosion, lower summer temperatures and improve critical fish habitat.

97 1999-020-00 Analyze the Persistence and Spatial Dynamics of Snake River Chinook Salmon (BPA)

Results will advance current understanding of the relationship between the distribution, pattern, and persistence of chinook salmon and landscape patterns

98 2000-034-00 Protect and Restore The North Lochsa Face Analysis Area Watersheds (BPA)

The approach in this analysis area would be to prevent future channel aggradation and instability by using an overall watershed approach. This includes burning, riparian planting, and road obliteration. This approach emphasizes working from the ridge tops to the stream bottoms. Concentration will be put on road obliteration, due to their location in the headwaters of these watersheds.

99 2000-35-00 Rehabilitate Newsome Creek Watershed - South Fork Clearwater River (BPA)

Protect and enhance Newsome Creek Watershed for the benefit of both resident and anadromous fish using an overall watershed approach. This project is a cooperative project between the Nez Perce Tribe and the Nez Perce National Forest.

100 2000-036-00 Protect & Restore Mill Creek (BPA)

Enhance critical riparian areas thru re-vegetation and maintaining the cattle exclusion fence, and replacing/repairing culverts which pose a fish/aquatic barrier to restore quality habitat for chinook salmon, steelhead trout, bull trout and resident fish

101 2001-035-00 Protect Bear Valley Wild Salmon, Steelhead, Bull Trout Spawning and Rearing Habita

Protect critical spawning, rearing and migratory habitats for wild chinook salmon, steelhead trout, bull trout and westslope cutthroat trout in the Bear Valley Basin by permanently closing the Bear Valley and Deer Creek allotments to livestock grazing.

102 2001-044-00 Conservation Easement, Baker Ranch, Salmon River East Fork (BPA)

Protect riparian areas, restore stream banks & save 70 cfs in the E.F. of the Salmon through a 740 acre ranch. Conservation easement will eliminate the use of water from 7 irrigation diversions, saving \$647,000 of cost of 7 fish screens and a bridge.

103 2001-051-00 Reconnect Little Morgan Creek to the Main-stem Pahsimeroi River (BPA)

Reestablish 14.3 miles of historical anadromous habitat and provide an isolated bull trout population access to the mainstem river.

104 2001-052-00 Restoration of Anadromous Fish Access to Hawley Creek (BPA)

Reconnect Hawley Creek to the Lemhi River, reduce water temperatures, and facilitate stream channel and riparian habitat restoration for anadromous and resident species in Hawley Creek by improving irrigation methods and increasing instream flows.

105 2001-067-00 Restore Passage Lower Lemhi / Salmon Rivers (BPA)

Establish fish passage and reconfigure the L3 and L3A Diversions on the Lower Lemhi River

107 2001-068-00 Transfer Lemhi Water Users (L-6 to Salmon River (S-14) (BPA)

The objective of this project is to change the source of water for these properties from the Lemhi River at L-6 diversion to the Salmon River at S-14 diversion. This would leave an additional 13 cfs of water flows through the critical reach of the Lemhi.

108 1996-034-01 Methow Valley Irrigation District Rehabilitation (BPA)

This is a Federal and State cost-share funded project. WDOE has approximately \$2,000,000 reserved for this water conservation project from its Agricultural Water Supply funds (also known as Referendum 38). The Washington Department of Fish and Wildlife (WDFW) agreed to provide \$275,000 for constructions costs, providing the diversions are removed from the Twisp and Methow river. BPA has agreed to fund \$2,831,271 of the overall project because it eliminates fish passage barriers in the Methow and Twisp rivers, conserves water, and improves instream flow for fish. For the past 16 months, the BPA has underwritten facilitation and engineering services necessary for the parties to develop a new project description. The previously funded BPA project to install a closed pipe system was never implemented because of MVID concerns regarding operational design, cost, water rights and lost habitat. The project description foresees replacing MVID's diversion structures and fish screens on the Methow and Twisp rivers. To address critical low flows in the Twisp during August and September, a pump station will be used to pump water from the Methow to meet the district's Westside irrigation needs. As a result, there will be additional instream flows for the Twisp that the parties anticipate will benefit the needs of fisheries in general, and ESA listed stock in particular. Fisheries are also expected to benefit from new diversion and fish screen structures that will lessen obstacles to fish passage. Other elements of the project description include canal rehabilitation and replacement of laterals that will result in improved water conservation. Waters saved through conservation will be placed in state water trust. Because of facilitation, BPA and WDOE funding was used to initiate replacement of laterals and support on-farm efficiencies June 2001. Construction is nearly complete.

109 1996-040-00 Evaluate The Feasibility and Risks of Coho Reintroduction in Mid-Columbia (BPA)

Historically, mid-Columbia coho salmon production occurred throughout many of the basin's tributaries. Major Columbia River tributaries in this area include the Wenatchee, Entiat, Methow, and Okanogan rivers. All the major upper river basin tributaries supported coho. The Yakama Nation has requested on-going funding since 1996 to determine the feasibility of re-establishing a naturally spawning coho population within the mid-Columbia tributaries, while keeping adverse ecological impacts on other Salmonid species of concern within acceptable limits. In 1996, selected habitats and acclimation pond sites in the Methow and Wenatchee river basins were identified for potential reprogramming of adult and/or juvenile coho from appropriate lower river hatcheries. In 1998, an interagency technical work group developed a comprehensive monitoring and evaluation plan intended to maximize the potential of Program success and minimize ecological risk to other species of concern (i.e., spring chinook, summer chinook, bull trout and steelhead). In 1999, the technical workgroup reached consensus and completed a Hatchery and Genetic Management Plan outlining and discussing project objectives for the next 3 to 4 years. The study plan identifies that some experimental uncertainties are basin-specific; results from monitoring are not transferable to another basin but apply only to the specific habitat area studied. However, resource managers have agreed that some study results can be applied to the entire region. Therefore, in the experimental design and monitoring/evaluation part of the program, several of the generic questions will be developed and implemented in the Yakima River basin.

110 1996-042-00 Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek (BPA)

The overall program to restore and enhance ESA-listed summer steelhead and spring Chinook populations and habitat in Salmon Creek, a tributary to the Okanogan River, has many sub-elements that address two limiting factors for anadromous fish: lack of instream flow and channel conditions that inhibit fish passage. We propose to undertake projects in these two categories. In addition, we propose to conduct regulatory compliance activities tied to these projects, specifically NEPA and SEPA, in order to prepare an EIS. Further, we propose to develop a Stream Management and Recovery Plan in order to adaptively manage the projects we propose to undertake as well as to monitor and evaluate measurable improvements to habitat productivity and populations in Salmon Creek. Our goal is to provide instream flows in Salmon Creek that satisfy the year-round life cycle requirements of anadromous fish, currently prohibited by the Okanogan Irrigation District's (OID) withdrawals of 100% of the stream flow 4.3 miles above the mouth of Salmon Creek. It is also our goal to meet the seasonal water needs of the OID. Previous studies indicate that in order to satisfy the needs of fish and irrigators, additional sources of water need to be provided, specifically 7,122-9,737 af per year. These same studies identified projects that would provide this additional water supply through water conservation, by upgrading the OID's existing facilities and constructing new facilities.

111 1998-025-00 Restore Steelhead and Chinook habitat in Early Winters Creek (BPA)

The project is part of a larger program to protect and restore the habitat strongholds in the Methow River Basin. The selection of this site resulted as a process that used existing watershed assessments to identify key watershed areas for protection and prioritize the most feasible restoration opportunities. The specific goal of this project is to increase the year round usability of anadromous and resident fish spawning and rearing habitat in Early Winters Creek. The identified objectives are: (1) restore historic fish, riparian and floodplain habitat; (2) protect and restore existing habitat; and (2) identify feasibility methods to augment instream flow.

112 1998-029-00 Goat Creek In-Stream Restoration for Salmonids (BPA)

The main goal of this project is to improve habitat quality that will allow greater juvenile and adult survival at each freshwater stage. This project will be used as a demonstration site to promote bioengineering and habitat restoration. The lower 1 1/2 miles of Goat Creek, a tributary to the Methow River, was channelized in the late 1970's thus leaving minimal habitat for steelhead, chinook and bull trout. The focus of the deliverables of this project is to re-establish meanders, cover, pools and riparian vegetation within this reach.

113 1998-031-00 Implementation of Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Assessment and Restoration Plan (BPA)

The CRITFC Watershed Program Work plan is designed to provide effective and efficient watershed restoration by: 1) Coordinating and conducting watershed assessment; 2) coordinating habitat restoration/protection projects with current or proposed Salmonid production and subbasin habitat objectives; 3) streamlining on-the-ground habitat project implementation; 4) organizing and coordinating the biological and physical evaluation and monitoring of watershed projects; and 5) promoting public awareness and education of watershed restoration protection projects in 10 major subbasins of the Columbia River. The work plan was developed in coordination with tribal fisheries programs of the Umatilla, Yakama, Warm Springs, and Nez Perce Tribes to implement focused watershed habitat restoration and salmon production in the Yakima, Klickitat, Walls, Umatilla, Salmon, Clearwater, Grand Ronde, John Day, Hood and Deschutes subbasins. The project is designed as a five-year project from 1998 to 2003. Project activities are the result of a work plan developed from the consistent with the Wy-Kan-Ush-Mi Wa-Kish-Wit and the NPPC Fish and Wildlife Program.

114 2000-001-00 Anadromous Fish Habitat & Passage in Omak Creek (BPA)

This project is part of a 10-year project, which originated from the Omak Creek Watershed Plan/E (NRCS 1995). The implementation is a cost share between BPA and the Natural Resource Conservation Service. Problems included poor water quality conditions (high water temps, low levels of dissolved oxygen, high fecal coliform levels), lack of riparian vegetation, accelerated sediment yield from uplands and stream banks and inaccessible stream reaches for anadromous fish, particularly summer steelhead.

115 2000-002-00 Remove Barriers/Restore Instream Habitat on Chumstick Creek (BPA)

Chumstick Creek is a 3rd order stream, which drains a 78 square mile sub-basin of the Wenatchee River watershed. In 1994, Chumstick Creek was ranked second to Mission Creek as contributing to current and future potential water quality degradation in the Wenatchee River watershed. The stream once supported healthy populations of chinook, steelhead and bull trout, however access to Chumstick Creek is now limited due to 23 culverts that are migrational barriers particularly at low flows. The overall goal of this project is to enhance and improve Salmonid migration throughout the Chumstick drainage. In addition, to replacing the 23 identified culverts 10-15 sites will be enhanced by improving in-stream habitat and riparian vegetation. With completion of this project and two others, the health of the watershed will be improved dramatically. In addition to the habitat for fish, the migrational corridor for waterfowl, bald eagles, spotted owls, and gray wolves will be improved. The Chumstick Creek barrier removal project was originally funded through the 1999 funding cycle. The original proposal was to remove 23 migrational barriers. That amount was reduced by CBFWA to \$160,000 recommending reduction in the number of culverts installed until progress had been proven. On August 1, 2000, BPA entered into a contract with Chelan County Conservation District to replace 12 to 13 culverts on Chumstick Creek. Because these individual projects are with separate landowners and time was short to get work completed quotes for these were requested and the actual bids came back much higher than anticipated. 8 culverts were replaced.

116 2001-063-00 Methow River Basin Screening (BPA)

This project provides fish screen facility upgrades, and new fish screen construction on four Methow River Basin irrigation diversion; Foghorn, Rockview, McKinney Mountain, Kum Holloway. In addition, the project scope includes necessary equipment upgrades for efficient project performance.

117 2001-065-00 Hancock Springs Passage and Habitat Restoration Improvements (BPA)

The project goal is to increase the population size of naturally producing spring chinook and steelhead in the Methow River. A secondary goal is to increase the amount of available spring-fed off-channel rearing habitat for juvenile salmonids in the upper Methow river. Tasks will include removal of the existing culvert on Wolf Creek Road, which is an up migration barrier to juvenile salmonids, and replace it with an arched culvert; riparian restoration through plantings and instream actions to increase channel complexity. Hancock Springs is geographically located at the downstream most point of spring chinook spawning in the Methow River and is a key location for off-channel rearing. Hancock Springs is fed entirely by groundwater and does not freeze in the winter months, which increases the geological importance for spring chinook, steelhead and other Salmonid species.

118 2002-001-00 Colville Confederated Tribes Ellisford Acclimation (BPA)

The Okanogan River summer Chinook salmon population is one of the strongest salmon populations in the basin. However, based upon redd counts in the Similkameen River (tributary) the Okanogan River, adult summer chinook are superimposing redds. It is recommended that returning adults should be dispersed to available nearby habitat to strengthen the population. Therefore, an acclimation facility located near adequate habitat would encourage dispersal and likely increase in production in the basin. Furthermore, Okanogan River spring Chinook were listed as extinct by the National Marine Fisheries Service. There is an effort by the Colville Confederated Tribes to utilize excess Carson stock spring Chinook smolts. An acclimation facility would ensure olfactory imprinting by juveniles.

119 2002-018-00 Tapteal Bend Riparian Corridor Restoration (BPA)

Widespread riparian degradation and loss of floodplain connectivity have been identified as a critical limiting factors in the Yakima Subbasin (Berg 2001). The Tapteal Greenway a non-profit conservation organization, has purchased a parcel of land along the lower Yakima River in Richland (Tapteal Bend), with the intended purpose of using it as a demonstration site for stream bank restoration and environmental education. Riverbank stability was severely degraded in the 1996 flood and riparian habitat had previously been destroyed. Proposal objectives are to design, implement, and maintain a bio-engineered stream bank restoration project and conduct long-term monitoring of the restoration work. Acquisition of an adjacent, undisturbed island with cottonwood galleries would also serve to expand the protective buffer to the river corridor and provide opportunity to re-connect a cut-off side channel to the river.

120 2002-029-00 Fish Passage on WDFW Lands in Yakima (BPA)

On Washington Department of Fish and Wildlife lands, inventory fish passage structures and intake screens, identify required corrective actions, and complete corrective actions where high priority passage problems exist.

121 2002-041-00 Columbia Cascade Stream Gauging (BPA)

This project will monitor, analyze and report stream flows in near real-time. It will improve the state of existing knowledge about flows in the three subbasin and will support multiple water and salmon initiatives including water rights acquisition, watershed/subbasin planning, habitat assessment, and restoration planning and implementation, TMDL modeling and monitoring, Ecosystem Diagnostic and Treatment modeling and compliance activities. This project will result in the installation of up to eight (8) continuous, near real-time stream gauges and up to six staff gauges in each of the three basins (Wenatchee River basin, Okanogan River basin, and the Entiat River basin). Funding and other support for this project will be provided by the Bonneville Power Administration. The Washington State Department of Ecology will be responsible for the successful outcome of this project including overall organization, the purchase and installation of the stream gauges, transmission and management of stream flow data including posting data and stream hydrographs to Ecology's public world wide web internet site, and for providing funding and various technical and infrastructure support to its designees, Chelan County and the Chelan County Conservation District and Okanogan County.

122 1996-019-00 Second-Tier Database Support (BPA)

The second-tier database and web services provide integration and direct and timely public access to Columbia Basin environmental, operational, fishery, administrative, and other information essential to sound operational and resource management decisions by the Federal Government. This work does not duplicate services provided by other federal, state, and private services in the region; rather it integrates public data for more effective access, consideration, and application. These services are critical to BPA's implementation of its fish and wildlife responsibilities under the Endangered Species Act (ESA). The services are available to FWP participants needing integration of data and can be used to implement effective monitoring and evaluation as part of adaptive management practices. Four DART Objectives are identified: 1) Maintenance of the existing DART system by providing electronic data integration services to generate data sets needed by FWP and ESA modeling, monitoring, and evaluation efforts. 2) Maintenance and expansion of the real-time prediction tools. Currently DART provides real-time information and predictions on smolt and adult passage and water quality information. These activities will expand the exposure analysis to quantify the exposure of the passing fish to temperature, gas spill, and flow conditions. 3) Continue development of data analysis tools to increase flexibility of web-based access to distributed databases and analysis through web browser tools. Participate in regional planning and development of integrated database. Integration of regional data will involve new technologies (i.e. XML eXtensible Markup Language) and, as noted above, significant changes to the institutional framework, that defines the goals and funding levels of the database centers.

123 1988-108-04 Pacific Northwest Hydropower Data Base and Analysis System (NWHS) (BPA)

The objective is to (1) coordinate with other participating agencies the maintenance of the data base portion of the Pacific Northwest Hydropower Data Base and Analysis System (NWHS); (2) perform the maintenance of the data base portion of the NWHS; (3) coordinate and perform the NWHS data base review; (4) prepare and utilize the System 1032 data base management tools and software instruction sets to support data base maintenance, data base review, hydropower supply estimates, Protected Areas designations, and data listings; (5) provide for technical training and outside technical consultation to assure successful performance of data compilation, data entry and file organization on the NWHS; (6) assist with application of the Hydropower Supply algorithm; (7) maintain logbooks of contacts and activities; (8) prepare and provide project status, progress and technical reports; (9) advise and assist BPA program personnel in their efforts to pursue a broadening of the recognition of and support for the NWHS; and (10) Assist the Power Business Line's Federal Hydro Projects Group (PGF) with the development of a Performance Indicator tracking system. The Performance Indicator system should allow for monthly updating, annual cumulative tracking, and visual reporting, for each project (or project group) in the Federal Columbia River Power System (FCRPS). Funding is split between Fish and Wildlife Group, the Power Business Line, and the Transmission Business Line.

124 1998-011-00 Montana Natural Heritage Program (BPA)

Annual purchase of to secure services from the Montana Natural Heritage Program (MTNHP) related to its sensitive species information for the state of Montana. These services include: 1) data maintenance and quality assurance efforts to keep the MTNHP data up-to-date and accurate; 2) formatting and transfer of the MTNHP Element Occurrence of sensitive species data and other available species data to BPA; 3) transfer of an updated data dictionary and other relevant documentation; and, 4) technical support and information interpretation assistance to BPA upon request. The data formats will include ESRI Arc/Info coverages or shapefiles for any spatial data, and Word, Adobe PDF, or HTML and hard copy for documentation information. Information used throughout BPA for environmental review and analysis. The Montana Natural Heritage Program is the state's clearinghouse for information on Montana's native species and habitats, emphasizing those of conservation concern. We collect, validate, and distribute this information, and assist natural resource managers and others in applying it effectively. Established by the Montana State Legislature in 1983, the program is located in the Montana State Library, where it is part of the Natural Resource Information System. The Montana Natural Heritage Program is also part of the Natural Heritage Network, and our data are linked to similar programs in all 50 states, most Canadian provinces, and many Latin American countries.

125 2001-017-00 Idaho Conservation Data Center (BPA)

Annual purchase of Idaho Conservation Data Center data. Acquire latest version of Idaho Natural Heritage Program Occurrence File with updated data dictionary, and any other available data on sensitive species. Electronic format for both products -- Arc/Info coverage(s) preferred if available, along with Word, .PDF, or .HTML for documentation and data dictionary (hard copy too). Include any additional available habitat data sets. Information used throughout BPA for environmental review and analysis. The Idaho Conservation Data Center is a cooperative, interagency effort to identify the plant, animal, and plant community resources of Idaho. As part of the Natural Heritage Network and NatureServe, the Idaho Conservation Data Center contributes to an understanding of global biodiversity and helps to provide tools for managers and the public to better protect our vanishing species and communities.

126 1984-021-00 Protect and Enhance John Day Anadromous Fish (BPA)

ODFW project in the upper John Day Basin to improve anadromous fish spawning and rearing by protecting and enhancing riparian areas by completing 10 to 15 year lease agreements to fence out livestock and plant native plants where needed, implementing floodplain restoration in mine tailings areas to allow a good connection with the flood plain of streams, and developing off riparian area water sources for livestock so water gaps are not needed

127 1993-066-00 NE Oregon Pump Screening (BPA)

The project provides immediate and long-term protection for anadromous and resident fish species in the John Day basin by installing and replacing out of date fish protection and passage devices on private irrigation diversions and dam structures. It directly follows Columbia Basin Fish and Wildlife Program (FWP) Measure 7.10-Provide Passage and Protective Screens on Tributaries, particularly measures 7.10A2 and A.3, which mandates: a. Screening and passage criteria based on NMFS standards; b. The use of existing expertise of federal, state and private entities to accelerate implementation of fish screening and passage measures; and c. The maintenance of prioritized list of tributary screening and passage facility improvements – which will include both the construction of new facilities, upgrading, and maintenance of existing screen systems. The expected outcome over the next five (5) years will be ongoing construction and installation to replace existing out of date screen systems remaining in the basins.

128 1998-017-00 Eliminate Gravel Push-up Dams in Lower North Fork John Day (BPA)

The goal of this project (#9801700) is the eventual elimination of gravel push-up dams on the lower North Fork John Day. Elimination of push-up dams will remove impediments to anadromous (Spring Chinook, Summer Steelhead) fish migration, improve water quality and habitat for both anadromous and resident fish, reduce sediment load from construction and washouts, and reduce surface area of pools during annual periods of highest temperatures and solar radiation. Installation of permanent pumping stations and infiltration galleries have been successful on both a scientific and aesthetic level. Water quality will be monitored continuously throughout each phase of the project with turbidity and temperature as the primary criteria. Monitoring of water quality will continue indefinitely. Monitoring efforts are coordinated with Bureau of Land Management, Oregon Department of Fish & Wildlife, and The Confederated Tribes of the Warm Springs John Day Basin Office.

129 1998-018-00 John Day Watershed Restoration Program (USBR)

This proposal represents a continuation and expansion of the ongoing Watershed Restoration Program within the John Day basin. The proposed projects are intended to improve water quality and quantity, aquatic habitat, and fish production; reduce bank instability, sedimentation, bed load movement, and summer water temperatures thereby improving water quality, reducing or eliminating migratory delays from passage impediments, and improving riparian condition. The proposal also includes implementing an annual monitoring program to evaluate each of these projects. Habitat issues in the John Day have been extensively studied over the last thirty years and are detailed in numerous reports, watershed assessments, management plans, and other similar documents. The Tribes, Oregon Department of Fish and Wildlife (ODFW), Oregon Water Resources Department (OWRD), Northwest Power Planning Council (NPPC), Bonneville Power Administration (BPA), Bureau of Reclamation (BOR), Oregon State University (OSU), and many others have conducted assessments and research, prepared management plans, or implemented restoration activities in response to identified or suspected issues. Managers believe that irrigation system efficiency improvements, along with upland and riparian restoration, would provide the greatest long-term benefits for fish and wildlife while improving late season stream flow for other purposes as well (John Day Subbasin Summary 2001). Where riparian management and watershed restoration activities have occurred, improvements in vegetative structure, density, and diversity, as well as stream temperature, stream flow (i.e.: unimpeded flow), fish activity, wildlife use, and channel structure have been achieved (USDI 2000, Unterwegner and Gray 1998).

130 1998-019-01 Wind River Watershed USGS (BPA)

Purpose is to produce an estimate of population density and biomass of juvenile steelhead and other salmonids in the tributaries of the Upper Wind River, to do habitat surveys, and to relate density and biomass of juvenile steelhead to stream habitat conditions. Electro shocking is used for capture and a percentage of fish are PIT tagged. The information gathered is integrated with smolt and adult monitoring that is being completed by the USFS and WDFW.

131 1998-019-02 Wind River Watershed Monitoring (BPA)

WDFW is completing steelhead smolt and adult population estimates. Adult trapping in traps at Sheppard Falls close to the mouth of the Wind and at Hemlock Dam on Trout Creek, snorkel counts and redd counts are used to estimate the number of adults. Four rotary Screw traps are used in strategic locations including one close to the mouth to determine smolt estimates. Mark recapture is used for smolts and floy tags are used for adults

132 1998-022-00 Pine Creek Ranch Acquisition (BPA)

CTWSRO are currently developing a Watershed and Management Plan for maintaining and facilitating the recovery of watersheds and wildlife habitat on Pine Creek Ranch with the assistance of OSU, BLM, ODFW, OMSI, and other agencies. This site specific management plan will be reviewed by BPA, as specified in the MOA between BPA and the Tribes. The MOA further specifies that this plan "will focus on habitat management designed to achieve and maintain native habitat that is naturally self-sustaining". Implementation of this plan is dependent upon receiving adequate funding from BPA.

133 1999-010-00 Mitigate Effects of Erosion on Salmonid Habitat - Pine Hollow (BPA)

Implement practices to reduce upland erosion, reduce flooding, and active recovery of riparian areas on Pine Hollow and Jack Knife Creeks. Specific actions include improve range management, install spring development for better livestock distribution and relocation from the riparian area, reseeding critical areas, install field terracing, water and sediment control basins, establish riparian pasture management, establish cross fencing for better livestock distribution, establish ungrazed buffer strips, and plant native woody species in riparian areas.

134 2000-015-00 Oxbow Ranch Acquisition (BPA)

The John Day River subbasin is one of national biological significance, being the second longest free-flowing stream in the continental United States and one of only two river systems in the entire Columbia River basin managed exclusively for wild anadromous fish. The upper Middle Fork John Day River, where Oxbow Ranch is located, has been identified as a high priority area in the John Day basin since the early 1970's. Project efforts on the upper Middle Fork (on private lands) have focused on improving fish passage over irrigation diversions, installation of riparian corridor fences, and fee title acquisition of critical habitat areas. Under the NPPC's Fish and Wildlife Program, the Tribes acquired the Oxbow Ranch on the Middle Fork John Day River in 2001 and began implementation of management activities. Ongoing management proposed for consideration under this proposal is related to three particular resource areas: 1) enhancement of upland and riparian habitats through noxious weed control; 2) improvement of river/riparian/floodplain habitats by removing historic mine tailings; and 3) improving instream flows by constructing headgates to allow some or all of the property water rights to be converted to instream flows. The Oxbow Ranch is composed of 1,022 acres, split about evenly between upland and river corridor lands (Figure 3). In addition to containing critical habitats for fish and wildlife species the ranch also holds certificates for senior water rights totaling approximately 5.5 cfs to the Middle Fork and key tributaries (see www.cbfwa.org, to review the original Oxbow Acquisition Project Proposal for a complete description of property resources).

135 2000-031-00 North Fork John Day River Subbasin Anadromous Fish Habitat Enhancement Project

The project goal is to protect and enhance habitat for improved natural production of indigenous, wild spring Chinook salmon and summer steelhead on private and public lands in the upper North Fork of the John Day River Basin. Project objectives include: (1) identifying habitat impacts, seeking public solutions to detrimental land use practices and integrating headwater protection strategies on public lands, (2) implementing habitat enhancements on private lands, and (3) collecting baseline data and conducting post-project monitoring of habitat improvements. This project is consistent with Northwest Power Planning Council (NPPC) Measure Numbers 7.6, 7.7 and 7.8. The project entails coordinated, cooperative efforts to protect and improve anadromous fisheries habitat on a comprehensive watershed management basis. Improved habitat quality will provide increased juvenile and adult freshwater survival and result in greater offspring out-migration. Habitat limiting factors have been identified by the tribes and agencies in various documents over the past 15 years. This information will be relied upon to assist the project with prioritization of habitat needs. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) will implement passive, natural recovery processes in combination with intensive native revegetation efforts to restore anadromous fish habitat on private lands in the upper North Fork of the John Day River Subbasin. Passage barriers may be remediated, banks may be stabilized and instream structural work may be initiated within the project area. The CTUIR will integrate protection of public owned headwater sanctuaries with private land restoration efforts. This will be achieved through coordination with the Umatilla National Forest and private landowners in the upper watershed. Short-term (three to five years) project effects shall include native plant community recovery, increased stream bank stability, and increased stream channel shading. Long-term (25 to 100 years) project effects shall include changes in hydrological features, vegetation succession, channel narrowing, cooler stream temperatures, reduced sediment input, increased wood recruitment, greater riparian and in-stream habitat diversity, and increased bird, mammal, macroinvertebrate and salmonid populations. Pre and post-project monitoring shall include: (1) stream channel transect measurements, (2) summer (with foliage) and fall (without foliage) photo documentation, (3) modified Hankin and Reeves physical surveys, (4) summer and fall macroinvertebrate sampling, (5) biological sampling, and (6) stream temperature monitoring. Project success will be evaluated by changes in: (1) channel width to depth ratios, (2) vegetative response, (3) riparian solar input, (4) pool to riffle ratios, (5) macroinvertebrate and salmonid abundance and diversity, and (6) stream temperatures.

136 2001-023-00 15 Mile Water Rights Acquisition (BPA)

Complete temporary and permanent water rights in the 15 Mile Subbasin. This includes outreach, education, data management, acquisitions, and monitoring to determine if water purchased is staying in stream.

137 2001-040-00 Wagner Ranch Acquisition (BPA)

The Wagner Ranch is a 9,253 acre property located nine miles south of Clarno, Oregon. The Ranch is one of the last remaining pieces to be acquired for contiguous protection of riparian habitat along the lower John Day River. The Wagner Ranch abuts the Pine Creek Ranch, which is owned by the CTWSRO and was purchased for conservation purposes under the Northwest Power Planning Council's Columbia River Fish and Wildlife Program. Management of Wagner Ranch will compliment management actions on Pine Creek Ranch. The project will benefit a rich and diverse group of fish, wildlife, and plant species. Wagner Ranch potentially supplies habitats for at least 36 animal and plant species that are listed as sensitive, threatened or endangered. Target wildlife species identified in the Columbia River hydropower loss assessments that would benefit from this project include mink, great blue heron, Canada goose, mallard, yellow warbler, spotted sandpiper, bald eagle and osprey. The property also provides important habitat for deer, elk and has the potential for bighorn sheep reintroduction. Fish species that would benefit from this project are spring Chinook salmon, summer steelhead and Pacific lamprey. The Wagner Ranch has 10 miles of mainstem frontage, 215 primary water right acres and a 4,349 acre BLM grazing allotment attached to the property.

138 2001-041-00 Forrest Ranch Acquisition (BPA)

Acquire approximately 820 acres of land, 8.6 cfs of water rights, and 6.0 miles of river habitat on the upper Middle Fork John Day River and 3,503 acres of land, 16.6 cfs of water rights, and 6.2 miles of river habitat on the upper mainstem John Day River known as the Forrest Ranch, which is currently in private ownership. The Middle Fork tract has been the highest priority restoration project in the John Day basin since 1971 and contains the highest density of spawning spring chinook salmon in the entire basin and critical spawning habitat for summer steelhead, a federally listed species. The John Day tract represents over 1.5 miles of mainstem habitat, one of the last remaining "gaps" in the riparian fencing program above Prairie City, and currently is the downstream distribution of any significant spawning and rearing for spring Chinook and summer steelhead. Due to historic degradation of rearing area, both parcels remain critical limiting factors for anadromous fish production.

139 2001-069-00 Oregon Water Trust Early Action Project (BPA)

In response to draught conditions and the special Action Solicitation, OWT acquired 15.32 cfs on a one year lease basis in tributaries of the Middle Fork and Main Stem John Day River. These tributaries, Clear Creek and Vinegar Creek on the Middle Fork and Bridge Creek on the Main Stem are occupied by steelhead for rearing and spawning. ODFW District Fish Biologist for the John Day helped prioritize these water rights and thinks that the acquisitions were very important for steelhead.

140 1999-008-00 Columbia Plateau Water Rights Acquisition (BPA)

Complete temporary and permanent water rights in the Oregon side of the Columbia Plateau. This includes outreach, education, data management, acquisitions, and monitoring to determine if water purchased is staying in stream

141 1998-016-00 Salmonid Productivity, Escapement, Trend, and Habitat Monitoring in the Oregon Part of the Columbia Plateau Province (BPA)

Monitor status and trends in abundance of spawning adult, rearing juvenile, and outmigrant steelhead/O. mykiss and some habitat attributes in the John Day subbasin and potentially other Oregon subbasins in the Columbia Plateau Province. PIT-tag outmigrating juvenile steelhead, analyze age structure, estimate migration timing and survival through mainstem Columbia R. dams, and SAR rates based on PIT-tag detections. Similar monitoring will be conducted for spring chinook in the John Day subbasin.

142 2000-017-00 Kelt Reconditioning Research (BPA)

Test methods of reconditioning wild steelhead kelts to help increase the contribution of repeat spawners toward rebuilding depleted populations.

143 2002-006-00 Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers (BPA)

This project radio-tags bull trout that are captured at the Tucannon Hatchery weir, in the lower Tucannon R., and in the juvenile fish facilities at Corps dams on the lower Snake R. Most of the bull trout captured and radio-tagged in the Tucannon R. are expected to be migrant adults that spend the non-spawning seasons of the year in the mainstem Snake R. reservoirs, particularly Lower Monumental pool. Detections of these radio-tagged specimens via mobile tracking and fixed-receivers will document how bull trout use the mainstem Snake R. and estimate how they are/could be affected by FCRPS operations.

144 2002-033-00 John Day Recovery Monitoring (BPA)

Assess resource recovery from past restoration activities, evaluate trends in resource recovery resulting from the ongoing watershed program, and identify the current condition and trends in resources as a background to other ongoing evaluations.

145 1983-319-00 New Marking and Monitoring Techniques (BPA)

All of the projects in the mainstem research/monitoring group rely on information gathered from PIT-tagged fish. This project addresses how to expand the current PIT-tag interrogation and tagging technologies to enable the fisheries community to successfully carry out the actions, research, and monitoring activities outlined in the 2000 BIOP and systemwide passage summary. Its goal is to satisfy the need for PIT-tag interrogation systems that will collect data on migrating adult salmon through mainstem CRB dams, on juvenile salmon transiting high-flow bypass and surface-collector systems, and all life-stages transiting small streams. Besides project administration, the proposed work has five main research objectives: 1) To upgrade the FS1001A transceiver that was developed to interrogate adult salmonids in fish ladders. The need for in-stream and high-flow detection as well as for larger antennas for future full-flow and counting-station interrogation systems requires modifications to the existing FS1001A transceiver. There are six major areas that will be redesigned – CPU hardware, power supply hardware, analog board, communication interface, display and keypad interface, and software for many of the individual components. Each of these must be individually developed and then interconnected in a layout that minimizes internal noise. The development is a 3-year endeavor with Digital Angel supplying in-kind support. An upgraded transceiver would be able to meet the currently identified needs of the fisheries community plus have the flexibility to meet future, unidentified needs. 2) To develop and evaluate a high-flow interrogation system for the corner collector at Bonneville Dam. If the corner collector designed by the COE is as efficient at attracting juvenile salmonids as the modeling suggests, PIT-tag data that are currently being collected at Bonneville Dam would be lost unless the current interrogation systems can be replaced with an effective high-flow system. This will be a multi-agency effort to develop this system. The first steps in this effort will involve attending planning meetings to define the structural, technical, biological, and statistical requirements for a high-flow system. This project will then develop and manufacture the antenna systems. It will conduct the biological evaluation by using fish to estimate reading efficiency of the system and to investigate the impact of debris on fish condition. 3) To finish the development of an in-stream interrogation system. The development of the in-stream interrogation systems is in its final stages. The antenna systems still need attention because electromagnetic interference continues to be a problem with the large unshielded antennas. This project will test the interim auto-tuning and multiplexing solutions developed by Digital Angel to determine how effective they are under different environmental conditions. This project will also finish the development and evaluation of different power systems for remote locations. 4) To help convert the flat-plate system for juvenile salmonids at Bonneville Dam to work with FS1001A transceivers. In order to transfer the operations and maintenance of the flat-plate interrogation system from NMFS to PSMFC, the system will be converted to utilize the FS1001A transceiver. NMFS will modify the sample box for the new antenna system. NMFS will also conduct electronic and biological evaluations to ensure that performance of the converted system is acceptable. 5) To adapt the state-of-the-art technology to tagging fish. Tagging technology has not changed significantly in 15 years. This project proposes to investigate different potential technologies to determine if they can be adapted for fisheries applications. For example, adapting video technology to make length measurements during tagging sessions.

146 2001-003-00 Installation of Adult PIT-tag Detection Systems (BPA)

Install adult PIT detection systems at mainstem dams as necessary to support evaluations of SARs for salmonids with different juvenile passage histories, transportation effects on homing, between-dam losses of adults, delayed mortality, and numerous other BiOp studies. This project involves significant cost sharing with the Corps is involved in this project.

147 2001-010-00 Using Induced Turbulence to Assist Juvenile Migrating Salmon (BPA)

Background and Rationale: Downstream migration of juvenile salmonids occurs during the spring runoff season when higher river flows minimize travel time and swimming effort to reach the ocean. The identified problem addressed in this research is the delay in migration caused by the presence of large dams on the Snake, Columbia, and Cowlitz River in Washington and Idaho. Section 5 of the 1994 Columbia River Fish and Wildlife Program (1994) summarized the problem: "Downstream passage is especially dangerous for juveniles because of the effects of dams and slow-moving reservoirs, such as turbine, bypass and spill-related mortalities, predation, migration delays and high water temperatures. The fish are on a biological time clock. To reach the ocean safely, the spring migrants must complete their downstream journey quickly." (page 5-1) Venditti et al. (1991) concur, stating that migration delays in slowly moving forebay waters appeared to be a major factor in prolonging migration time. Early work by Bates (1964) concluded that the length of reservoir may be one of the factors limiting successful downstream migration. It has been shown that the presence of the slow-moving waters in the reservoirs and resultant delays may actually stop and reverse the smoltification process (Thorgaard, personal communication, 1999). Juvenile salmon are delayed in two ways during downstream migration: transit delays caused by slower-moving waters in reservoirs, and passage delays caused by an inability to efficiently find the surface bypass collector (SBC). Swimming delays occur in the reservoir "far field," defined as the reservoir more than 30 meters upstream from the dam (Giorgi et al. 2000). Passage delays occur in the near and intermediate fields (between 0 m and 30 m upstream from the dam). This proposal focuses on providing guidance in the near and intermediate fields of reservoir forebays. Coutant (1998) suggests several methods for incorporating "trails of turbulence" to locations far upstream where waters are unaffected by dams. Such suggestions will be addressed in future projects. Attracting Juveniles to SBCs. Recent studies (Adams et al. 1999) performed at Lower Granite Dam on the Snake River showed that only about 20% of migrating fish came within six meters of the SBC. They showed species-specific differences in behavior and suggested that future consideration be given to species and origin when designing passage systems. Early work focused on increasing local velocity (e.g. Bates, 1964), independent of fluid turbulence. Turbulence for fish deflection was attempted qualitatively by Bates and Vanderwalker (1964) using fluid air jets, but they found that the jets clogged due to debris and rust. Increasing velocity (and the implied turbulence) can deflect fish from a desired course (Coutant, 1998, Swenson, personal communication, 1999). Role of Turbulence in Fish Movement: Salmonids, both juvenile and adult, swim by producing cyclic tailbeats that only slightly deform the fronts of their bodies (subcarangiform movement; Skakiotakis et al. 1999). The tailbeat cycles produce alternating vortices as the fish tail changes direction twice in each tailbeat (Stamhuis and Videler, 1995, Muller et al. 1997). Vortices form rings and an effective jet of fluid flow directed away from the fish (Blickham et al. 1992). Triantafyllou and Triantafyllou (1995) demonstrated that swimming efficiency is increased dramatically by taking advantage of this reverse-directed fluid jet. Maximum swimming efficiency occurs when the frequency of the tailbeat times the width of the wake is equal to about 0.35 times the fish swimming speed (Strouhal number equal to 0.35). They also state that "fish instinctively exert precise and effective control of the flow around their bodies to extract energy from waves, turbulence, and even their own wakes." Spedding (1987) believes that "fish tune their kinematics to produce an optimal wake for maximal hydrodynamic efficiency." Turbulent Assists in Swimming: Some have hypothesized that fish take advantage of naturally occurring turbulence in rivers to further increase swimming efficiency. Triantafyllou and Triantafyllou (1995) comment that "fish encountering vortices sense the pressure variation of the spinning eddies as they move along its side. To capture energy from the vortices and boost swimming efficiency, the fish instinctively times the flapping of its tail to create counterrotating whorls that meet and weaken the encountered ones." Coutant and Whitney (2000) cited qualitative evidence that upstream migrating adult salmon use vortices to accelerate upstream movements. The publication Return to the River, Appendix D (ISG, 1996), adds that once past the dams, adults have been observed to move upstream through the center of "rips" that are shed from bankline protrusions into the river. The same document observes that Spring Chinook smolts moved faster than the bulk flow on the Willamette River, suggesting that they take advantage of vortices from obstructions and accelerated velocities at wave fronts. Turbulence in Waterways: Coutant (1998), summarizing the work of many others, describes turbulent bursts that occur in all waterways. Upward bursts, known as kolk, are responsible for the "upwelling" features at the water's surface, while downward bursts are capable of entraining sediment from the streambed. This normally turbulent environment is greatly dissipated in the forebay region of reservoirs. Measurements of turbulence in the field have progressed rapidly. Recently, Nikora and Smart (1997) used fast-response electronic Pitot tubes and acoustic Doppler velocimetry (ADV) to characterize the turbulence in New Zealand gravel-bed rivers. ADV measurements have also recently been used to measure turbulence in the San Francisco Bay using a profiling technique (Stacey, 2000), and to characterize the hydraulics of flow in an estuary near the Mississippi Gulf Coast (Wilson, 2000).

Computer Simulations: Only recently have we been able to simulate complicated water flow in three dimensions. Regarding the ability to accurately simulate vortex sheets from an object, Demuren and Wilson (1999) show that a special form of the Navier-Stokes equations must be used: the algebraic Reynolds stress model, or ASM. **OBJECTIVE:** The objective of this project is to test the hypothesis that appropriately scaled induced turbulence in the near and intermediate fields of forebays will attract juvenile salmon and guide them to SFB systems. The project has four Tasks, numbered 1, 2, 3, and 6. Tasks 4 and 5 will be performed in future work, while Task 6 is scheduled for the first year and for ensuing years. Each Task and Activity will be described. A time schedule follows in Table 1. **PROJECT DESCRIPTION - Task 1: Characterize turbulence in salmonid-bearing rivers.** The first step in understanding if juvenile salmon respond to appropriately induced turbulence is to characterize naturally occurring turbulence in salmonid-bearing waters. This Task will be accomplished by measuring turbulence in areas free from and influenced by obstructions (rocks). All data will be analyzed to characterize (1) turbulent kinetic energy; (2) turbulent bursts; and (3) eddy size. It is anticipated that eight activities will be required. **Activity 1.1: Literature review for platform design.** Approach: The submitted proposal listed several studies that used acoustic Doppler velocimeters (ADV) for measuring velocities and for subsequently characterizing turbulence. The authors of these papers will be contacted to request details of their platform designs, and the literature review will be updated to include any studies published since October 2000. **Schedule: May 2001. Activity 1.2: Platform design.** Approach: A platform will be designed to carry the ADV and associated hardware. Essential features of the platform will include a movable trolley to allow for accurate lateral and vertical positioning of the instrument, a compass, bi-direction levels, and telescoping or adjustable legs. It is anticipated that the platform will measure approximately 1m by 1-m and stand 1 m high. A field visit to the USGS Spokane office will be made to discuss how they deploy their acoustic Doppler current profilers (ADCPs) for discharge measurements. **Schedule: June 2001. Activity 1.3: River selection.** Approach: Two or three rivers will be selected for turbulence measurements. Selection criteria include (1) presence of Spring Chinook and Steelhead; (2) access to the site; and (3) nature of flow during the summer of 2001. Actual measurements will proceed for most of the summer season, so the river selections will be staged such that access is available during the anticipated measurement periods. A two-day field trip through the region is likely for this activity which will take place while the platform is being constructed. **Schedule: June 2001. Activity 1.4: Platform construction.** Approach: The platform for measurements will be constructed in the Albrook Hydraulics Laboratory shop according to the design completed in Activity 2. No more than one week should be required for the relatively simply construction. **Schedule: July 2001. Activity 1.5: Test measurements.**

Approach. Test measurements will be made in the South Fork of the Palouse River near the WSU campus. Although salmonids are not present, the purpose of the test measurements is to finalize and test the protocol that will be used during Activity 6. Measurements will be taken, filtered, and examined to review sampling location, frequency, and consistency. Schedule: July 2001.

Activity 1.6: Perform measurements. Approach. Turbulence measurements will be taken in the presence and in the absence of obstructions at each selected site. One sampling day will consist of at least one set of measurements both with and without obstructions. Obstructions will be selected that represent a range of relative roughness values from less than one to greater than one, where relative roughness is the ratio of rock height to flow depth. The extent of the downstream wake region (and suspected eddy size) will be determined using a Price current meter by observing at what locations flow ceases to recirculate and again flows downstream. The sampling zone will then be divided into ranges shown in Figure 1. Figure 1. Approximate sampling grid for ADV measurements. Turbulence measurements will be taken at the grid intersections whose location depends upon the width of the flow disturbance and the depth of flow. It is anticipated that each measurement will be taken for approximately two minutes, requiring at least 80 total minutes for each set of obstruction-present measurements. With no obstruction in place, only two verticals and two horizontal ranges will be used requiring a total of eight measurements. Only one set of measurements (obstructed + non-obstructed) will be scheduled each day; sampling progress will proceed faster if possible. Schedule: July - August 2001.

Activity 1.7: Analyze data. Approach. Data will be analyzed upon returning to the lab in two steps. The first step will filter the data and discard spurious measurements using the software package WINADV. Once the datasets have been cleaned, each set will be analyzed for (1) turbulent kinetic energy; (2) turbulent bursting, and (3) approximate eddy size. Each analysis step is briefly described below. Turbulent kinetic energy: The turbulent kinetic energy terms will be calculated by using the information collected from the fluctuating velocity component measurements. The spatial variation of the kinetic energy will be evaluated using the turbulent intensity terms. Turbulent bursting. Using the method of Papanicolaou et al. (2001) and Lu and Willmarth (1973) measurements that quantify the number of bursts per measuring location will be identified. This will provide the energy of bursts, and the probability of occurrence of the bursts per location. Approximate eddy size. The eddy size will be approximated using the Taylor's frozen hypothesis. This hypothesis assumes that on an average, the eddies have a constant volume as long as turbulence remains isotropic (the energy distribution is the same in each direction). The spatial distribution of eddies will be evaluated in this study at different locations. Schedule: July - August 2001.

Activity 1.8: Progress report. Approach: A progress report will be written following Task 1 to summarize progress and show the turbulent characteristics of natural flow with and without obstructions. The turbulence description will be the basis for Task 2 explained below. Schedule: August 2001.

Task 2.- Replicate turbulence in portable fish raceway. Activity 2.1: Transport the raceway flume to WSU and set up for testing. Approach: A portable raceway flume owned by the USGS Columbia River Research Lab in Cook, Washington, will be transported to the Albrook Hydraulics Laboratory in Pullman for turbulence tests. After arrival, the flume will be fitted with (1) a through-flow water system, and (2) a measurement support system along the top of the flume. The measurement support system will be designed to allow the easy and accurate placement of the lab ADV used in Activity 2. Schedule: July 2001.

Activity 2.2: Identification of the fully developed flow conditions in the raceway. Approach: The test measurement section must be located in the raceway where flow is fully developed: that is, the flow is no longer affected by the entrance or wall conditions. The beginning location will be determined by plotting the streamwise velocity profile at different locations in the longitudinal direction of the raceway as measured with a laboratory ADV. Flow has reached a fully developed condition where the profile no longer changes in the downstream direction. Schedule: July 2001.

Activity 2.3: Replicate turbulent flow conditions in the raceway. Approach: The characteristics of the turbulence measured in the field will be replicated in the laboratory by ensuring that the eddy parameters from the field are reproduced faithfully in the raceway. Eddy parameters include kinetic energy and both generation and spatial frequency. Several devices will be used to induce the artificial turbulence, including water jets and mixers. The exact protocol used will depend upon the results of Task 1, but it is anticipated that both single units and units in series will be used in steady and unsteady modes. A steady mode will be characterized by a constant water discharge, whereas an unsteady mode will produce cyclic or pulsating discharges. Schedule: August -November 2001.

Activity 2.4: Measurements of turbulence. Approach: Measurements will be performed by means of an ADV (lab version) while statistical packages developed in-house will be used to provide information about the statistical characteristics of turbulence. The measurements will be performed both with and without the presence of obstructions following the blueprint of measurements performed at the field. Schedule: August - November 2001.

Activity 2.5: Analysis of the data. Approach: The analysis will improve our understanding of various turbulence generation processes. Methods that can be used to control the level of turbulence will be developed. A time series will be performed to identify the convection velocity of eddies and the frequency of occurrence of the peak events. Schedule: August 2001 - February 2002.

Activity 2.6: Scale the data back to the field conditions. Approach: The data collected during the laboratory measurements will be scaled by using the following conditions: 1) the ratio of the kinetic energy at the prototype and the model should be constant and 2) the ratio of frequency at the prototype and the model should be constant. By doing so we will ensure that conditions found at the prototype can be simulated by performing modeling work at the laboratory where the experimental conditions are well controlled. Schedule: November 2001 - February 2002.

Activity 2.7: Progress report. Approach: A progress report will be written following Task 2 to summarize progress and show the success in replicating natural turbulence in a laboratory setting. This turbulence will be used to test the project hypothesis in Task 3. Schedule: March 2002.

Task 3: Determine preferential fish swimming paths. Activity 3.1: Identify test site. Approach: We expect the test site to be located at the Columbia River Research Laboratory of USGS. The site has temperature controlled White Salmon River and well water available. However, depending on the findings in Tasks 1 and 2 alternative sites may be sought. If findings indicate the portable raceway is of inadequate size with significant edge effects that distort the test flow patterns then we may seek alternative study sites. Some alternatives include larger concrete raceways at other locations, adult holding structures at National Fish Hatcheries, and net pen enclosures in the forebay of a small hydroelectric dam. Schedule: May-September 2001.

Activity 3.2: Identify source of test fish. Approach: The source and physiological status of fish used in the proposed experiments is a critical issue. To some extent, the final site selection will determine the source of juvenile Chinook and steelhead used in the experiments. We will conduct preliminary experiments with juvenile salmonids reared in hatcheries so that we do not impact wild or hatchery migrants. After developing and testing final protocols for the experiments, we will locate a source of juvenile salmonids that have experienced some in-river migration. The experience of in-river migration of juvenile salmon is generally associated with development of measures of smoltification (i.e., increased ATPase, silvering, reduced condition factor). The change in status of smoltification of fish is important because it is associated with a change in the disposition to migrate and may be associated with a change in the behavioral response to water velocity and turbulence. Schedule: May-September 2001.

Activity 3.3: Setup test raceway, video system, and acoustic camera at the Columbia River Research Laboratory for testing equipment. Approach: We plan to assemble the test raceway, video system, and acoustic camera at the Columbia River Research Laboratory to perform initial equipment testing. This will allow the researchers to fine-tune the test apparatus without having to travel to the test site identified in Activity 3.1. This activity will help to reduce overall cost by minimizing expenses associated with travel and transportation. Schedule: December 2001 - March 2002.

Activity 3.4: Test video system precision and accuracy. Approach: Stereocinematographic techniques described in Boisclair (1992) will be used to observe and position fish in the portable raceway. Three pairs of video cameras will be positioned along the length of the raceway and aimed through viewing ports in the raceway. Overlapping the field of view of the stereo pairs will be necessary to ensure the

entire raceway volume is recorded on video. Video images will be processed by a quad videoprocessor to ensure temporal synchrony of images from each stereo pair of cameras. Jandel video analysis software (JAVA) will be used to determine the position (X,Y,Z coordinates), movement and speed of each test fish throughout the test raceway. Schedule: December 2001 - March 2002.

Activity 3.5: Test acoustic camera precision and accuracy. Approach: Additional fish position data will be collected using an acoustic camera. Recent advances in sonar technology have enabled engineers at the University of Washington's Applied Physics Laboratory to design a dual-frequency identification sonar (DIDSON) that provides very-high resolution, near video quality images for inspection and identification of objects underwater. It operates at two frequencies (1.8 MHz and 1.0 MHz), to obtain sharp images from 1 m to over 30 m in range. We plan to test this unit to evaluate its potential application as a tool for determining fish behavior. Schedule: December 2001 - March 2002.

Activity 3.6: Setup test raceway, video system, and acoustic camera at test site chosen in Activity 3.1. Approach: The test raceway, video system, and acoustic camera will be moved to the test site identified in Activity 3.1. Setup and calibration time will be minimized having previously tested the components in Activities 3.3-3.5. Schedule: March-April 2002.

Activity 3.7: Conduct tests with test fish. Approach: Actively migrating smolts will be introduced into a test raceway with a predetermined hydraulic signature to determine their response to differing degrees of turbulence and hydraulic complexity. Actively migrating juvenile Chinook salmon and steelhead smolts will be obtained to serve as test fish for the turbulence flume tests. Test fish will be held 24 h prior to testing to allow sufficient recovery from any stress or injury that may have occurred during collection. Tests will consist of introducing single fish (50 juvenile Chinook and 50 juvenile steelhead) into the portable raceway while recording the X, Y, and Z positions of the test subject for 1 h using stereocinematographic techniques (Boisclair 1992). In addition, 10 groups of 10 test subjects (5 groups of each species) will be introduced into the portable raceway to determine if social interactions may affect fish behavior relative to the turbulent signature. Water velocity vectors and turbulence coefficient data acquired in Task 2 will be partitioned into cells of differing scale, from the approximate size of a smolt up to 0.5 m³ in size. Resulting fish data from the tests will consist of: 1) fish presence or absence in cell, 2) total time spent in each cell, 3) number of times fish enters cell, 4) direction of fish entry and exit of cell, 5) the orientation of each fish in a cell (head/tail first), 6) tailbeats per unit of time in each cell, 7) swimming speed, and 8) acceleration rates. Schedule: May-September 2002.

Activity 3.8: Perform data analysis and complete annual report. Approach: Logistic regression analysis will be used to assess whether water velocity vectors and turbulence coefficients can predict use or nonuse of turbulent areas. Logistic regression has no assumptions about the distribution of the predictor variables; predictors can be any mix of continuous, discrete and dichotomous variables. Logistic regression however is sensitive to extremely high correlations among the predictor variables. Univariate logistic regression will be used to assess a variable's significance in explaining the probability of use. Linearity between the predictor and the logit will be evaluated using the method described by Demaris (1992). If the variable is found to be highly nonlinear, then design variables may be created to best represent potential functional responses. The importance of each variable in the model will be verified by a stepwise removal method and compared through the likelihood ratio test (Hosmer and Lemeshow 1989). Once the significant variables are identified, diagnostics will be run to detect the presence of interactions and influential outliers using SAS (SAS 1995). Significant interactions will be assessed for dependence on influential outliers and for biological importance. How well the data used to derive the model fits the model will be evaluated using the Hosmer and Lemeshow (1989) chi square goodness of fit statistic and by comparing the results of a biased cross-classification and an unbiased classification table. A biased classification is created by predicting presence and absence for the samples that are used to derive the coefficients. An unbiased classification table will be created using a jackknife technique (SAS 1995) to classify observations as present or absent using a probability cutpoint of 0.5. How well the model classifies the observations using the classification table will be used as one way of judging the validity and predictive ability of the model. How well the model predicts presence and absence in turbid areas will be tested using cross-validation. Because the classification coefficients usually work too well for the sample from which they were derived, it is desirable to know how well the coefficients predicted presence and absence for a holdout data set. The percent correct classified for the presence and absence samples, and the total percent correctly classified will be calculated so that the model can be evaluated with respect to whether it is better at classifying presence or absence. Output from the model will consist of rules of fish behavior within and around turbulent plumes and may be used to optimize the use of induced currents and surface bypass systems in the forebays of mainstem dams to pass fish safely and efficiently. Schedule: September-December 2002.

Task 6: Perform CFD experiments to reproduce results from Tasks 1 and 2 to simulate a swimming fish. To support the activities in tasks 1 and 2, numerical simulations will be performed with the computer code U2RANS. These simulations will be validated with field data collected in earlier tasks and will allow deeper understanding of the higher-order flow hydrodynamics by interrogation of the flow field using a very fine scale numerical grid. Simulations of flow around a swimming fish will be included, but only in a uniform flow field. More advanced simulations will be performed in upcoming years.

Activity 6.1: Literature review of turbulence data, turbulence simulation and U2RANS. Approach: A very important hypothesis in this work is the response of salmonids to turbulence, therefore, continual effort will be made to review the most relevant literature related to experimental measurements of turbulence and numerical simulation of turbulence. Although it is expected that this will be an ongoing task, the project team will expend additional effort during the early stages of the project reviewing the literature. In addition, the doctoral student appointed to conduct the simulations will review relevant literature describing the numerical engine, U2RANS. Schedule: May - July 2001.

Activity 6.2: Student training for Gridgen and U2RANS. Approach: The student appointed to conduct the numerical simulations will travel to the University of Iowa and spend two work-weeks being trained to use the Gridgen, U2RANS and Tecplot software packages. During this time, the student will receive focused instruction from permanent and post-doctoral research staff. Schedule: June 2001.

Activity 6.3: Development of the numerical model grid for the laboratory flume. Approach: During this activity, the grid for the numerical model flume will be developed. Simulations will be conducted to ensure the appropriateness of the boundary conditions and validation with experimental data will ensure that the simulations are providing meaningful results. Schedule: June - July 2001.

Activity 6.4: Simulation of bed forms. Approach: The numerical model will be used to perform simulations of the flume grid with varying bed conditions. These conditions will include a smooth bed, smooth sand bed, dune bed formations and cobble bed. These simulations will be compared with experimental data where possible to validate the velocity profiles, turbulence production and turbulence dissipation. Schedule: July - November 2001.

Activity 6.5: Simulation of smooth bed flume with circular steady wall jet. Approach: The numerical model grid will be modified to include a steady-state circular wall jet. The flow simulations will be interrogated for the mixing length of the jet, turbulence dissipation and turbulent kinetic energy. Simulations will be compared with available data in the literature. Schedule: September - December 2001.

Activity 6.6: Simulation with a series of steady-state wall jets. Approach: Simulations will be conducted with a series of circular wall jets to investigate their mixing and dissipation processes. Data from this step will be interrogated to determine the spacing of jets that may have the most likelihood of efficiently guiding juvenile salmonids. Schedule: November 2001 - January 2002.

Activity 6.7: Simulation of swimming fish in smooth flume. Approach: Simulations will be conducted with a swimming fish fixed in one location for flow in a smooth bed flume. This step will investigate the effects of fish location relative to the bed and walls and ascertain whether the flume boundaries are affecting the flow field around the simulated fish. Schedule: January - April 2002.

148 1996-021-00 Gas Bubble Disease Research and Monitoring of Juvenile Salmonids (BPA)

Project history: This project was initiated in 1996. Previous work, consisting of the hands-on monitoring in the regional Biological Monitoring Program, was conducted under project BPA # 8740100: Assessment of smolt condition for travel time analysis. Additional work was also conducted under BPA # 8200300, Significance of predation and development of prey protection measures for juvenile salmonids in the Columbia and Snake river reservoirs. Previous costs were \$2,361,919.00. Annual reports for 1995 through 1999 have been submitted to BPA. Reporting since 1999 has been to the National Marine Fisheries Service for inclusion in their annual report of gas supersaturation. Six publications in peer-reviewed journals have been produced: five under BPA project #9602100 (Beeman et al. 1998; Weiland et al. 1999; Hans et al. 1999; Mesa et al. 2000; Beeman and Maule 2001) and one under BPA project #8200300 (Mesa and Warren 1997). Data on vertical and horizontal distribution of individuals were collected during three years (1997 through 1999), and we are in the final stages of analyzing those data for the final report and two or more peer-reviewed publications. We have completed the tasks associated with this project, but continue to provide training and QA/QC for the ongoing monitoring by the Smolt Monitoring Program (SMP) of juvenile salmonids during their seaward migration. Publications: 1) Beeman, J.W., P.V. Haner, and A.G. Maule. 1998. A new miniature pressure-sensitive radio transmitter. 2) North American Journal of Fisheries Management. 18:458-464. Beeman, J.W., and A.G. Maule. 2001. Residence times and diel passage distribution of radio tagged juvenile spring chinook salmon in a gateway and fish collection system of a Columbia River dam. North American Journal of Fisheries Management 21:455-463. 3) Hans, K.M., M.G. Mesa, and A.G. Maule. 1999. Rate of disappearance of gas bubble trauma signs in juvenile salmonids. Journal of Aquatic Animal Health 11: 383-390. 4) Mesa, M.G., L.K. Weiland, and A.G. Maule. 2000. Progression and severity of gas bubble trauma in juvenile salmonids. Transactions American Fisheries Society 129: 174-185. 5) Mesa, M.G. and J.J. Warren. 1997. Predator avoidance ability of juvenile chinook salmon (*Oncorhynchus tshawytscha*) subjected to sublethal exposures of gas supersaturated water. Canadian Journal of Fisheries & Aquatic Science 54:757-764. 5) Weiland, L.K., M.G. Mesa, and A.G. Maule. 1999. Influence of infection with *Renibacterium salmoninarum* on susceptibility of juvenile spring chinook salmon to gas bubble trauma. Journal of Aquatic Animal Health 11:123/129.

149 1997-024-00 Avian Predation on Juvenile Salmonids (BPA)

The USGS-Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, and the Columbia River Inter-Tribal Fish Commission initiated a study in 1997 to assess the impacts of piscivorous waterbirds (i.e., gulls, terns, and cormorants) on the survival of juvenile salmonids in the lower Columbia River. Virtually every evolutionarily significant unit (ESU) of anadromous salmonid in the Columbia Basin is currently or soon will be listed as threatened or endangered under the U.S. Endangered Species Act of 1973. Regional plans for Columbia Basin salmon recovery have recommended that avian predation be thoroughly investigated, along with other salmonid mortality factors, and managed if warranted. Investigations indicated that Caspian terns nesting on Rice Island, a dredged material disposal island in the Columbia River estuary, were the most significant avian predator of juvenile salmonids on the lower Columbia River. The Rice Island tern colony consisted of about 15,000 breeding adults, the largest known colony of Caspian terns in the world. In 1997, Caspian terns nesting on Rice Island consumed between 5 and 10 million salmonid smolts, or 5-10% of the estimated number of smolts to reach the estuary. In 1998, the colony consumed between 8 and 14 million salmonid smolts, or 8-15% of the estimated number of smolts to reach the estuary. The magnitude of Caspian tern predation on juvenile salmonids in the Columbia River estuary in 1997 and 1998 prompted regional fish and wildlife managers to investigate the feasibility of management initiatives to reduce the impact of tern predation on smolt survival in the estuary. A pilot study was conducted in 1999 to test the feasibility of colony relocation as a way to reduce the magnitude of Caspian terns predation on juvenile salmonids. Using habitat modifications and social attraction (i.e., tern decoys and audio playbacks) to encourage nesting on East Sand Island and grass planting, fencing, and harassment of terns to discourage nesting on Rice Island, approximately 1,400 nesting pairs were relocated from Rice Island to East Sand Island in 1999. Terns nesting on East Sand Island consumed roughly 40% fewer juvenile salmonids compared to terns nesting on Rice Island, presumably due to the proximity of East Sand Island to marine habitats. Based on these results, regional fish and wildlife managers decided to pursue a long-term management plan to relocate terns nesting on Rice Island to East Sand Island and other restored colony sites outside the Columbia River Estuary to reduce smolt losses to terns. The management plan in 2000 sought to prevent all nesting by Caspian terns on Rice Island and to attract all the terns that formerly nested at Rice Island to 4 acres of tern nesting habitat on East Sand Island. However, a court-ordered temporary restraining order precluded the elimination of all tern nesting on Rice Island. Nevertheless, 94% of the terns nesting in the estuary chose the colony site on East Sand Island. Juvenile salmonids comprised only 44% of the diet of terns nesting at East Sand Island, compared to 91% of the diet of terns nesting at Rice Island. The relocation of nearly all the nesting terns from Rice Island to East Sand Island resulted in a sharp drop in consumption of juvenile salmonids. Total consumption of juvenile salmonids by Caspian terns nesting in the Columbia River estuary in 2000 was estimated at 7.3 million (95% confidence interval: 5.7 - 9.3 million). This represents a reduction in smolt consumption by terns of about 4.4 million (38%) compared to the 1999 consumption estimate. In 2001, all Caspian terns nesting in the Columbia River estuary nested on restored habitat on East Sand Island. The estimated size of the East Sand Island colony (9,100 pairs) was not significantly different from 2000, suggesting that the tern breeding population is no longer increasing, as it was in the 1990's. Tern nesting success at the East Sand Island colony in 2001 (1.3 young raised per nesting pair) was the highest ever recorded for Caspian terns nesting in the Columbia River estuary, apparently a reflection of high forage fish availability. The proportion of juvenile salmonids in the diet (33%) was the lowest ever recorded for terns nesting in the estuary. This resulted in another decline in consumption of juvenile salmonids by terns in the Columbia River estuary; consumption in 2001 was estimated at 5.9 million smolts (95% c.i.: 4.8 - 7.0 million smolts). This represents a reduction in smolt consumption by terns of about 5.9 million (50%) compared to the 1999 consumption estimate. To achieve further reductions in annual consumption of juvenile salmonids by Caspian terns in the Columbia River estuary, regional resource managers are considering the restoration of tern colonies outside the estuary and the relocation of a portion of the East Sand Island colony to these alternative sites. The East Sand Island tern colony is currently the nesting site for about two-thirds of all Caspian terns in the Pacific Coast population. Redistribution of a portion of the East Sand Island tern colony to a number of restored Caspian tern colonies would improve the outlook for conservation of Caspian terns, as well as Columbia Basin salmonids. Caspian tern colonies on or near the mid-Columbia River show little promise as alternative nest sites for terns currently nesting in the estuary. The tern colony on Three Mile Canyon Island, which formerly consisted of 200-400 breeding pairs, completely failed in 2001 for the second year in a row due to mink predation. The tern colony on Crescent Island (ca. 720 breeding pairs) increased 26% compared to 2000 and experienced good nesting success (0.84 young raised per breeding pair). But juvenile salmonids comprised 68% of prey items, suggesting that adult terns shifting from the East Sand Island colony to the Crescent Island colony would have a greater impact on survival of juvenile salmonids. Also, the high density of tern nests on Crescent Island and the high nesting densities of gulls on the remainder of the island suggest that there is little opportunity for expansion of the Crescent Island tern colony. The best prospects for restoration or augmentation of Caspian tern colonies seem to exist on the coast of the Pacific Northwest. The welfare of other listed or beleaguered salmonid stocks has been a primary concern in coastal areas under consideration for restoration of Caspian tern colonies, yet for most former coastal colony sites there is little or no evidence that juvenile salmonids were a significant component of tern diets. Restoration of permanent colony sites for Caspian terns along the coast of the Pacific Northwest appears unlikely without empirical evidence that local salmonid stocks will not be at risk. In 2001, we tested the feasibility of attracting Caspian terns to nest on barges as temporary colony sites so that the suitability of alternative sites for tern colony restoration can be assessed. A small barge covered with sand and equipped with tern decoys and audio playback systems was anchored in Commencement Bay, Washington. Caspian terns began nesting on the barge within one month of deployment. Approximately 388 tern nests were initiated on the barge at a density of 1.5 nests/m², the highest Caspian tern nest density reported in the Pacific Northwest. Tern diets were 65% juvenile salmonids; a variety of marine forage fishes comprised the remainder of the diet. The barge was removed prior to hatching of tern eggs because of a breakdown in inter-agency coordination on the project. Nevertheless, the study demonstrated that Caspian terns can rapidly colonize a suitable barge and that temporary colonies on barges can help assess prospective colony restoration sites along the coast of the Pacific Northwest. The rapid and overwhelming response of Caspian terns to the habitat provided on the barge in Commencement Bay is strong evidence for the acute shortage of suitable nesting habitat along the coast of the Pacific Northwest. Developing and implementing a Columbia River Avian Predation Management Plan is a cooperative effort with input from many agencies and stakeholder groups. Specifically, an Interagency Avian Predation Working Group was formed in May 1998 to take the lead in developing and implementing short- and long-term management plans to reduce the impacts of piscivorous waterbirds on survival of juvenile salmonids in the lower Columbia River. The Working Group includes representatives from the U.S. Army Corps of Engineers, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Northwest Power Planning Council, Bonneville Power Administration, Oregon Division of State Lands, U.S. Department of Agriculture - Wildlife Services, Oregon State University (OSU), U.S. Geological Survey, Columbia River Inter-Tribal Fish Commission (CRITFC), Real Time Research (RTR), Audubon Society of Portland, and National Audubon Society. As participants in the Working Group, OSU, USGS, CRITFC and RTR researchers will provide technical assistance to managers in developing, monitoring, and evaluating these plans. Specifically, we will (1)

identify those piscivorous waterbird populations (i.e., terns, cormorants, and gulls) that pose the greatest risk to smolt survival, (2) test the feasibility of different management initiatives to reduce avian predation on smolts, (3) monitor and evaluate the effectiveness of those initiatives once fully implemented, and (4) recommend changes to existing management plans to maximize benefits to juvenile salmonids, while maintaining or enhancing the status of managed bird populations.

150 1998-035-01 Watershed Scale Response of Habitat to Abandoned Mine Waste (BPA)

Description of the Proposed Action: The University of Washington, College of Forest Resources and the Center for Streamside Studies in Seattle, Washington, is to be funded by the BPA to conduct a three-year research project to measure the watershed scale response of stream habitat to abandoned mine waste, the dispersion of metals, and their effects on biota in the Methow River basin. The objectives of this project are to 1) identify specific pathways and processes of metal contamination from source to receptors, 2) estimate metal dispersion in the Methow River, 3) evaluate food chain transfer of metals, 4) recommend guidelines for restoration, and 5) submit peer review journal publications.

151 1988-108-04 StreamNet (CIS/NED) (BPA)

Provides regionally consistent, georeferenced data pertaining to fish and their habitats obtained from the basin's state, tribal and federal fish management agencies via the Internet at www.streamnet.org, and custom data services to FWP participants. StreamNet is a cooperative, multi-agency data compilation and data management project authorized by the Northwest Power Planning Council's Fish and Wildlife Program (FWP). It is funded primarily by the Bonneville Power Administration as part of its program to protect, mitigate and enhance fish and wildlife resources affected by the development and operation of hydroelectric facilities on the Columbia River and tributaries. Other funding has been obtained from agencies including the Environmental Protection Agency and the National Marine Fisheries Service. The Pacific States Marine Fisheries Commission administers the project. Three fourths of the project consists of sub-projects within the state fish and wildlife agencies, Columbia River Intertribal Fish Commission and US Fish and Wildlife Service to develop databases within the respective agencies and facilitate data transfer regionally. In addition to administratively housing the StreamNet sub-projects, these cooperating agencies also contribute in kind support. The kind and amount of support varies between agencies. The StreamNet Project compiles, manages and distributes information related to fish resources in the Columbia River basin, with additional information available for the rest of the Pacific Northwest. The state, tribal and federal fish and wildlife agencies collect and utilize data related to the region's fish and wildlife resources to meet their own mandates. A subset of these data, primarily the annually collected types of information that are routinely used to monitor trends within fisheries and populations and provide management information, are compiled by StreamNet into regionally standardized formats and publicly distributed. In this manner, data common to fisheries management but collected and stored in multiple formats by the individual agencies are standardized and made uniformly available basin wide. StreamNet also ties all data to the regional 1:100,000 scale routed hydrography (GIS stream network) so that different kinds of data can be compared on a geographic basis and mapped. The project utilizes the Internet as its primary means of data distribution, but also provides custom data services to FWP participants. The StreamNet web site provides access to information in a queryable database and also provides maps, individual data sets not contained in the queryable database, and library references. All data in the StreamNet database are referenced to source documents that are housed in the StreamNet Library. Core data include: salmonid distributions, redd counts, peak spawner counts, hatchery releases, hatchery returns, facilities (dams, hatcheries), dam/weir counts, and harvest. Static data include: protected areas, smolt density model results, photographs and pre-built maps. Prototype data include habitat restoration / improvement projects, resident and nongame fish distribution / abundance, barriers, screening, carcass placement, water temperature and macroinvertebrates.

152 2001-074-00 NPPC Regional Data Needs (BPA)

The Northwest Power Planning Council (Council) has called for regional efforts to develop a comprehensive information management system for fish and wildlife in the Columbia River Basin. The Council anticipates this system will result from a collaborative process, involving all entities with decision-making responsibilities in the region. It has agreed in principle to enter into an agreement with the National Marine Fisheries Service aimed at developing such a comprehensive system. Science Applications International Corporation (SAIC) has special expertise in assessing information systems' capabilities and in identifying the steps necessary to integrate and enhance existing systems. This Statement of Work (SOW) outlines the tasks SAIC will undertake to survey the information requirements of all relevant stakeholders in the region as well as their existing information management capabilities. SAIC will produce a report that analyzes current information systems and highlights areas in which existing management capabilities are lacking or in which information needs are greater than currently recognized. The report will also provide a broad-brush inventory of data currently being gathered. Based on the outcome of the user requirements survey and the evaluation of existing information gathering and management capabilities, the SAIC report will recommend the steps that would be necessary to produce a coordinated information management system for the region. SAIC will advise the Council what steps would be required to link existing systems, what issues would need to be addressed in designing protocols for cooperative sharing of information among the relevant entities and what would need to be added to such a system to meet defined but currently unmet information management goals. This comprehensive information management system should be capable of integrating information from various sources, using tools like search engines, data analysis programs, and geographic information management systems. The aim is to assist a variety of entities in carrying out their respective legal responsibilities. For example, the system will support the work of the Council in developing a systems-based fish and wildlife program as called for in the Northwest Power Act. It will also support other relevant agencies in carrying out their responsibilities under the Endangered Species Act and the Magnuson Fishery Conservation and Management Act. The system will also enhance development and implementation of biological opinions for the federal hydropower system.

153 2002-021-00 Reduce Water Temperatures in Teanaway (BPA)

Implement actions to reduce stream temperatures, reduce suspended sediment, meet water quality standards and improve salmonid habitat. Actions implemented will include irrigation improvements, tree planting, bank stabilization and road improvements. In 2000, a total maximum daily load (TMDL) technical evaluation was written by Ecology to address water temperatures in the Teanaway River Basin, and after the public review process, the TMDL submittal was accepted by USEPA Region 10 in January 2002. This TMDL identifies three main remedies to reducing water temperatures in the Teanaway Basin: 1) restore riparian vegetation to increase shade and stabilize banks, 2) increase instream flows, and 3) reduce sediment inputs to the Teanaway. This offsite mitigation project will pursue all of these goals. Riparian vegetation will be restored by planting trees along streambanks. Irrigation systems will be upgraded, and points of diversion moved, to increase in-stream flows. An extensive monitoring and sediment source identification program will help to identify significant sediment inputs. Additionally, further temperature monitoring will help identify areas of greatest temperature increase, to focus future work on identified reaches.

154 2002-027-00 Lower Snake Hydrodynamics and Water Quality (BPA)

Researchers at the Pacific Northwest National Laboratory and BPA propose to apply state-of-the-art computer models to describe the complex hydrodynamic and water quality environment in the Lower Snake River, and to relate the collected information to migrating salmon. There are two goals of the proposed study: 1. provide physical river information specific to the anadromous salmonid species at locations of concern, and 2. augment the fish individual numerical simulator (FINS) model from two to three dimensional. The proposed work tasks follows: collect bathymetric data; collect temperature data; collect acoustic Doppler current profiler (ACDP) data; collect meteorological data; develop computational fluid dynamics (CFD) grid; conduct CFD modeling of Lower Granite Reservoir (LGR); and conduct CFD modeling downstream of the LGR. Additionally, there would be monthly and an annual (draft and final) report prepared. The Statement of Work located in the project file, further describes the proposed work. The proposed work covers the first year of a planned three-year project. This first year will focus largely on in-situ mapping of thermal and hydrodynamic conditions in the LGR. The subsequent years will focus less heavily on data collection and more heavily on 3-D CFD and FINS model validation and operation. Most of the work proposed would be non-intrusive to the environmental resources, that is, would not require surface disturbance to vegetation, soils, and water resources. Accessing the sampling sites and collecting data may cause short-term disturbance to wildlife, and short-term displacement to fish while collecting water temperature, bathymetric information, and other parameters of the aquatic ecosystem. However, these effects are not expected to impact fish and wildlife populations, movements, survival, reproduction, or any other life history component. While physical information and data would be needed, much of the work would involve analyses of the collected data through computerization, incorporation of geographical information system work, and modeling. Relationships to Other Projects: This project will directly compliment two existing projects (9102900 and 9302900). Project 9102900 is an ongoing study with proposed new focus on migrating behavior and survival of fall Chinook salmon smolts passing downstream in LGR. Project 9302900 is an ongoing study of hatchery fall Chinook survival passing downstream in LGR. The hydrodynamic and water quality temperature models and data developed under this proposal will benefit the above studies by providing useful water temperature and velocity information. Each of these studies would be coordinated to avoid duplication and ensure maximum benefit of allocated funds.

156 1989-096-00 Genetic Monitoring and Evaluation Program for Supplemented Populations of Salmo Steelhead in the Snake River Basin (BPA)

Monitor changes over time in genetic characteristics of hatchery, natural (supplemented), and wild (un-supplemented) populations of Snake River spring/summer chinook salmon and steelhead. Estimate reproductive success of hatchery and wild steelhead.

157 1990-052-00 Performance/Stock Productivity Impacts of Hatchery Supplementation (BPA)

Measure genetic changes from artificial propagation of steelhead and spring chinook to provide increased understanding of the reputed failure of steelhead supplementation in Idaho's Clearwater River and an improved knowledge basis for supplementation

158 1990-093-00 Genetic Analysis of *Oncorhynchus nerka* (Modified to Include Chinook Salmon) (BPA)

This project provides genetic information on *Oncorhynchus nerka* and *O. tshawytscha* throughout the Snake and Columbia Basins to be used in the overall recovery and captive propagation of endangered Snake River sockeye and threatened Snake River chinook salmon.

159 1991-071-00 Snake River Sockeye Salmon Habitat and Limnological Research (BPA)

Enhance and monitor freshwater rearing habitat for juvenile Snake River sockeye. Evaluate the effects of nutrient addition and fish stocking on the lake's ecosystems and growth and survival of planted juvenile sockeye.

160 1991-072-00 Redfish Lake Sockeye Salmon Captive Broodstock Program (BPA)

Establish and maintain safety-net captive broodstocks of endangered Snake River sockeye salmon. Spawn captive adults to produce eggs, juveniles, and adults for reintroduction into Redfish Lake and other Sawtooth Valley, ID, nursery lakes and for future broodstock needs. Evaluate juvenile out-migration and adult returns by release option.

161 1992-040-00 Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research (BPA)

Provide a safety net captive broodstock program for Redfish Lake sockeye salmon. Provide pre-spawning adults, eyed eggs, and smolts to aid recovery of this ESA-listed endangered species in Idaho.

162 1993-056-00 Research on Captive Broodstock Programs for Pacific Salmon (BPA)

Develop Pacific salmon captive broodstock husbandry practices through experimental research to improve juvenile quality, improve adult reproductive performance, improve in-culture survival, and identify genetic risk factors. This project investigates problems associated with artificial culture throughout the life cycle and focuses on problems identified by the Stanley Basin Sockeye and Snake River Chinook Salmon Captive Propagation Technical Oversight Committees.

163 2000-071-00 Analyzing Behavioral Changes During Salmonid Domestication (BPA)

Analyze behavioral changes occurring during hatchery domestication in chinook salmon and steelhead by comparing behavioral performance and physiological responses of the progeny of hatchery and wild chinook salmon and steelhead parents.

164 2001-049-00 Safety-Net Coordinator (BPA)**165 2002-004-04 Safety-Net Artificial Propagation Program - WDFW (BPA)**

Provide data on salmon and steelhead population status, review SNAPP work products prepared by the Extinction Risk Analysis contractor and provide fishery co-manager comments, and participate in the SNAPP coordination process with other fishery co-managers.

166 2002-004-00 Safety-Net Artificial Propagation Program - CRITFC (BPA)

Project contractor will work closely with the Interior Columbia Technical Recovery Team to conduct extinction risk analysis for "at risk" salmon and steelhead populations (Step 1 of the Safety-Net Artificial Propagation Program [SNAPP] planning process) and prepare report for technical review. Project expected to begin July, 2002. Overall objective of SNAPP is to establish contingency plans, using best available propagation techniques, to prevent extinction of key populations of ESA-listed salmon and steelhead while necessary improvements to mainstem passage and tributary habitats are effectuated.

167 2002-004-01 Safety-Net Artificial Propagation Program - NPT (BPA)

Project expected to start in July 2002. Provide data on salmon and steelhead population status, review SNAPP work products prepared by the Extinction Risk Analysis contractor and provide fishery co-manager comments, participate in the SNAPP coordination process, and subcontract for expert scientific review of SNAPP work products, with focus on the Middle Fork Salmon River.

168 2002-004-02 Safety-Net Artificial Propagation Program - IDFG (BPA)

Provide data on salmon and steelhead population status, review SNAPP work products prepared by the Extinction Risk Analysis contractor and provide fishery co-manager comments, and participate in the SNAPP coordination process with other fishery co-managers.

169 2002-004-03 Safety-Net Artificial Propagation Program - SBT (BPA)

Provide data on salmon and steelhead population status, review SNAPP work products prepared by the Extinction Risk Analysis contractor and provide fishery co-manager comments, and participate in the SNAPP coordination process with other fishery co-managers

170 1983-350-03 New Perce Tribal Hatchery; M & E (BPA)

The Nez Perce Tribe is authorized to build and operate the Nez Perce Tribal Hatchery (NPTH;198335000) to help establish and recover spring, early-fall, and fall chinook salmon in the Clearwater subbasin. Supplementation will occur in three tributaries for spring chinook salmon, two tributaries for early-fall chinook salmon, and at two locations in the Clearwater River for fall chinook salmon. This monitoring and evaluation program examines the performance and status of hatchery and natural fish, effects on non-targeted fish populations, sustainability of harvest, and communication and application of findings. Activities and sub-activities are designed to provide data for resolving nine main management questions and critical uncertainties. Seven primary data collection activities and four small-scale experiments are associated with quantification of performance criterion. Areas of special interest include juvenile survival to and through the mainstem corridor and the overall performance of fish reared according to NATURES supplementation criteria. Both hatchery and natural juveniles will be PIT-tagged to assess juvenile survival. Survival and migration timing will be estimated from PIT-tag detections at Lower Granite Dam and McNary Dam using the SURPH.2 model and the Cramer and Neeley model. Survival estimates to McNary Dam have been included to provide baseline information in the case of normative river operation. Performance of NATURES reared fish will be evaluated against the general performance of ongoing conventional production in the Clearwater River subbasin and with post-release survival of NPTH NATURES and NPTH conventional paired releases.

171 1996-043-00 Johnson Creek Artificial Propagation & Enhancement (BPA)

Enhance and monitor a weak but recoverable stock of native summer chinook salmon in Johnson Creek. Construct facilities for adult collection and holding, juvenile rearing and smolt acclimation.

172 1997-038-00 Listed Stock Chinook Salmon Gamete Preservation (BPA)

Preserve Salmonid Gametes through cryogenic techniques to maintain genetic diversity in ESA listed populations with low levels of abundance and at high risk of extirpation.

173 1996-010-05 Pittsburgh Landing Fall Chinook Acclimation Facility (BPA)

The site is located in the Hells Canyon Nat'l Recreation Area near Whitebird, ID. It is on the ID side of the Snake R at River Mile 215, about 31 miles downstream of Hells Canyon Dam.

174 1998-010-06 Captive Broodstock Artificial Propagation (BPA)

Implement and evaluate the captive broodstock project through the collection of juvenile salmon from the wild and maintaining them in captivity. The founding generation is spawned and the resulting F1 generation is released back to the parental stream.

175 1996-010-07 Capt. John Rapid's Fall Chinook Acclimation Facility (BPA)

The site is located at Captain John Rapids on the Snake R between Asotin, WA and the mouth of the Grand Ronde R at River Mile 164. The site is on the WA side of the river, 20 miles upstream of Asotin.

176 1996-010-08 Big Canyon Fall Chinook Acclimation Facility (BPA)

The site is located on the lower Clearwater R adjacent to Hwy 12 near Peck, ID. The site is 4 miles below the confluence of the North Fork and the Middle Fork of the Clearwater R at River Mile 35.

177 1982-013-01 Coded-Wire Tag Recovery Program (BPA)

The Coded-Wire Tag (CWT) Recovery Project is an on-going data collection and data management program by ODFW, WDFW, and PSMFC that contributes to the annual assessment of hatchery and wild salmon populations throughout the Columbia Basin. In specific, the goal of this project is to sample statistically valid numbers of Chinook and Coho in the Columbia River and Oregon coastal commercial and recreational fisheries and the escapement. Annually, the CWT recovery data from marked groups are used to estimate survival, catch distribution, ocean escapement, and returns to hatcheries and spawning grounds. These data also document long-term trends for evaluation of hatchery stocks as surrogates for critical wild stocks, and for comparison with other long-term data sets throughout the west coast. The Fish and Wildlife Program has goals for monitoring and evaluation (Section 3), restoration of wild stocks (Sections 4 & 7), increased hatchery effectiveness (Section 7), improved passage around dams (Sections 5 & 6), and improved stock assessment and harvest management (Section 8). This project contributes to these goals by providing annual monitoring, as well as a long-term, consistent database that supports modeling efforts such as used in the PATH project. These data will ultimately be used to address critical uncertainties identified in the Fish and Wildlife Program as well as for managing the Columbia River.

178 1982-013-02 Annual Stock Assessment - Coded Wire Tag Program (ODFW) (BPA)

This program contributes to the annual assessment of hatchery and wild salmon populations throughout the Columbia Basin. Specifically, the goal of this project is to tag a statistically valid number of coho and chinook salmon from each production release at each hatchery to assist in basinwide stock assessment and for evaluation of hatchery programs. The project currently uses coded-wire tagging technology, based on established methods and procedures, for this marking. The project has a second goal of evaluating the technical and biological feasibility of alternative marking technologies. Annually, the data from these mark groups is used to estimate survival, catch distribution, ocean escapement and returns to hatcheries and spawning grounds. This data also documents long-term trends for evaluation of hatcheries, as surrogate data for critical stocks, and for comparison with other long-term data sets from throughout the region. The Fish and Wildlife Program has goals for monitoring and evaluation (Section 3), restoration of wild stocks (Sections 4 and 7), improved passage around dams (Sections 5 and 6), increased hatchery effectiveness (Section 7), and improved stock assessment and harvest management (Section 8). This project is expected to contribute to these goals by providing annual monitoring, as well as a long-term consistent data base that contributes to modeling efforts such as used in the PATH project, and that can be used to address critical uncertainties identified in the Fish and Wildlife Program. Expected biological outcomes This marking program is not expected to have any direct biological effect on wild salmon and only minimal direct biological effect on hatchery salmon, possibly slightly lower survival for marked fish. The monitoring data collected from these marked fish is expected to be used to evaluate hatchery production with the intent of improving the biological performance of the hatchery fish, and reducing biological effects of the hatchery programs on wild fish (straying, harvest impacts). What data is available to measure biological outcomes? Recovery of CWT hatchery fish in areas they were not intended to return to indicates which specific hatchery release contributed to the straying. This information can then be used to compare, and alter, hatchery practices. Harvest data from CWT hatchery fish is used to monitor and project harvest impacts on wild fish. Data from CWT hatchery fish (survival, harvest rate, catch distribution, age composition, etc.) is used to evaluate, and alter, hatchery programs to improve performance.

179 1982-013-04 Annual Stock Assessment-Coded Wire Tag Program (WDFW) (BPA)

This project is one of three coordinated projects that contribute to the annual assessment of hatchery and wild salmon populations throughout the Columbia Basin. A statistically valid number of hatchery coho and chinook are tagged from each hatchery to assist in basinwide stock assessment and for evaluation of hatchery programs. The project currently uses coded-wire tags to determine the survival, contribution and stray rates of hatchery reared salmon both coastwide and to the Columbia River basin. The data from these tagged releases is also used to document long term trends in the above variables that will lead to effective evaluation of hatcheries and will be used as surrogate data for critically depressed wild stocks. The Fish and Wildlife Program has specific goals for monitoring and evaluation (Section 3), restoration of wild stocks (Sections 4 and 7), improved passage around dams (Sections 5 and 6), increased hatchery effectiveness (Section 7) and improved stock assessment and harvest management (Section 8). This project as part of an umbrella project to assess stock performance in the Columbia Basin will contribute to the goals of the Fish and Wildlife Program by providing annual monitoring, as well as a long-term consistent data base that can be used in modeling efforts such as PATH project, and address critical uncertainties identified in the Program. Expected biological outcomes: This marking program is not expected to have any direct biological effect on wild salmon and only minimal biological effect on the hatchery salmon (e.g., slightly lower survival rates than unmarked salmon). The monitoring data collected from these marked fish is expected to be used to evaluate hatchery production, and be used to compare survival, distribution and straying trends with other marked groups in the Columbia Basin and west coast. These data will may lead to improvements in hatchery practices and biological performance of hatchery reared salmon and allow for monitoring of impacts of hatchery salmon on wild salmon (e.g., straying) What data is available to measure biological outcomes? Currently there are tag return data from Washington, Oregon and Idaho which are stored in the PSMFC data base. These data include total recoveries from each tag group and location of recoveries (freshwater and marine). From these data assessment of hatchery fish performance is made and reported in annual reports submitted to BPA, and data are available on-line from PSMFC for use in other evaluations. Annual Reports compare performance of each tag group released at each hatchery. These data are provided to compare intra and inter-brood performance in the Basin. These data can be used to assess stray rates to determine if hatchery fish are impacting wild spawning populations.

180 1987-100-02 Umatilla Subbasin Fish Habitat Improvement (BPA)

Protect and enhance coldwater fish habitat on private lands in the Umatilla River basin in a manner that achieves self-sustaining salmonid populations and their associated habitat by utilizing natural stream functions to the fullest extent. Target species: Summer Steelhead and Redband Trout

181 1988-053-03 Hood River Production Program - CTWSRO M&E (BPA)

182 1988-053-04 Hood River Production Program - ODFW M&E (BPA)

A monitoring and evaluation (M&E) project was implemented in December 1991 to collect life history and production information on stocks of anadromous salmonids returning to the Hood River subbasin. This information is being used to evaluate various activities of the Hood River Production Program (HRPP) and to develop management guidelines that will minimize the HRPP's impact on indigenous populations of fish. ODFW funded the project until July 1992, after which time the project was funded through the Bonneville Power Administration (i.e., Project Number 1988-053-04). Jack and adult escapements and selected jack and adult life history patterns, and meristic and morphometric characteristics, have been estimated for eight complete run years of winter steelhead, spring and fall chinook salmon, and coho salmon and seven complete run years of summer steelhead. Run year specific estimates of harvest and exploitation rates have been estimated for two complete summer and winter steelhead run years and three complete spring chinook salmon run years. Rainbow-steelhead rearing densities, mean fork length, mean weight, and condition factor have been estimated for four years in selected reaches of stream located throughout the Hood River subbasin. Estimates of subbasin smolt steelhead production and data on selected types of steelhead smolt life history, meristic, and morphometric characteristics, has been collected for six years. Estimates of in-basin hatchery summer and winter steelhead smolt mortality have also been estimated for six years. Information collected by this project has been used to 1) determine the current status of indigenous populations of resident and anadromous salmonids, 2) identify measures that will minimize any potentially detrimental impacts the HRPP could have on indigenous populations of resident trout and anadromous salmonids, and 3) develop and fine tune management guidelines that will optimize the benefits associated with the HRPP.

183 1993-040-00 Fifteenmile Creek Habitat Restoration Project (BPA)

Provide for continued operation and maintenance of all completed habitat restoration measures within the Fifteenmile Sub-basin. Improve habitat where feasible. Continue collection of habitat data. Target species: Fish and Wildlife endemic to the Fifteenmile Creek Sub-basin, Winter Steelhead, Spring Chinook, Redband Trout, Pacific Lamprey.

184 1994-042-00 Trout Creek Habitat Restoration Project (BPA)

O&M and construction of instream and riparian habitat improvement; Monitoring and Evaluation of Summer steelhead smolt production and habitat recovery; coordination for basin long range plan with a goal to increase native ESA listed stock. Target species: Summer Steelhead (*O. mykiss*) and Resident Redband Trout

185 1998-021-00 Hood River Fish Habitat Project (BPA)

Implement habitat improvement actions that will support supplementation efforts within the Hood River subbasin as approved by the NPPC and supported by the BPA Environmental Impact Statement (EIS) for the Hood River Production Program (HRPP).

186 1998-028-00 Trout Creek Watershed Improvement Project (BPA)

Implementation of practices that will enhance steelhead smolt production and habitat recovery following completion of a watershed assessment/long-range plan currently being conducted. Target species: Summer Steelhead (*O. mykiss*) and Resident Redband Trout.

187 2001-020-00 Fifteenmile Creek Riparian Fencing / Physical stream Survey Project (BPA)

Construct approximately 30 miles of riparian protection fence over a three year period along Fifteenmile Creek and its tributaries. Conduct a physical stream of 90 miles of privately owned stream in the Fifteenmile Subbasin. Target species: Fish and Wildlife endemic to the Fifteenmile Creek Subbasin, primary target species; Winter Steelhead, Spring Chinook, Redband Trout, Pacific Lamprey.

188 2001-021-00 Fifteenmile Creek Riparian Buffers - Wasco County (BPA)

Implements riparian buffer program using cost share provided by USDA, state of Oregon, and private landowners.

189 2001-054-00 Emergency Flow Augmentation for Buck Hollow (BPA)

Augment stream flow in Buck Hollow Creek during 2001 with 1-1.5 cfs from headwater well.

190 2002-015-00 Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon (BPA)

One watershed council coordinator and two planner/designers will provide support to five watershed councils in Sherman County. All future conservation projects, including riparian buffers, will be based on watershed plans and individual ranch plans developed by these positions. Target species: Middle Columbia Summer Steelhead (John Day and Deschutes runs), Resident Redband Trout, Wildlife, including elk, deer, antelope, bighorn, upland game birds and migratory species.

191 2002-019-00 Establish Riparian Buffer Systems (BPA)

Implement riparian buffer systems using cost share provided by USDA, State of Oregon, and private landowners. Target species: Summer Steelhead, Spring and Fall Chinook, Pacific Lamprey, resident redband trout.

192 2002-026-00 Morrow County Buffer Initiative (BPA)

This project will implement a riparian buffer program using cost share funding from USDA, State of Oregon and private landowners. Target species: Summer steelhead, Spring Chinook, Pacific Lamprey, resident redband trout.

193 2002-034-00 Wheeler SWCD Riparian Buffer Planning and Implementation (BPA)

This project will implement a riparian buffer program using cost share funding from USDA, State of Oregon and private landowners. Target species: Summer steelhead, Spring Chinook, Pacific Lamprey, resident redband trout.

194 2002-035-00 Gilliam SWCD Riparian Buffers (BPA)**195 1984-025-00 Joseph Creek, Grande Ronde River (BPA)**

Access, create, improve, protect, and restore riparian and instream habitat for anadromous salmonids, thereby maximizing opportunities for natural fish production.

196 1992-026-01 Grande Ronde Model Watershed - Planning (BPA)

Continue the Grande Ronde Model Watershed Program Administration and Habitat Restoration. Develop and oversee coordinated, sustainable resource management in the Grande Ronde Subbasin. Plan, design and implement salmonid habitat restoration projects.

197 1992-026-01 Little Sheep Creek Lg Wood Placement and Culvert Replacement (BPA)

Replace two culverts with structures that are un-passable to both juvenile and adult fish. Place fifteen large pieces of wood adjacent to the stream that will improve habitat.

198 1992-026-01 Lostine River/Carcass Supplementation and Evaluation (BPA)

Assess the impact of Chinook salmon or summer steelhead carcass placement of the water quality and indicators of productivity in the Lostine River.

199 1992-026-01 Grouse Creek Restoration (BPA)

Improve fish passage through the culvert of Grouse Creek, increase riparian vegetation and shade along the lower portion of the creek, and increase surface water flows during the dry season.

200 1992-026-01 GRMWS - LaGrande Ranger District FY01 Projects (BPA)

Continue the Grande Ronde Model Watershed Program Administration and Habitat Restoration. Develop and oversee coordinated, sustainable resource management in the Grande Ronde Subbasin. Plan, design and implement salmonid habitat restoration projects.

201 1992-026-01 GRMWS - Wallowa Valley Ranger District FY01 Projects (BPA)

Continue the Grande Ronde Model Watershed Program Administration and Habitat Restoration. Develop and oversee coordinated, sustainable resource management in the Grande Ronde Subbasin. Plan, design and implement salmonid habitat restoration projects

202 1992-026-01 GRMWS - Union County Bridges (BPA)

Remove three existing bridges and replace with high quality long life steel beam bridges. Monitor the condition of the crossings periodically to assure proper functioning.

203 1992-026-01 GRMWP - Bue Road Improvement (BPA)

Continue the Grande Ronde Model Watershed Program Administration and Habitat Restoration. Develop and oversee coordinated, sustainable resource management in the Grande Ronde Subbasin. Plan, design and implement salmonid habitat restoration projects

204 1992-026-01 GRMWP - Lostine Watershed Assessment (BPA)

Project designed to compile and summarize watershed information from both private and public entities. Assessment to be used for watershed planning in the Lostine River drainage and will be helpful in setting priorities and development of sub-basin plans.

205 1992-026-01 GRMWP - Clark Creek/Bryant Alternative Watering System (BPA)

Project designed to minimize cattle impacts to Clark Creek, and demonstrate the viability of alternative livestock winter water development methods.

206 1992-026-01 GRMWP - Indian Creek/Trick Runoff and Buffering System (BPA)

Project designed to improve water quality in Indian Creek and the Grande Ronde River by reducing sediment and nutrient inputs from confined livestock.

207 1992-026-01 GRMWP - Rangeland Drill/Watershed Restoration and Enhancement (BPA)

Reduce soil erosion, stream sedimentation and nutrient input by rehabilitating and restoring degraded range and pasturelands. Focus on addressing the watershed concerns associated with invasive weeds, especially on range and pasturelands. Address habitat parameters associated with soil movement resulting from weed infestations.

208 1992-026-01 GRMWP - Eisminger/CREP Dike Relocation (BPA)

Protect valuable cropland from flooding, improve floodplain function by access during high water, improve riparian and floodplain sediment filtering capacity, improve riparian quality and function, and restore wetlands.

209 1996-083-01 McCoy Meadows Watershed Restoration (BPA)

The overall objective of the project is to restore the natural character and function of the McCoy Meadows wetland complex. The FY01 phase is to replace a bridge crossing McCoy Creek.

210 1997-078 Catherine Creek Irrigation Stabilization (BPA)

Complete modifications to the Wright-Hempe-Hutchinson Diversion structure to meet ODFW fish passage criteria.

211 1999-043-00 Union County Technical Engineering Assistance (BPA)

Procure technical services to assist GRMWP staff, NRCS personnel, and the Union SWCD in the development of habitat restoration projects.

212 1999-044-00 Wallowa County Technical Engineering Assistance (BPA)

Procure technical services to assist GRMWP staff, NRCS personnel, and the Wallowa SWCD in the development of habitat restoration projects.

213 1999-047-00 Wet Meadow Inventory and Assessment (BPA)

Identify and assess the functionality of the wet meadow ecosystems to help determine the natural upland storage capability for spring runoff.

214 1999-058-00 Upper Grande Ronde and Catherine Creek Watershed Restoration (BPA)

Improve water quality by reducing sediment movement from livestock impacts, and increase bank stability and improve riparian vegetation on Fly Creek tributaries.

215 1999-061 Mill Creek Fish Passage/Union County SWCD Channel Road (BPA)

Provide year-around salmonid fish passage at the Caldwell ditch diversion.

216 1999-070-00 Wallowa County Gaging Station (BPA)

e gaging stations are part of an overall monitoring program to determine water use and flow characteristics in Wallowa County. The objectives include providing information to irrigators about their water usage and its affect on Bear Creek, Lostine River, and Wallowa River; and develop a comprehensive project that will address the low low issues.

217 1999-071-00 Hagedorn Road Relocation/Stream Restoration (BPA)

Relocate a stream bottom road to a location upslope. Install culverts to improve drainage and eliminate erosion of stream channel.

218 1999-072-00 Wildcat Creek Culvert Replacement (BPA)

Provide improved adult and juvenile fish passage.

219 1999-074-00 Little Fly Creek Headcut Rehabilitation (BPA)

Improve habitat, reduce sediment loads and improve channel characteristics by reestablishing groundwater and overbank flow, stabilizing banks, increase sediment storage capacity of the stream channel, and reduce sediment loads.

220 1999-079-00 Beaver Creek Fish Passage (BPA)

Restore access to approximately 19 miles of habitat. Prevent cattle access to Beaver and Jordan Creek Watersheds through construction of riparian fence.

221 1999-081-00 East End Road Obliteration and Sediment Reduction (BPA)

Reduce sediment delivery to tributary streams of the Grande Ronde River through improved road management. Improve salmonid production and survival in tributary streams.

222 2000-059-00 USFS Marr Flat Allotment and Big Sheep/Imnaha Fisheries Enhancement (BPA)

Provide barrier free access to protect spawning areas, improve water quality, instream habitat, quality of riparian areas, and reduce erosion and risk if culvert failures.

223 2000-061-00 Upper Wildcat and Joseph Creek Watershed improvement (BPA)

Improve water quality within perennial fish-bearing streams by adding large wood, planting deciduous and coniferous vegetation and constructing enclosure fencing on headwater and mainstem stream systems.

224 2000-062-00 Imnaha/Park Ditch Water Conservation (BPA)

Provide a more efficient delivery system for water diverted for irrigation from the Imnaha River, to increase streamflow and decrease the overall diversion of water.

225 2000-063-00 Meadow Creek Riparian Pasure Fence (BPA)

Improve steelhead, and Chinook salmon habitat, increase bank stability, and improve riparian zones adjacent to Meadow Creek, through the construction of a riparian pasture fence.

226 2000-064-00 Conservation Reserve Enhancement Program Incentive (BPA)

Increase landowner participation in the USDA Conservation Reserve Enhancement Program, improve riparian conditions on salmonid streams within Wallowa County through fencing and vegetation improvements.

227 2000-065-00 Meadow Creek/Habberstad fish habitat Enhancement (BPA)

Restore degraded riparian and floodplain habitat, improve in-stream habitat diversity and improve water quality. A combination of livestock control, floodplain reconnection, in-stream work and planting will be used to restore habitat.

228 2000-066-00 McCoy Creek-Alta Cunha Rances Riparian Restoration (BPA)

Restore degraded riparian and floodplain habitat, improve in-stream habitat diversity and improve water quality. A combination of livestock control, floodplain reconnection, in-stream work and planting will be used to restore habitat.

229 2000-069-00 Grande Ronde River Basin - Culvert Replacements (BPA)

The project will replace existing structures with culverts and associated jump pools to allow fush passage at all flows, and will be designed to meet PACFISH standards.

230 2001-018-00 Phillips-Gordon Watershed Assessment (BPA)

The assessment will analyze the watershed's aquatic and terrestrial habitats and watershed functions, including historical factors, current conditions, and projected habitat trends.

231 2001-019-00 Little Catherine and Lick Creek Restoration (BPA)

Reduce sediment loads and movement by improving drainage on roadways. Increase bank stability and improve interaction between the channel and floodplain through protection of riparian areas from livestock access.

232 1987-127-00 Smolt Monitoring by Federal and Non-Federal Agencies (BPA)

The federal and non-federal Smolt Monitoring Program (SMP) provides data on movement of smolts out of major drainages and past the series of dams on the Snake and Columbia Rivers. The monitoring sites are the Lower Granite, Little Goose, Lower Monumental, McNary, John Day, Bonneville, and Rock Island dams, Lewiston Snake River trap, Lower Grande Ronde River trap, and the White Bird trap on the Salmon River. Indices of migration strength and migration timing are provided for the run-at-large at key monitoring sites. In addition, marked smolts from hatcheries, traps, and dams provide measures of smolt speed and in-river survival through key index reaches. Fish quality, descaling, and gas bubble trauma measures are taken on samples of fish collected at each monitoring site, and provide indicators of the health of the run. These data are used for in-season operational decisions, including implementation of the Biological Opinion measure, relative to flow and spill management, particularly during periods when spill is being provided to improve smolt passage. The SMP also provides data on resident species collected at monitoring sites, including species of concern, such as bull trout, white sturgeon and lamprey. Note: The Imnaha River trap is another annual SMP site operated by the Nez Perce Tribe (NPT) under Project 1997-015-01.

233 1987-401-00 Assessment of Smolt Condition: Biological and Environmental Interactions (BPA)

Short Description: Provide research support to regional hatchery and fishery managers to determine interactions between juvenile salmonid physiological development and the environment that affect smoltification, disease resistance and smolt-to-adult returns. Project History and Importance: Project 198740100, the Assessment of Smolt Condition has existed under that name since its inception in 1987. This project developed from the need to determine the effect of fish condition on juvenile migration rates and survival. The goal of this project continues to focus on investigating and improving understanding of the interactions of the physiological condition of wild and hatchery Columbia River juvenile salmonid and steelhead stocks with the environment so that management actions can maximize survival from emergence through adult return. The project provides scientific support to regional hatcheries and fish management agencies by evaluating the developmental biology of juvenile salmonids to address critical questions related to the physiological development and condition of salmonids. Until 1995 the project provided information about the physiology and health of migrating juvenile salmonids, related to in-season management of the Water Budget, with an emphasis on determining what factors influence migration rates through the mainstem. In 1995 the project was asked to add objectives related to gas bubble trauma monitoring, and in 1997 a separate project was formed for that purpose. Formerly serving the Fish Passage Center Smolt Monitoring Program, since 1996 the project has cooperated on hatchery and management projects related to rearing conditions, developmental biology, smolt condition and health. The current focus is production level studies to identify the influence of different feeding regimens, water sources and temperature regimes on the physiological and immunological range of response of salmonids to environmental change throughout their life history, and therefore, long-term survival. Physiological monitoring and evaluation objectives have continued in extensive science support activities for federal, state, and Tribal fisheries managers.

234 1989-107-00 Statistical Support for Salmonid Survival Studies (BPA)

Short Description: Improve monitoring and evaluation capabilities by developing better measurement tools and study designs to estimate juvenile and adult salmonid survival and survival relationships. Provide statistical guidance to investigators in the Columbia Basin. Project History: Project 8910700 was initiated in 1989 to develop the statistical theory and methods needed to analyze smolt and adult PIT-tag survival studies. The project developed the initial study designs for the National Marine Fisheries Service (NMFS)/University of Washington (UW) Snake River survival studies of 1993-present (e.g. NMFS Project 1993-029-00). These ongoing efforts have produced statistical software (i.e., SURPH.1, SURPH.2, SURPH 2.1, USER.1, USER.2) for UNIX- and PC-based computers which are accessible to the Columbia Basin community via internet and the World Wide Web (WWW). Additional products include comprehensive user manuals for SURPH and software for sample size calculations. As the Snake River survival studies have evolved, the numerical needs for new and more descriptive data analyses have also increased. This project continues to maintain existing analysis capabilities as well as add new data analysis features at the request of program users (e.g., NMFS, USGS). As the new 134.2 kHz frequency PIT tag decoder systems come on-line, the survival methods were extended to the joint analysis of survival of both downriver smolts and returning adults. The listing of salmonid stocks under the ESA has often limited access and sample sizes needed to perform reliable survival studies. To this end, this project has developed statistical models for the analysis of radio-tag and acoustic-tag survival studies. These technologies have the potential of reducing required sample sizes while at the same time increase information content. Statistical software USER.2 was developed specifically to analyze the increasing variety of radio-tag studies of smolt and adult survival performed by regional investigators. This project has also assisted in the development of statistical software to optimally design 2D and 3D hydrophone arrays for tracking of acoustically tagged fish. Applications include smolt investigations at hydroprojects and eventually smolt studies in the Columbia River estuary and nearshore ocean environments.

235 1989-107-00 Statistical Support for Salmonid Survival Studies (CORPS)

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236 1990-080-00 Columbia River Basin PIT Tag Information System (BPA)

Short Description - Provides basic infrastructure for all PIT tag related projects in Columbia River Basin. Operates and maintains long-term data repository for PIT tag information. Operates and maintains permanent PIT tag interrogation sites. Supports other PIT tag research.

Project Goal - To operate and maintain the Columbia River Basin-wide database for PIT Tagged fish and to operate and maintain the established interrogation systems. The data collected by this system is accessible to all entities.

Performance System Goal - To collect 100% valid data and provide that data in "near-real" time with downtime of any system component of not more than one percent as measured during the period of peak out-migration.

The measurable goal for the system is to collect 100% valid data and provide that data in "near-real" time with downtime of any system component of not more than one percent as measured during the period of peak out-migration.

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238 1991-028-00 Monitoring Smolt Migrations of Wild Snake River Spring/Summer Salmon (BPA)

Short Description - Collect time series information to examine migrational characteristics of wild ESA-listed Snake River spring/summer chinook salmon stocks. PIT tag wild chinook salmon parr annually; and subsequently monitor as parr/smolt at stream traps and river dams. Migrational timing and survival patterns of individual and combined populations are tracked over time and examined for relationships with various environmental and climatic conditions.

Ongoing Goals and Objectives: 1) Continue collecting and PIT tagging wild ESA-listed Snake River spring/summer chinook salmon parr from selected Idaho streams annually; 2) Intercept and decode tagged parr/smolt as they pass traps in tributary streams and Snake and Columbia River dams annually. 3) Examine and map the migrational characteristics of these wild salmon stocks both annually and historically. 4) Continue monitoring environmental parameters within natal streams to address research needs for tributary habitat and determine how they affect wild parr and smolt movements, migrations, and survival. 5) Continue providing real-time wild smolt timing data for making operational decisions to maximize survival of wild smolt as they migrate through the Federal Columbia River Hydropower System.

240 1991-051-00 Monitoring and Evaluation Statistical Support (BPA)

Short Description - Develop statistical methods for monitoring and evaluating salmonid recovery plans. Provide added-value analyses and statistical support on regional fisheries issues. Provide smolt migration timing predictions on the Internet.

Project Overview and Importance to Columbia River Basin Fish and Wildlife Program - This project was initiated in 1991 in response to the Endangered Species Act (ESA) and the subsequent 1994 Council Fish and Wildlife Program (FWP) call for regional analytical methods for monitoring and evaluation. This project supports the need to have the "best available" scientific information accessible to the BPA, fisheries community, decision-makers, and public by analyzing historical tagging data to investigate smolt outmigration dynamics, salmonid life histories and productivity, and providing real-time analysis to monitor outmigration timing for use in water management and fish operations of the hydrosystem. To support real-time monitoring and provide information dissemination, the project provides real-time analyses of PIT-tag data and smolt passage indices to predict outmigration timing at 8 Snake and Columbia River dam sites. This information is coupled with travel time information and barging predictions in the Snake River Basin. Daily updates are provided for yearling and subyearling chinook, steelhead, and sockeye from April through September of each year since 1994. These predictions, along with supporting information, can be retrieved and independently analyzed using interactive software and graphs on the internet (www.cbr.washington.edu/rt/realtime.html). The second element this project provides is value-added analyses of historical tagging data by testing hypotheses, estimating parameters, and investigating interrelationships without the tremendous costs of additional field studies. The third element of this project is to provide statistical assistance and guidance to the BPA and the NW fisheries community on an as-needed basis. These efforts are used to provide BPA with independent assessment capabilities and provide technology transfer and statistical guidance on the best approaches to tag analyses to regional investigators. Among the tasks conducted this last year was an examination of the bias in estimating control-treatment ratios (i.e., transportation/benefit ratios) under low return conditions. Another task examined the power of proposed statistical tests of recovery identified in the Biological Opinion (BO) for the Columbia River [National Marine Fisheries Service (NMFS) 2000] and developed more sensitive statistical decision rules with greater probabilities of drawing the correct conclusions.

Ongoing Goals and Objectives: - Provide in-season statistical support by providing real-time analyses of smolt outmigration dynamics for ESA demes (NMFS ESUs) and runs-at-large for the Snake and Columbia Rivers. Provide statistical analyses of historical tagging data to extract extra-value information on salmonid population dynamics and their interactions with the environment, and provide statistical guidance on the design and analysis of fisheries tagging studies. Provide BPA and the Northwest fisheries community with professional support as needed in the design, analysis, and interpretation of fisheries tagging studies and the design and evaluation of Biological Opinion performance studies and their compliance rules. The analytical and information support services provided by this contract will continue to be needed in the future to help BPA and the region responsibly meet the continuing demands for information available for both in-season management of fish and river resources and decision making related to fish mitigation programs. The specific analytical support activities required each year will change to meet the needs of BPA and the Northwest fisheries community in their ongoing efforts to enhance and recover Columbia River Basin salmon runs.

242 1993-029-00 Estimate Survival for the Passage of Juvenile Salmonids Through Dams and Reservoirs of the Lower Snake and Columbia Rivers Short BPA Title: Survival Estimates Through Dams and Reservoirs (BPA)

Short Description - Provide precise measurements of survival of juvenile salmon as they pass through dams and reservoirs in the Snake and Columbia Rivers and relate to adult returns. Project Overview and Importance to FWP - The goal of this NMFS study is to provide up-to-date, precise estimates of survival of juvenile salmonids migrating through reservoirs, dams, and free-flowing reaches of the Snake and Columbia Rivers. This information is critical for evaluating the success of strategies to recover depressed stocks and to evaluate success in meeting the passage survival performance standards in the NMFS 2000 Biological Opinion. To accomplish this goal, NMFS will continue to PIT tag yearling chinook salmon and steelhead at Lower Granite Dam as needed to estimate their survival through the hydropower system. When possible, NMFS will utilize fish PIT-tagged in other studies to reduce tagging. NMFS will also continue to PIT tag hatchery subyearling fall chinook salmon for release above Lower Granite Dam to estimate their survival through the Snake River and PIT tag and release river-run subyearling fall chinook salmon (mostly wild Hanford stock) at McNary Dam to estimate their survival through the lower Columbia River. NMFS will determine where losses occur for subyearling chinook salmon between the free-flowing Snake River and Lower Granite Reservoir using a streambed flat-plate PIT tag detector. NMFS will explore the relationships among survival, travel time, environmental variables, and dam operations using the expanding data base generated by this study. As PIT-tagged adult fish return, NMFS will continue to explore survival to adult for fish with different passage histories.

243 1994-033-00 Fish Passage Center (BPA)

The FPC provides technical analysis, data summaries, graphic representations for the state, federal and tribal fishery managers' use in developing their recommendations for fish passage management to the federal operators and regulators and the National Marine Fisheries Service. The FPC designs and oversees the implementation and conducts the analysis of the Smolt Monitoring Program (SMP), including the dissolved gas trauma monitoring, and distributes the data daily to public and private entities in the region. The FPC is responsible for management, implementation and assists in the analysis of the Comparative Survival Study (CSS) as directed by the Comparative Survival Study Oversight Committee. The FPC maintains historical and current databases of hatchery release, hydrologic, project operation, reservoir operations, adult salmon passage, juvenile salmon passage, gas bubble trauma, water temperature and dissolved gas data, and maintains public use and access to these databases. FPC staff participates in the NMFS Regional ESA process as requested by the agencies and tribes specifically, the Implementation Team process, the Dissolved Gas Team, the Technical Management Team. FPC staff provides analysis and presentation to state water quality agencies as requested by the agencies and tribes. The FPC disseminates data and analyses developed and utilized by the FPC to the region through the FPC web site.

244 1996-020-00 Comparative Survival Rate Study (CSS) of Hatchery PIT Tagged Chinook & Comparative Survival Study BPA Short Title: PIT Tagging Spring/Summer Chinook in Hatcheries (BPA)

Short Description - Adult and juvenile PIT tag recovery data are analyzed to compare survival estimates for transported fish of known origin, downriver stocks, wild and hatchery transported fish and fish handled and not handled at dams. Longer Description - The Comparative Survival Study (CSS) is starting the eighth year of a long term PIT tag study to develop smolt-to-adult survival indices for spring and summer stream type chinook and summer steelhead originating above Lower Granite Dam and in the Mid Columbia River to evaluate smolt migration mitigation measures and actions (such as flow augmentation, spill, and transportation) for the recovery of listed salmon stocks. The objective is to build a long-term data base monitoring smolt to adult return rates and passage characteristics of specific wild and hatchery groups of spring/summer chinook, fall chinook and steelhead throughout the Columbia River Basin. The mark group proposals are made within the context of other mark groups planned for other research studies. Wherever possible the CSS will make use of mark groups for other research to meet CSS requirements. The objective of developing smolt-to-adult survival indices was recommended in the PATH (Plan for Analyzing and Testing Hypotheses) process that was carried out by the regional, state, federal and tribal salmon managers with the Northwest Power Planning Council (NWPPC). The PATH recommendations address the question, "can transportation of fish to below Bonneville Dam compensate for the effect of the hydro system on juvenile survival rates of the Snake River spring and summer chinook salmon during their downstream migration?" The PATH recommended research includes the following; 1) Estimate smolt-to-adult survival rate (SAR) for transported wild and hatchery stream type chinook, 2) Determine if SAR rates are significantly different from the interim SAR hydro goal, 3) Compare SARs of transported and downriver indicator stocks, 4) Estimate transport/control ratio and in-river survival concurrently over a number of years in order to span a range of environmental conditions. The interagency Comparative Survival Study (CSS) Oversight Committee was established to design, plan, and oversee the conduct and analysis of the multi-agency CSS.

245 1997-015-01 Title Present Scope: Imnaha River Smolt Monitoring Program. Title for proposed ex scope: Imnaha Smolt Survival and Smolt to Adult Return Rate Quantification (BPA)

Present 2002 Scope - Operate Imnaha River smolt trap as part of the annual smolt monitoring program to provide the Fish Passage Center with information and indices on spring emigration timing, estimated survival, smolt performance and health of wild and hatchery smolts from the Imnaha River to Snake and Columbia River dams. Proposed Expanded Scope - Quantify juvenile emigrant abundance, determine smolt survival from the Imnaha River to Lower Granite and McNary dams, quantify smolt-to-adult return rate (SAR) of wild/natural Chinook salmon at Lower Granite Dam and back to the Imnaha River.

246 2000-013-00 Evaluate An Experimental Re-Introduction of Sockeye Salmon into Skaha Lake (BPA Title: Eval Reintroduction Sockeye Salmon Skaha Lake) (BPA)

Evaluation of an experimental re-introduction of sockeye salmon into Skaha Lake in the Okanogan River Basin. Through a cooperative multi-agency process that involves U.S. and Canadian Agencies and Tribes, assess risks benefits, formulate hypotheses, analytical tools, and develop an experimental design and management plan. The assessment will be completed by completing the following six objectives over three years: 1) Disease risk assessment. 2) Exotic fish risk assessment. 3) Inventory of sockeye salmon habitat and opportunities for habitat enhancement. 4) Development of a life-cycle model of sockeye, including interaction with resident kokanee. 5) Development of an experimental design. 6) Finalization of a plan for re-introduction of sockeye salmon into Skaha Lake and associated monitoring programs.

247 1998-014-00 Ocean Survival of Salmonids (BPA)

The primary objective of this study is to continue to physically characterize and model the Columbia River plume in the nearshore ocean environment, provide estimates of growth of juvenile chinook and coho salmon inside and outside the Columbia River plume, and document the impact of changing ocean productivity on survival and growth rates of juvenile salmonids in the Pacific Northwest and on their prey field (euphausiids and other zooplankton species) during what appears to be a possible regime shift to cooler, salmon friendly waters off the Oregon and Washington coast. Although the objectives will be met by executing the study plan, the degree of success will be contingent on ability to contract a vessel to conduct the trawls and whether adequate numbers of juvenile salmon can be collected.

248 1998-014-00 Ocean Survival of salmonids, Canada-USA Shelf Salmon Survival (BPA)

The primary objective of this study is to obtain a single coast-wide set of data that will allow US and Canadian scientists to begin identifying broad regions of good or poor salmon growth in the ocean, and to begin defining the reasons why growth differs between regions. Based on these preliminary results it will be possible to refine sampling locations for future years and determine the appropriate sampling frequency that is needed. A secondary goal will be to establish which specific stocks of salmon remain resident in the areas of poorest growth, and to therefore begin to develop some understanding of why marine survival may differ between different stocks of salmon in the ocean. Information generated from this study will quantify and allow detection of impacts of differing ocean productivity on salmon growth and survival. Documenting the cause of the changes (reduction) in growth with physical features of the ocean will help to improve our understanding of how climatic events in the ocean will affect important fish resources. The samples collected will provide an initial assessment of whether different stock groups (including ESA listed stocks) predominate in regions of poor growth and survival. For example, there is evidence that the Snake R chinook stock is disproportionately abundant in the region of poor ocean growth off Vancouver Island, making up about 2% of the total chinook identified in a sample from this region based on DNA analysis. If the migratory behaviour of certain stocks preferentially exposes them to regions of poor ocean survival, then such information needs to be incorporated in management plans, and the assumption that the ocean presents a relatively uniform and unchanging environment for salmon needs to be reconsidered. CWT returns from coastal chinook fisheries also indicate that maturing Snake River chinook have a more southerly distribution in coastal waters, with a center of abundance in the region off Vancouver Island which we have tentatively identified as having the poorest salmon growth and survival. Other Columbia River stocks, such as the Hanford Reach chinook, have a more northerly ocean distribution that coincides with the region of higher growth. They are therefore expected to have better ocean survival for reasons described in this proposal. Direct information on the ocean distribution of juvenile chinook during the first summer of life at sea, when they are expected to be most influenced by ocean conditions is lacking however. An important component of the work proposed here is therefore to establish which stocks of salmon are found in different regions within the study area. The large changes in ocean survival of Pacific salmon are having significant effects on fisheries management in both Canada and the United States. This proposal for funding by the Bonneville Power Administration is to allow the development of a collaborative research effort between Fisheries & Oceans Canada researchers with their counterparts in the National Marine Fisheries Service of the United States government. It is anticipated that on the basis of the data collected during the survey proposed here, a more extensive and tightly co-ordinated research program between the Canada and the US will be developed.

249 2000-080-00 Pacific Ocean Salmon Tracking (POST) (BPA)

A great deal of work has been conducted within the 12 freshwater provinces of the Columbia River watershed on the ecology of Pacific salmon stocks. However, despite half of total salmon mortality occurring in the ocean (Bradford 1995), and large declines in the ocean survival of many salmon stocks occurring over the last three decades, very little is known about the ocean ecology of these salmon. New technology makes the tracking of juvenile or maturing salmon over the vast distances of the Pacific Ocean possible. When combined with new information from recent research on the ocean migration pathways of juvenile salmon, it should be possible to design a program to track individual salmon out from their rivers of origin and establish migration pathways for individual fish and specific stocks (rates and direction of movement), and to identify their ocean foraging grounds. It may be possible to develop stock-specific estimates of mortality and rates of movement for salmon in regions such as the lower Columbia River and in the ocean to complement PIT-tag studies previously used in the upper Columbia River to measure rates of mortality. This information would also allow an assessment of how much time salmon spend within the estuary or plume environments. It is likely that this research can be done in a cost-effective and scientifically credible way that will complement the extensive freshwater studies that have been done in the Columbia River. Coordinated properly, it will allow simultaneous monitoring of juvenile salmon during the first few months of sea life from stocks in all regions of the West Coast of North America. This will provide critically needed information on how salmon use the ocean during their extensive migrations, and insight into how current and anticipated future climate change will affect individual stocks of Pacific salmon from the Columbia River.

250 2001-053-00 Re-Introduction of Lower Columbia River Chum Salmon into Duncan Creek (BPA)

BPA funded a salvage operation for the Bonneville Population of Columbia River chum salmon. Water levels in the lower Columbia River were the second lowest on record and may remain low through the fall of 2001. If conditions persist, chum salmon returning to spawn from November through December may encounter limited access to spawning areas. The Bonneville Population is the most at risk as low flows in Columbia River tributaries and the mainstem may prevent chum from using traditional spawning sites and limit the amount of spawning and incubation space available. In addition, it is unknown whether adequate mainstem Columbia flows can be maintained throughout the entire incubation and emergence period. If allowed to manage on their own, these population may overcrowd remaining available habitat, experience a significant increase in pre-spawning mortality, or at worst, not be able to spawn at all causing the complete loss of the 2001 brood. The goal of the salvage operation was to preserve the genetic diversity within lower Columbia River chum salmon, specifically the Bonneville Population, by ensuring adequate numbers of returning adults survive to spawn successfully, either naturally or artificially. The degree of intervention will depend on evaluation of water levels and spawning ground accessibility. Priority will be given to natural spawning if adequate, stable waters exist to support it. For areas where low water levels prevent natural spawning, the capture of brood stock for artificial propagation will be employed. Artificially produced fry will be liberated back into the streams in spring 2002. Artificially cultured eggs from each spawning pair will be divided into separate treatment groups and thermally marked before release.

251 2002-012-00 Lower Columbia River Habitat Assessment and Mapping (BPA)

Use data from satellite imagery to develop GIS queries that will assist in the identification of areas for hyperspectral imagery. The imagery will be classified to depict important estuarine habitats and comparisons will be made with previous habitat mapping. The datasets will provide baseline data and detailed habitat assessments necessary for implementing habitat protection and restoration program and habitat monitoring.

252 2002-051-00 Subbasin Planning, Regional Level (BPA)

The Regional Level contract provides regional coordination and staff support to the Regional Coordinating Group (RCG) for Subbasin Planning, overall project management and contracting functions and technical support for tasks that are basin-wide in scope. 1. Regional Coordinating Group: The RCG will provide advice and recommendations to the Council on region-wide issues such as federal and tribal coordination, interstate coordination, overall schedule and budget allocation issues. The RCG will be chaired by the Council and be represented by the 13 basin tribes, NMFS and USFWS, Bonneville, and representatives from the four statewide/provincial/tribal coordination groups. The RCG will consider both regional coordination and regional technical support issues. 2. Regional Coordination: The contract at the regional level will allow the Council staff to provide support to the RCG and working in coordination with the statewide/provincial/tribal coordination and project management function to perform coordination and project and fiscal tracking of subbasin planning region-wide at both the statewide/provincial/tribal level and the subbasin level with lead entities and their subcontractors. Council and Council staff will review draft subbasin plans for consistency with the Council program, initiate ISRP and public review of subbasin plans, consult with the region's tribes for consistency with legal rights and initiate review of subbasin plans by NMFS and USFWS for ESA use, where applicable. 3. Regional Technical Support: The regional technical contract will fund staff to provide region-wide support for assessment, coordination and information management and provide out of subbasin assumptions for subbasin planning. As work is clarified and a more specific budget is developed, releases on the master contract will be awarded.

253 2002-051-00 Subbasin Planning, Statewide/Provincial/Tribal Level (BPA)

This contract provides staff support to the statewide/provincial/tribal coordinating group (SPTCG) in each state for coordination and project management to accomplish subbasin planning. Additionally, the contract provides for technical support to the provinces and subbasins within each SPTCG for assessment products. Statewide/Provincial/Tribal Coordination: This contract functions to provide to each state services that will enable the Council to be assured that subbasin planning will be coordinated and that sufficient project and fiscal tracking of subbasin contracts will be provided. The SPTCG will be composed of appropriate tribes and federal and state agencies, governor's offices, coordination groups or Salmon Recovery Boards as in Washington and other stakeholders. In order to be true to the decentralized nature of the subbasin process the Council has provided the contract flexibility for each SPTCG to be somewhat unique in the implementation of subbasin planning in Idaho, Montana, Oregon and Washington. Statewide/Provincial/Tribal Technical Support: This contract will provide the technical expertise through teams in each SPTCG to produce subbasin assessments for subbasin planners. The specific products will be either EDT or similar analytical web based products. Technical assistance will involve assessment results, review and effectiveness of management strategies, and review with subbasin planners

254 2002-051-00 Subbasin Planning, Subbasin Level (BPA)

The Council will subcontract directly with the lead entity or individual, designated by the statewide/provincial/tribal coordination group, for the development and submittal of subbasin plans. Since the lead entities must be designated by the statewide/provincial/tribal coordination groups, these groups may have additional criteria that apply for designation. Lead entities can be state agencies, tribes, Recovery Boards, Conservation Districts, watershed councils, or other organizations or individuals, so long as they meet the criteria. Each of the four states is functioning differently at the statewide/provincial/tribal level, but each is expected to identify to the Council the designated lead entity for each subbasin as they are selected. As each subbasin level contract is signed, the statement of work and budget will be incorporated into this Master Subbasin Level Planning Contract by a release. There is the potential to have up to 62 subbasin plans; one for each subbasin, and the potential for multiple contracts for one subbasin if there are co-leads. It is expected, however, that the lead entity will subcontract with others for plan deliverables as necessary to complete the plans. The Council developed a Request for Funding package for designated lead entities as a means to initiate a subbasin level contract. The package contains information request forms, statement of work and budget template, general contract information and expectations, and contract language. As lead entities are designated by the statewide/provincial/tribal coordinating groups, the Council's staff will initiate the contracting process with that organization and approve the contract as soon as possible. Each state has an allocation for subbasin-level planning. Depending on the agreed upon functions of each statewide/provincial/tribal coordinating group, a specific funding allocation or range of funding may be established for each subbasin within that state. However, the final budget for each subbasin level contract will be approved based on statement of work and budget, and the supporting information provided by the lead entity. The Council will coordinate as necessary with project managers at the statewide/provincial/tribal level where they exist, to manage subbasin level contracts. Where project managers are in place, they will perform an invoice review function prior to the invoice being submitted to the Council where they are not in place, this function will be provided by Council staff. Reimbursements for planning expenditures will be made directly from the Council to the subbasin lead entities. The statement of work indicates a single task under the element of subbasin level planning. The task for the Council is to contract with and administer contracts with each subbasin level planning lead entity. The subbasin plans will be developed locally and submitted to the Council, so the lead entities are contractually responsible for delivering the product. The total budgeted amount for subbasin level planning is \$9.3 million over two years, to be allocated to the four states and to be further allocated to the subbasins within each state. As work is clarified and a more specific budget is developed, releases on the master contract will be awarded.

255 1987-100-01 Umatilla River Anadromous Fish Habitat Enhancement Project (BPA)

The goal of this project is to protect and enhance anadromous fish habitat on private lands in the Umatilla River Basin. Project objectives include: 1) identification of detrimental land uses and development of watershed-level solutions to address habitat impacts; 2) maintenance and continued implementation of habitat enhancements; 3) collection of baseline data and post-project monitoring to identify habitat limiting factors and assess effects of habitat enhancements. Since its inception in 1987, the project has secured 48 agreements with landowners and enhanced 18.5 stream miles on private properties throughout the Umatilla River Basin. The recently completed Umatilla Subbasin Summary and the nearly finalized Umatilla Subbasin Watershed Assessment will provide direction and assist with prioritization of future habitat needs. Targeted areas shall include portions of the mid and upper mainstem Umatilla River and stream reaches within the Birch, Wildhorse, Mission, Cottonwood, Moonshine, Coonskin, Buckaroo, Squaw, Meacham Creek Subwatersheds. Although the Tribes will continue to implement individual projects with cooperative landowners, efforts are currently underway in all targeted watersheds to tie existing and proposed enhancements together. Such an expanded approach will result in stream reach-level habitat recovery and complement other Bonneville Power Administration funded projects in achieving more comprehensive watershed restoration goals. The Tribes will continue to prioritize passive, natural recovery to preserve and restore stream habitat. Active, bioengineering approaches will be reserved for areas that will not sufficiently recover in a natural state. Short-term project effects shall include native plant community recovery, increased stream bank stability and increased stream channel shading. Long-term project effects shall include improved stream geomorphic features, vegetative succession, cooler stream temperatures, reduced sediment deposition, increased large woody debris recruitment, greater habitat diversity, increased juvenile and adult salmonid freshwater survival, greater salmonid offspring out-migration and increased bird, mammal and invertebrate populations. Project monitoring shall include stream channel transect measurements, photo point documentation, habitat inventories, macroinvertebrate surveys, biological sampling, stream temperature monitoring and suspended sediment monitoring. Results will be evaluated in annual reports submitted to the Bonneville Power Administration. This project is consistent with Northwest Power Planning Council Measure Numbers 7.6, 7.7 and 7.8. The project entails coordinated, cooperative efforts to protect and improve anadromous fisheries habitat on a comprehensive watershed management basis.

256 1989-098-00 Idaho Supplementation Studies - salmon (BPA)

The goal of the Idaho Supplementation Studies Project is to evaluate the usefulness of supplementation as a recovery/restoration strategy for depressed stocks of spring and summer chinook salmon in Idaho. The project is a multi-agency effort, covering 31 streams throughout the Salmon River and Clearwater River basins, working to help define the potential role of chinook salmon supplementation in managing Idaho's natural spring and summer chinook populations, and identify genetic and ecological impacts to existing natural populations. The ISS experimental design is split into three main approaches: (1) Large-scale population production and productivity studies designed to provide Snake River basin wide inferences. (2) Using study streams to evaluate specific supplementation programs. (3) Small scale studies designed to evaluate specific hypotheses. Approaches one and two measure population responses to supplementation and are long-term studies. Approach three determines specific impacts of supplementation such as competition, dispersal, and behavior; and are short-term studies conducted in "controlled" environments. We expect this research to demonstrate the best methods for supplementing existing natural populations of chinook salmon and re-establishing natural populations in streams where chinook salmon have become extirpated. We expect supplementation effects and recommendations to be different for each stream. The study design called for a minimum of 15 years (three generations) of research (Bowles and Leitzinger 1991). Sampling was initiated in 1991, and implementation began in 1992. Supplementation effects are monitored and evaluated by comparing juvenile production and survival, fecundity, age structure, and genetic structure and variability in treatment and control streams of similar ecological parameters.

257 1989-098-01 Idaho Supplementation Studies - salmon (BPA)

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258 1989-098-02 Idaho Supplementation Studies - salmon (BPA)

259 1989-098-03 Idaho Supplementation Studies - salmon (BPA)

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260 1990-055-00 Idaho Supplementation Studies - steelhead - previously 1989-098-00 (BPA)

This project was designed to investigate potential benefits and risks of supplementation with small-scale experiments and to develop protocols for biologically sound steelhead supplementation. We used the Regional Assessment of Supplementation Project (RASP 1992) guidelines to formulate the research design. We minimized the risk to ESA listed wild populations of steelhead and chinook salmon by choosing study streams that are vacant of steelhead or are no longer managed as viable wild populations. Prior to developing a supplementation program basic biological data must be available to assess population abundance, population trends, and to understand stock specific life-history and genetic attributes. This study has focused on gathering this information from wild steelhead populations. We are monitoring wild juvenile and adult abundance with weirs, snorkel surveys, and screw traps in key production streams that can serve as indicators of the steelhead status within Idaho. We are determining smolt age, smolt length, juvenile growth rates, juvenile and smolt migration patterns in key wild production streams. We have developed a steelhead genetic database of 72 wild populations and the five hatchery stocks reared in Idaho.

261 1991-073-00 Idaho Natural Production Monitoring and Evaluation - previously 1989-098-00 (BPA)

The Idaho Natural Production Monitoring and Evaluation Project (INPMEP) is an ongoing project in place to monitor trends in spring/summer chinook salmon and steelhead trout populations in the Salmon, Clearwater and lower Snake River drainages. This project has three major components including long-term general monitoring programs, evaluating habitat enhancement projects, and estimating life-cycle survival. The general monitoring programs provide historical as well as up to date information on juvenile salmon and steelhead populations. Specifically, the general parr-monitoring database contains 17 years of parr density and carrying capacity estimates from over 150 tributaries in the Mountain Snake Province. Adult escapement is monitored by completing redd count surveys for steelhead trout and chinook salmon. The second component of this project has been to evaluate habitat improvement projects initiated in the 1980's in over 20 key spawning and rearing tributaries. Benefits from the habitat projects were intensively monitored for about 10 years. During that period, the maximum benefits of the habitat enhancement projects could not be determined because seeding levels were below carrying capacity. Improved escapement in 2001 provides a unique opportunity to compare treatment and control sections during a period (2002) when densities may approach parr carrying capacity. We expect to focus on those comparisons during the 2002 field season. The third component of the INPMEP is evaluating overall life-cycle survival for aggregate Snake River spring and summer chinook salmon and steelhead trout. The survival work includes the freshwater stage (smolts per female) as well as the combined migration and ocean stages (smolt-to-adult survival). The survival analysis provides a method for determining if freshwater survival or migration and ocean survival are most limiting to the recovery of Snake River salmon stocks, and a baseline from which to evaluate future responses to management actions.

262 1994-008-06 Implement Tucannon River Model Watershed Plan to Restore Salmonid Habitat (Work contracted under 1999-001-00, 1999-057-00) (BPA)

The Tucannon River is currently home to ESA listed stocks of spring chinook salmon, fall chinook salmon, summer steelhead, & bull trout. Protection, enhancement, & restoration of salmonid habitat is guided by the Tucannon River Model Watershed Council, consisting of federal, state, & local resource agencies & government, tribes, citizens, & local landowners. The Council wrote the Tucannon River Model Watershed Plan following extensive assessments. Plan identified critical limiting factors affecting salmonid habitat productivity are high stream temperatures, high sediment levels in spawning gravels, lack of complex rearing & resting pools, and geomorphic instability. Plan guided restoration efforts to correct these limiting factors are designed to accelerate & complement the natural ecological processes, while watershed scale project prioritization insures selection of highly effective projects. The goal of the Tucannon River Model Watershed Plan is improved capacity of habitat to support viable salmonid populations. This goal supports the Columbia Basin Fish & Wildlife Authority Co-manager's and the Tucannon Subbasin Summary goals of improved adult pre-spawning and juvenile survival. Biological outcomes of improved survivability will be affected by, increasing pool and spawning habitat quality & quantity through geomorphic stabilization, riparian bio-function restoration, increasing complexity, maintaining adequate flow, and reducing water temperature & sediment embeddiness. Projects will be designed to incrementally move toward desired biological outcomes by addressing Plan and subbasin summary identified limiting factors, the 2000 Columbia Basin Fish and Wildlife Program (Program) Habitat Strategies, and NMFS Biological Opinion Habitat RPA Actions 149, 150, 151, and 153. Milestone evaluations, planned for FY 2002 & 2003, and project assessments will validate project effectiveness to achieve biological goals and guide adaptive management strategies. Assessments will be done in collaboration with WDFW, WSU, USFS, & NRCS. The district's opportunity to match & leverage funds from various sources (i.e. SRFB, DOE, WCC, USFS), utilize a long standing partnership with USDA NRCS for technical support, continue project partnerships with WDFW & USFS managers on public lands, & dove tail with the Conservation Reserve Enhancement Program (CREP) to establish buffers in riparian areas increase cost effectiveness & accelerates restoration to meet biological goals.

263 1994-018-07 Garfield County Sediment Reduction and Riparian Improvement Program - (proposal) - funded under: 1999-021-00, 1999-059-00, 1997-088-00 (closed, but some 088 activities carried i and 059 contracts) (BPA)

This project proposal is continuation of the area covered under BPA project ID 199401807. The reason for this is because of the recent subbasin summaries completed in the Columbia Plateau. The southern portion of Garfield County has been covered under the Pataha Creek Model Watershed project since 1995. It is included in the Tucannon Subbasin Summary. The northern portion of the county is in the Lower Snake Subbasin Summary and is now included in this proposal. This project proposal is to aid the farmers and ranchers of Garfield County in their continuing effort to reduce the amount of soil erosion on cropland, rangeland, and riparian areas. The soil erosion coupled with other contaminants has led to a degradation of the water quality and quantity of most of the streams in the county. The Pomeroy Conservation District is currently working with the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) in getting as many farmers and ranchers enrolled in the Continuous Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) as possible. These programs are designed to restore and enhance habitat along certain eligible streams and drainages to benefit fish and wildlife. Although these programs are available and successful, the issue of sediment in the streams is not entirely covered. This proposal is to use additional funding to address areas not covered by these two federal programs. Examples: additional funding for off-site watering facilities outside the riparian zones; the introduction and eventual conversion of more cropland acres into a no-till or direct seed program and other effective conservation programs. Our current cost share program through BPA has been working very well in the Pataha Watershed and other funding has been used in a limited amount throughout the remainder of the county. However, there is still an immense arena of cooperators in Garfield that have not utilized these programs. The upland portion of this program would address those cooperators that have not used existing programs or reached their district limitation. A new emphasis is also being directed towards cattle operations along streams and must also be addressed to improve salmon habitat and water quality.

264 1994-046-01 Walla Walla River Basin Fish Habitat Enhancement (BPA)

This project is a continued effort by the CTUIR in cooperation with local landowners to address habitat parameters necessary for rebuilding healthy, naturally producing populations of salmonid fish in the Walla Walla Basin. The project objectives are: 1) Identify, select, and implement habitat restoration and protection projects that provide long-term benefit to biological systems and the salmonid fish relying on them; 2) Continually elevate benefit to salmonid species and biological life within project areas through improved methodology. Habitat interventions implemented under this project will function at a watershed level, employ proven scientific methods, and strive to restore and protect biological diversity and natural floodplain and channel function. The project focuses on areas within the basin that are expected to provide the greatest benefit to target species while understanding the considerable monetary investment made by the public and need for cost efficiency.

265 1998-020-00 Assess Fish Habitat and Salmonids in the Walla Walla Watershed in Washington (BPA)

The intent of this project has been to collect baseline field data concerning fish habitat conditions and salmonid distribution and abundance information that are needed to guide numerous state and federal watershed and fish protection or restoration planning efforts. We have obtained detailed stream flow and water temperature data from many of the streams in the basin within Washington state. We have also conducted spawning ground surveys and summer electrofishing or snorkeling surveys in most Washington streams to determine indigenous salmonid (steelhead/rainbow, bull trout, whitefish) distribution and relative abundance. Further, the surveys have provided some information about the distribution of native non-salmonids and introduced species within the basin. Our surveys have incidentally located several previously unknown or undocumented barriers to fish migration. In some cases these barriers have precluded salmonids from spawning and rearing in nearly entire streams. We propose modifying this project to focus our monitoring and evaluation on specific areas and expanding the project in FY2002 to also assess adult steelhead and bull trout populations in two major Washington tributaries to the Walla Walla River: Touchet River and Mill Creek. The assessment will require construction at two existing facilities in the basin, and will include trapping, tagging and monitoring of spawning for both species in both rivers. Juvenile sampling and tagging will also be expanded in 2002 to fully describe the productive nature of the rivers and life history patterns and survivals within the basins. Electrofishing and snorkeling will be used to capture juvenile fish during summer, and a rotary migrant trap on Touchet River will be employed to estimate smolt outmigration. Smolt trapping may be initiated in Mill Creek in 2003 if an ODFW study is not funded in 2002. PIT tags and CWT tags will be used to help estimate parent-to-progeny survival rates, and identify life stage(s) within the populations that may be experiencing higher than expected mortality, possibly associated with habitat problems.

266 2000-019-00 Tucannon River Spring Chinook Captive Broodstock Program (BPA)

The Tucannon River spring chinook salmon stock represents the lowest geographic population in the Snake River Basin. The stock is genetically distinct from other Snake River Basin stocks, and is listed as "threatened" under the ESA. A decline in the Tucannon River spring chinook run since 1994, and predicted low returns, will not likely be adequate enough to sustain or rebuild the population to healthy levels. In 1997, WDFW and the co-managers believed that extreme intervention (captive broodstock) was called for to prevent extinction. This captive broodstock project is short-term (ending in 2008) to reduce the potential negative genetic risks posed by captive broodstock programs. This program is designed to produce additional hatchery smolts for release into the Tucannon River between 2002 and 2008. This program, in conjunction to the existing supplementation program, which has existed since 1985, will occur concurrently with habitat restoration efforts that are addressing the limiting factors within the Tucannon River Basin. Other out of basin limiting factors (mainstem adult and juvenile dam passage problems) are also being addressed. As proposed by the program, a maximum of 300,000 hatchery smolts will be released into the Tucannon River annually, with the expected outcome to produce between 500-600 hatchery origin adults annually in the future (2005-2010). All or the majority of these returning adults will be left in the river to spawn naturally to increase natural production in the Tucannon River. For FY2002, five brood years (1997-2001) of spring chinook will be reared at Lyons Ferry Hatchery at various life stages. Portions of the 1997-2000 brood year fish will become mature during the year. The mature fish will be separated from the others and spawned. The progeny will be reared at Lyons Ferry Hatchery and marked for evaluation purposes before release in the Tucannon River.

267 2001-011-00 Habitat Diversity in Alluvial Rivers (BPA)

We propose to develop and implement a remote-sensing/modeling approach to assessing ecological connectivity and salmonid habitat dynamics in alluvial-bedded rivers. The approach will use LIDAR, a recently developed aircraft-based sensor, to collect high-resolution topographic data for the entire mainstem of the Umatilla River and associated floodplains. After analysis, the data will be used in conjunction with a state-of-the-art computer simulation model to predict surface- and ground-water flow in the channel and floodplains of three study reaches. Model predictions of spatial and temporal aquatic habitat dynamics in the study reaches will be validated using data collected via remote-sensing and on-the-ground field surveys. This effort represents the culmination of a variety of past and ongoing research efforts in the Umatilla Basin and would build upon existing facilities, stream databases, and store-houses of remote-sensing imagery compiled by the Confederated Tribes of the Umatilla Indian Reservation. It further represents an integrated collaborative effort between Tribal Government, university researchers, and small business. Expected benefits of this research include: 1) development of a rapid assessment technique to document nodes of high salmonid habitat quality and a means to help prioritize opportunities for habitat restoration; 2) the ability to test the effectiveness of various flow and floodplain management scenarios in producing high-quality salmonid habitat; and 3) a means to inform current debates regarding the ecological effects of water-use policies on alluvial rivers. With further development, these techniques may allow the use of USGS river flow records and aerial photograph archives to predict water movement and seasonal habitat dynamics on historical floodplains. Combined, the products resulting from the proposed research will create a unique source of new information to further our understanding of aquatic habitat needs for native salmonids in the Columbia River Basin.

268 2001-038-00 Gourlay Creek Dam Fish Ladder (BPA)

Gourlay Creek Dam is a key limiting factor in the re-generation of salmon and trout in the Gourlay Creek watershed. Currently it provides a complete barrier to fish passage to ESA listed salmonids as well as to salmonids that are under status review for ESA listing. Historically, Gourlay Creek has provided important salmonid habitat within the Scappoose Bay Watershed (SBW). Salmonids still utilize the lower reaches of Gourlay Creek. The proposed project would open up over 2 miles of habitat for ESA candidate species (Coho and cutthroat trout) and nearly 4 miles of habitat for ESA listed steelhead. The City of Scappoose owns and manages close to half of the Gourlay Creek Watershed including high quality habitat above and below the Gourlay Creek Dam. Gourlay Creek is also one of the City's municipal watersheds. The City of Scappoose, the Scappoose Bay Watershed Council (SBWC), local residents, local high school kids, OR Dept. of Fish and Wildlife, OR Trout, OR Dept. of Forestry, Olympic Resources (local timber company), OR Dept. of Water Resources, Bonneville Power Administration, and OR Department of Environmental Quality have undertaken assessment and restoration work in the SBW and Gourlay Creek watersheds. These efforts demonstrate both the ecological importance of the watershed and the significance of addressing the fish barrier problems. There is a continued high level of support and interest in conserving and restoring salmonid habitat in the Gourlay Creek Watershed. The City has worked with the SBW council for the past 3 years monitoring water quality on Gourlay Creek and over the past 2 years has undertaken extensive assessment and begun restoration work with ODFW, the SBW council, and other watershed partners. The City of Scappoose is also in the process of developing a long-term management plan for City forestlands in the watershed. The Gourlay Creek Fish Passage and Fish Habitat Project is a major piece of the overall fish conservation and restoration efforts in the watershed. Ongoing and proposed fish monitoring efforts will help ensure that the effectiveness of the project and provide a basis for adaptive management in the watershed (Ref A, pink shaded area). The City of Scappoose, in partnership with the SBWC has been working with David Evans and Associates (DEA) in developing initial proposals and plans in constructing fish passage opportunities at the Gourlay Creek Dam/water reservoir. Essentially, the City of Scappoose is seeking funding to plan, design and construct a fish passage (ladder) facility which would include an initial 3-year monitoring element as well as longer term fish and flow monitoring. The City believes this project warrants funding within the "High Priority" criteria while acquiring support from multiple partners and facilitating the continued use of the Gourlay Creek as a water resource for some 6,000 people.

269 2000-055-00 Nutrient enhancement studies (BPA)**270 2001-061-00 Touchet River Flow Acquisition (BPA)**

The Washington Water Trust proposes to increase flows in the Touchet River through the permanent acquisition of an agricultural water right and transfer of the water right to instream flow in perpetuity. The transferred water right will be protected as an instream water right through the Washington State Trust Water Rights Program (Chapter 90.42 RCW). Acquisition of this water right from a Touchet River farmer is a time-limited opportunity which, if funded and approved as a Trust Water Right, will result in an immediate and permanent improvement in Touchet River instream flows. These flows will directly benefit bulltrout and steelhead currently listed as threatened under the Endangered Species Act. Of particular interest to Washington State Department of Fish and Wildlife is the chance to improve flows for upstream migration of adult steelhead. The subject water right is located on the Touchet River between Prescott and Waitsburg at approximately river mile 40. This water right is a fairly senior water right with a priority date of 1869 and the current landowner reports the use has never been interrupted. This seniority will allow the instream flow to be protected as it flows past all junior users. In particular, the water right is senior to a downstream irrigation district which often takes a majority and occasionally all of the Touchet's flow at its diversion point near Hofer Dam. If this water right is transferred to an instream right it will be senior to the irrigation district's water right (and thus ineligible for their diversion) and will provide flows to a reach of the river that has historically been de-watered.

271 2001-064-00 Improve Stream Flow and Passage for Simcoe Creek Steelhead (BPA)

We propose to maintain the summer flow of Simcoe Creek by providing stock water to replace stream diversions during the summer base flow period, and to facilitate upstream and downstream passage of steelhead by screening two canals and laddering two diversions. These actions fall under three of the four categories listed in BPA's May 10 solicitation, addressing tributary flow, tributary upstream passage and tributary downstream passage (screening). Simcoe Creek is the largest tributary of Toppenish Creek, which flows into the Yakima River. The Simcoe Creek watershed is entirely within the Yakama Indian Reservation, and contributes more than 10 percent of the subbasin's summer steelhead run. This proposal addresses four diversions of Simcoe Creek operated by and for Yakama tribal members (Fig. 1). Two of the four diversions require upstream and downstream fish passage facilities. Besides constructing fish passage facilities, we would also drill wells using project funds to provide summer stock water, thereby shortening the diversion season. Two other diversions in the vicinity (South Fork and Smartlowit) irrigate considerably smaller acreages, and are primarily used to water stock. The two diversions serve canals that run generally parallel to the stream channels, and can continue to be operated as high-flow channels from late fall into spring. We propose to drill wells to replace these canals as summer and early fall stock water sources. A third objective is to pump with solar power wherever necessary to overcome utility access problems. This would also help limit overall power consumption and use groundwater more efficiently by allowing well placement near the point of need. This project does not directly address mortality of migrating steelhead smolts within the Columbia River mainstem, but is expected to increase the number of migrating steelhead entering the mainstem by providing more habitat area, better quality habitat, and more favorable passage conditions in a significant tributary.

272 2002-020-00 Fabricate and Install New Huntsville Mill Fish Screen (BPA)

The Washington Department of Fish and Wildlife (WDFW), Yakima Screen Shop (YSS) proposes to replace the Huntsville Mill fish screen facility located on the Touchet River, a tributary to the Walla Walla River. Obsolete Walla Walla basin fish screens constructed in the 1930's, 40's, 50's and 60's must be replaced or updated to comply with current, regional fish screen biological protection criteria adopted by Columbia Basin Fish and Wildlife Authority (CBFWA), Fish Screening Oversight Committee (FSOC) in 1995. The project objective is to provide 100 percent protection from mortality and/or injury for all species and life stages of anadromous and resident salmonids, including bull trout and steelhead trout that are listed as "threatened" under ESA (6/98 and 3/99, respectively). Old screens in the Walla Walla basin, and in other Columbia River sub basins, may provide fair protection for large (4-6 inch long) yearling smolts, but poor protection for fry and fingerling life stages. Mortality of fry and fingerlings by irrigation diversions may reduce subsequent smolt production and hampers efforts to restore depressed salmon and steelhead populations through natural production or hatchery supplementation. Biological evaluation of completed Phase II fish screen facilities by Battelle, Pacific Northwest National Laboratory (PNNL) under Project # 198506200 has quantified survival and guidance rates approaching 100% (ranging from 90 to 99%). Consequently, the state and federal fish agencies and Confederated Tribes of the Umatilla Indian Reservation (CTUIR) propose to complete replacement or upgrade of all obsolete fish screen facilities in the Walla Walla basin.

273 2002-030-00 Develop Progeny Marker for Salmonids to Evaluate Supplementation (BPA)

The proposed research would include the development and testing of a progeny mark. A progeny mark is a material or chemical administered to female parents that is detectable in the tissue of their progeny. Ideally, a benign compound (or element such as strontium) would be injected either into the female adult's peritoneum or dorsal sinus and be assimilated into the eggs. The marker would be tested in laboratory conditions at three different concentrations against a control group. The hypothesis is that after the marker is incorporated into the egg, it would be laid down in the otolith of the progeny where it would be detectable using an electron microprobe. A nested ANOVA would be used to test within-female variation and between-treatment variation. This work would be an extension of work done by Kalish (1990) and Rieman et al. (1994) on sockeye salmon to determine if juvenile salmon had an anadromous or resident female parent. Researchers found that the higher strontium concentrations in anadromous sockeye (because of the higher strontium concentrations in the ocean) were passed on to their progeny and were detectable in the center of the progeny's otoliths. In the development of a progeny mark we would be artificially manipulating marker concentrations in adult females during their upstream migration. If successful, researchers would now have a tool to evaluate the success of their supplementation programs by determining the natural reproductive success of hatchery fish spawning in the wild in relation to wild spawners. After an effective progeny mark is developed, the new marker would be injected into adult, hatchery, female steelhead collected at traps and weirs (such as the Three Mile Falls Dam Trap on the Umatilla River). The marked adults would be released for natural spawning. The chemical compositions of otolith centers from a sample of naturally produced progeny would indicate the ratios of progeny from marked (hatchery) and unmarked (wild) females.

274 2002-047-00 Artificial Production Review Evaluation (APRE) (BPA)

The Artificial Production Review Evaluation will be reviewing each hatchery program in the Columbia River basin to re-examine its goals, determine how it is currently functioning and project how it might be changed or improved to more effectively or efficiently accomplish its goals. The Hatchery and Genetic Management Plans will be designed to examine each hatchery program to evaluate potential effects on Columbia River ESA species. Recommendation will be provided to increase positive effects and reduce detrimental effects of operating the hatchery programs.

275 1992-026-04 Investigate Early Life History of Spring Chinook Salmon and Summer Steelhead in the Grande Ronde River Basin (BPA)

Short description - Implement captive broodstock programs and associated research, monitoring, evaluation, and fish health for spring chinook salmon populations in Catherine Creek, upper Grande Ronde and Lostine rivers, to conserve genetic diversity and assist in recovery. Abstract - This program was initiated as a conservation measure in response to severely declining runs of chinook salmon in the Grande Ronde Basin. Our goals are to help prevent extinction of the three populations; provide a future basis to reverse the decline in stock abundance of Grande Ronde River chinook salmon; and ensure a high probability of population persistence well into the future once the causes of basin wide population declines have been addressed. Associated objectives include: 1) to reduce the demographic risk associated with the decline of native wild chinook populations in the Lostine River, upper Grande Ronde River and Catherine Creek, 2) to maintain genetic diversity of indigenous artificially propagated chinook Populations, 3) to maintain genetic diversity in wild chinook populations, 4) to assess the effectiveness of captive broodstock for use in recovery of chinook salmon, and 5) to determine most effective treatments for captive broodstock programs. We have collected naturally-produced juveniles for five years (1995-99), and reared these juveniles to the smolt stage at Lookingglass Fish Hatchery (LFH). Two-thirds of these smolts were transferred to Bonneville Fish Hatchery (BOH) and reared in freshwater and one-third to NMFS Manchester Marine Lab (MML) and reared in saltwater. Fish are reared at these facilities to maturity. We plan to continue collecting juveniles on an annual basis. Captive broodstock progeny are reared to the smolt stage at LFH. Our first smolt release occurred in 2000 from the spawn in 1998. We anticipate production of about 150,000 Lostine River and Catherine Creek smolts as a result of eggs taken in 1999. When the program is at full production, a minimum of 150 adults should return to the river of parent origin, to ensure threshold escapement levels are met. Expected biological outcomes - 1) Reduce the demographic risks associated with the decline of native wild populations in the Lostine and upper Grande Ronde rivers and Catherine Creek. 2) Maintain genetic diversity of indigenous artificially propagated chinook populations. 3) Maintain genetic diversity of wild populations. 4) Develop indigenous broodstocks for Grande Ronde chinook hatchery program. 5) Assess captive broodstock program performance in achieving adult broodstock, smolt production, adult return goals, and management objectives. 6) Determine optimum program operational criteria and technical approaches to ensure success of achieving objectives. 7) Assess the utility of captive broodstock programs for use in recovery of salmonids. 8) Produce an adequate number of eggs annually so that 150,000 Catherine Creek, Lostine River and upper Grande Ronde River stock smolts can be released into parent streams. 9) Determine and compare captive broodstock performance in seawater and freshwater environments. What data is available to measure biological outcomes? 1. Annual estimates of wild and hatchery fish escapement to Catherine Creek and Lostine and Grande Ronde Rivers. 2. Spawning distribution and spawner composition in Catherine Creek, Lostine River and upper Grande Ronde River. 3. Survival rates for captive reared fish in seawater (Manchester) and freshwater (Bonneville Hatchery). 4. Genetic profiles for natural and hatchery fish. 5. Data to compare performance of captive brood in seawater and freshwater including: age at maturity; growth rates; fecundity; egg survival; disease history and profile; egg production, fry production, smolt production; egg and fry survival; survival and growth of F1 progeny. 6. In the future we will have juvenile migration performance, smolt-to-adult survival and life history data for freshwater and saltwater treatment groups. Where does this data reside? Data resides in databases, tables, and reports. Centralized database is maintained in ODFW, La Grande Fish Research office, Eastern Oregon University, 211 Inlow Hall, One University Boulevard, La Grande OR 97850

276 1998-010-01 Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program (BPA)

Investigate the abundance, migration patterns, survival, and life history strategies of spring chinook salmon and summer steelhead from distinct populations and implement fish population and habitat monitoring in the Grande Ronde and Imnaha River basins. The goal of this project is to investigate the critical habitat, abundance, migration patterns, survival, and alternate life history strategies exhibited by spring chinook salmon and summer steelhead juveniles from distinct populations in the Grande Ronde and Imnaha River basins. Our methods include collecting juveniles with migrant traps and passive seining techniques, marking with PIT tags for migration timing and estimating survival indices, and snorkeling to determine habitat use. This study provides information as directed under three separate measures of the Columbia River Fish and Wildlife Program (7.1C, 7.1D, and 7.4L) in that it will provide information on abundance of parr and estimates for egg-to-parr and parr-to-smolt survival. This information is important in evaluating critical life stages, population status, and sustainability of naturally spawning populations. This study provides a means for long term monitoring of juvenile salmonid production in the Grande Ronde and Imnaha River basins that is essential for assessing the success of restoration and enhancement efforts including habitat improvement and hatchery supplementation (Captive Brood and Northeast Oregon Hatcheries project, NEOH). Findings to date indicate that a proportion of the Catherine Creek and upper Grande Ronde River spring chinook populations leave their upper rearing areas in fall and overwinter in the Grande Ronde valley where rearing habitat is significantly altered and degraded. We have also found that juvenile chinook are most abundant in pool habitats during summer and winter, which other studies have shown to be in short supply in the Grande Ronde basin. We have also shown that differences exist between local populations and life history types in migration timing at Lower Granite Dam which demonstrate the need to manage the hydrosystem so as to maximize survival throughout the entire migratory period of Snake River spring/summer chinook salmon smolts.

277 1997-001-00 Idaho Chinook Salmon Captive Rearing (BPA)

Develop captive rearing techniques for chinook salmon and evaluate the success and utility of captive rearing for maintaining stock structure and conservation levels of adult spawners in three drainages. The strategy of captive rearing is to prevent cohort collapse by providing captive-reared adult spawners to the natural environment, which, in turn, maintain the continuum of generation-to-generation smolt production. Captive rearing also strives to maintain the genetic identity of the local population by utilizing naturally spawned individuals in the project. However, captive rearing is a short-term approach to species preservation. It does little to repair the underlying problems that have resulted in the decline of Pacific salmonids over the past decades, but the benefits of this program will be realized by maintaining locally adapted populations until these issues have been resolved. The goal of this project is to develop and test captive rearing techniques. Project activities are divided into two parts: hatchery propagation and spawning performance monitoring and evaluation. The success of the project depends on developing culture techniques to produce fish with the proper behavioral, morphological, and physiological characteristics to successfully interact with and breed with wild individuals. Field monitoring is used to document behavioral interactions, spawn timing, success of redds spawned by captive-reared individuals, and to determine if changes in culture technique result in the desired changes in reproductive behavior or performance.

278 1991-055-00 NATURES [Formerly Supplementation Fish Quality (Yakima)] (BPA)

The project is developing a Natural Rearing Enhancement System (NATURES) for the production of hatchery fish with wild-like characteristics and increased post-release survival. Its main objectives are to determine if rearing salmonids with seminatural raceway habitat, exercise current velocities, automated underwater feeders, live food supplemented diets, and predator avoidance training increases their smolt-adult survival. Conservation programs can use the better survival offered by NATURES rearing to increase the size of endangered and threatened salmon stocks, which will, in turn, help maintain the biological diversity of the Columbia River Basin and genetic integrity of Pacific salmon. The development of these techniques is called for in Sections 7.2D.1, 7.2D.3, and 7.4K.1 of the Columbia Basin Fish and Wildlife Program and sections 4.4.c and 4.4.d of the ESA Snake River Salmon Recovery Plan. The method used to reach each objective is to: 1) develop more natural fish rearing protocols, 2) evaluate each protocol on a pilot scale to determine if it produces wild-like salmon with increased instream survival, 3) refine and reevaluate the protocols, 4) select the best protocol, and 5) evaluate the protocol's effect on smolt-adult survival with production scale releases. All the research uses the scientific method of strong inference for problem solving, compares experimental treatment fish to conventionally-reared controls, incorporates testable null hypotheses that can be refuted, and uses statistical analysis in decision making. NATURES research has already developed several fish culture practices that increase instream postrelease survival up to 60%. The program is now determining if these techniques produce similar increases in smolt-adult survival. The incorporation of NATURES rearing techniques into Columbia River hatchery programs will help return a productive fishery to the river and conserve Columbia River salmonid populations. Expected biological outcomes - 1. Increase survival of hatchery-reared salmonids 2. Produce hatchery-reared salmonids with wild-like characteristics 3. Speed the rebuilding of endangered and threatened salmonid stocks 4. Reduce negative wild-hatchery fish interactions by releasing fewer hatchery fish, while maintaining or increasing recruitment by producing higher survival NATURES fish. What data is available to measure biological outcomes? - 1. The project's experimental data indicates the instream survival of chinook salmon reared in seminatural raceway habitat exceeds that of conventionally-reared fish. 2. The project's experimental data indicates that the instream survival of predator trained salmon can exceed that of predator naïve salmon. 3. The project's experimental data indicates that the foraging ability of fish reared on live food supplemented diets can exceed that of fish reared exclusively on pellets. 4. In addition to the above, the project routinely collects data on fish length, weight, fish health, coloration, morphology, inculture survival, depth preference, social behavior, aggressive behavior, foraging behavior, and predator vulnerability. Where does this data reside? - The data is publicly available in reports and published papers: Berejikian et al.1999; Berejikian et al. 2000; Maynard et al. 1995; Maynard et al. 1996 a, b, and c; Maynard et al. 1997 a and b; Maynard et al. 1998.

279 1996-067-00 Manchester Spring Chinook Broodstock Project (BPA)

Rear Snake River spring/summer chinook salmon captive broodstocks from Idaho's Salmon River sub-basin and Oregon's Grande Ronde River sub-basin. Provide pre-spawning adults, eyed eggs, and juveniles to aid recovery of these ESA-listed stocks.

280 2001-047-00 Reintroduction success of steelhead from captive propagation and release strategie

In the last decade, nearly a dozen captive propagation programs have been implemented in the Columbia and Snake River Basins to maintain or rebuild depressed and declining populations of Pacific Salmon. NMFS (2000) has recently identified a number of additional populations that may require intervention with artificial propagation. The captive broodstock programs currently underway utilize either full life cycle rearing to amplify the population through juvenile releases or release of captive-reared adults for natural spawning. An alternative broodstock approach that has significant potential is the sequestration of populations into freshwater environmental reserves, where the life cycle may be completed without migration to and from the ocean. The high cost of present captive broodstock approaches emphasizes the need to investigate the success of alternative approaches. The relative reproductive success and offspring fitness fish provides a critical measure of the success of captive broodstock approaches. Opportunities to comparatively evaluate the relative reproductive success of captive broodstock strategies are rare and, indeed, necessary evaluation techniques have not been completely developed. An experiment in progress at the NMFS Alaska Fisheries Science Center's Little Port Walter (LPW) Research Station presents a unique and cost effective opportunity to simultaneously investigate the reproductive success and offspring fitness characteristics of artificially propagated steelhead derived from a sequestered *Oncorhynchus mykiss* population and its founder anadromous population. Progeny from all four parental cross-types of the two populations were both released as smolts and held as captive broodstock. Adults from all groups will be placed in their ancestral stream and behavioral interactions and spawning success quantified in instream enclosures in spring 2001. DNA fingerprinting will allow quantification of parental contribution to the F1 generation. Offspring behavioral interactions and fitness will be quantified in laboratory behavior trials. The innovative combination of behavioral and genetic metrics will provide important insights for uses of alternative artificial propagation strategies to aid recovery of declining salmonid populations.

281 1997-080-00 Asotin Creek Upland Sedimentation Reductin (BPA)

Direct Seed 105 acres per year of upland dry land corps for a five year period to reduce erosion rate to less than 2% per year to reduce sediment runoff to tributaries which directly feed currently productive spawning and rearing habitat in Asotin Creek.

282 1997-086-00 Asotin Watershed Upland BMP's (BPA)

Direct Seed 169 acres per year of upland dry land corps for a five-year period to reduce erosion rate to less than 2% per year to reduce sediment runoff to tributaries which directly feed currently productive spawning and rearing habitat in Asotin Creek.

283 1999-002-00 Asotin Watershed Project Implementation (BPA)

Plans, implements and monitors all projects on private lands in Asotin Creek, Ten Mile Creek and Couse Creek Watersheds.

284 1999-052-00 Asotin Creek Five Year Minimum Till Program (BPA)

Direct Seed 773 acres per year of upland dry land corps for a five-year period to reduce erosion rate to less than 2% per year to reduce sediment runoff to tributaries that directly feed currently productive spawning and rearing habitat in Asotin Creek.

285 1999-060-00 Asotin Watershed Upland BMP Implementation (BPA)

Construct 5 sediment basins per year on upland dry land corps to reduce to reduce sediment runoff to tributaries that directly feed currently productive spawning and rearing habitat in Asotin Creek.

286 2000-046-00 ISCO Water Sampling and Macroinvertebrate Samples (BPA)

Macroinvertebrate samples are taken twice per year, once in late spring – early summer and another in late summer – early fall, and identified down to family. The taxa information, with water quality and habitat information is used in a biotic index equation to establish relative stream health.

287 2000-047-00 GIS Mapping of Asotin Creek Watershed Habitat Projects (BPA)

GIS map with yearly update of all project locations within the watershed with corresponding project descriptions.

288 2000-053-00 Asotin Creek Riparian Planting (BPA)

Plant 20,000 trees in conjunction with CREP riparian corridors.

289 2000-054-00 Asotin Creek Riparian Fencing Projects (BPA)

Construct riparian corridor fencing and off channel watering systems in conjunction with livestock confinement areas associated with winter livestock holding areas.

290 2000-067-00 Asotin Creek Channel, Floodplain and Riparian Restoration (BPA)

Project site includes approximately 1 mile of meander reconstruction in 2002. In the summer of 2003, after riparian planting, two miles of George Creek including this project site will be enrolled into the CREP program.

291 1986-050-00 White Sturgeon Mitigation and Restoration in the Columbia And Snake Rivers Upstr Bonneville Dam (BPA)

This project is a cooperative effort between The Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Columbia River Inter-Tribe Fisheries Commission, Oregon State University, United States Geological Survey – Biological Resources Division. This study was designed to: 1. describe the reproduction and early life history of white sturgeon; 2. describe the life history and population dynamics of subadult and adult white sturgeon; 3. define habitat requirements and quantify habitat availability for white sturgeon; and 4. evaluate the need and identify potential methods for protecting, mitigating, and enhancing populations of white sturgeon. To determine effects of the hydropower system on white sturgeon populations and habitat, comparisons were made in the three lowermost reservoirs between Bonneville and McNary Dams with the unimpounded reach below Bonneville Dam to the estuary. The unimpounded population has unrestricted access to the ocean and exhibits seasonal migrations. Successful spawning occurs each year with all life stages being present that supports a productive fishery. Dam construction likely had little or no effect on population characteristics and habitat use in the reach below Bonneville Dam to the estuary. The 1987 Fish and Wildlife Program Measure 903(e)(1) calls for research to determine the impact of development and operation of the hydropower system on sturgeon in the Columbia River Basin. These studies may include habitat requirements, maintenance of genetic integrity, stock assessment, potential for artificial propagation, and migrating potential. The goal of this project is to: 1. implement and evaluate selected measures to protect and enhance populations and mitigate for effects of the hydropower system on production of white sturgeon in the Columbia River downstream from McNary Dam; and 2. determine the need and identify potential measures for protecting and enhancing populations and mitigating for effects of the hydropower system on production of white sturgeon in the Columbia and Snake Rivers upstream from McNary Dam.

292 1993-060-00 Select Area Fishery Evaluation (BPA)

This project is a joint effort by the Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW) and the Clatsop County Economic Development Council. The current project, initiated in 1994, is an outgrowth of a successful pilot study initiated in 1987 to initiate a small scale net-pen acclimation project in Youngs Bay. Results included 1) successful estuarine net-pen rearing, 2) adult survivals were at least double those of traditional hatchery programs, 3) high homing instincts were realized with less than 1% stray rates, and 4) nearly all (99%) of the adult production resulting from Youngs Bay coho net-pen releases were accountable in fishery harvests. The current SAFE Project is designed in a three-phase approach for each site and each species released at each site. Phase one focuses on determining sites that have the potential to support net-pen rearing and release sites and fisheries to harvest returning adults. Phase two determines the feasibility of establishing net-pen rearing and release sites and adopting fisheries to harvest returning adults. Sites receiving positive results in phase two are moved into phase three which included establishing additional net pens, increasing releases to full production, and expanding fisheries as necessary to harvest returning adults. As this project has continued, it has achieved the goal of introducing fisheries into select areas that minimize impact on protected weak stocks but allowed for full harvest of surplus hatchery-produced salmon returning to that select area. Select Area fisheries have consistently remained well below ESA-related impact limits while maintaining fisheries harvesting nearly 100% of the target species released in each Select Area fishing site. To date the majority of the project has focused on tasks associated with phases one and two and little effort has been invested into moving on to phase three. Based on the results of this project to date several sites and species are deemed suitable for expansion under phase three of this project. As this project reaches culmination project managers expect to move additional sites and species into phase three or eliminate them from this program. Monitoring activities associated with the project have not been limited to catch but also include monitoring of straying to escapement areas in the Columbia River basin. Stray rates have been extremely low, with the exception of SAB fall chinook reared and released from Big Creek Hatchery as broodstock for the Youngs Bay program and spring chinook released at Tongue Point. The project has modified release strategies to eliminate these situations. For SAB fall chinook broodstock, releases have been moved to Klaskanine Hatchery located on the North Fork of the Klaskanine River, a tributary to Youngs Bay. Initial returns indicate that moving the broodstock from Big Creek Hatchery to Klaskanine Hatchery has eliminated the straying problem while increasing harvest of returning adults. For spring chinook at Tongue Point, large scale releases have been discontinued at this time; however, CEDC is proposing plans to continue to evaluate straying of spring chinook at this site. CEDC's plans include 1) moving the net pen site away from the main channel of the Columbia River, 2) using a homing enhancing chemical (morpholine) to improve homing to net pen site, and 3) reducing the number of smolts released for study purposes. As returns on production fish are harvested, commercial fishers and processors each pay a voluntary 5% assessment on these landings. Revenue from the increased releases of 3.8 million spring chinook alone will generate over \$450,000 annually. This will reduce future funding requests by over 50%. The expected outcome of this project is the demonstration that significant, and sustainable, known stock fisheries can be implemented while allowing for rebuilding of weak and listed stocks. Additionally, it is expected that the project will culminate with Select Area fisheries being established in all sites that have proven to be acceptable with regards to water quality and impacts to listed species. Project will also continue to evaluate possibility of expansion into additional sites.

293 1997-009-00 Evaluate Potential Means of Rebuilding Sturgeon Populations in the Snake River Bet Lower Granite and Hells Canyon Dams (BPA)

The goal of the Nez Perce Tribe's (NPT) White Sturgeon Program is to restore and rebuild the white sturgeon populations in the Snake River between Hells Canyon and Lower Granite dams to support a sustainable subsistence harvest of white sturgeon by the Nez Perce People equivalent to 5 kg/ha/yr. This project addresses measure 10.4A.4 of the Northwest Power Planning Council Fish and Wildlife Program (1994) to "...fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams." In 1996, a biological assessment of the Upper Snake River White Sturgeon was conducted by the Nez Perce Tribe (NPT) as part of BPA project # 8605000. The Upper Snake River Sturgeon Assessment was successful in identifying: 1) regional sturgeon management objectives, and 2) potential mitigative actions needed to restore and protect the population. However, the risks and uncertainties associated with their implementation could not be fully assessed because critical data concerning the status of the population and their habitat requirements are unknown. Currently, under BPA project # 199700900, data on the health and status of the population and the specific life history attributes are being collected. From these data an adaptive management plan will be developed that will 1) reassess potential mitigative actions, 2) recommend the implementation of needed mitigative action(s), and 3) present a monitoring and evaluation plan.

294 1998-056-00 NMFS Net Exchange Program (BPA)

This project was initiated by the Yakama Indian Nation in 1998 with participation among the three remaining Stevens Treaty tribes and coordination with The Columbia River Compact under US v. Oregon jurisdiction. During 1997, 1998, and 2000, the Columbia River tribes conducted a series of studies to examine the potential effectiveness of gillnet mesh size requirements as a voluntary means of reducing harvest impacts on wild steelhead in the treaty commercial gillnet fishery. Studies examined the frequency distribution of gillnet mesh sizes in an unrestricted gillnet fishery and the species composition of the catch by different mesh sizes. In 2001, S. P. Cramer and Associates completed an analysis and a summary report which describes methods, results, and implications of detailed studies of Zone 6 Treaty Indian gillnet fisheries undertaken in Fall of 2000 to monitor changes in net use following a 9" net distribution program, investigate mesh selectivity, and project fishery effects of changing mesh size profiles. Access by Columbia River tribal fisheries to abundant fall chinook runs is sometimes limited by incidental catches of wild steelhead that migrate concurrently through the fishing grounds. Because steelhead are typically smaller in size than fall chinook, the use of large mesh in gillnets may allow for increased catch of chinook while also limiting impacts to wild steelhead. Actual benefits of mesh size regulations depend on the relative catch rates of each species by different mesh sizes, the fishing effort conducted with nets of each mesh size, and the respective run sizes of chinook and steelhead. Material for a total of 648 gillnets was purchased by BPA and distributed during August and September of 2000 and 191 new nets were observed in the fishery (recognized by color-coded floats). Fishers did not have time to complete assembly of all nets but remaining nets are expected to be phased into future fisheries. Almost half of the new 9" nets were estimated to have replaced 6" and 7" nets previously in use and the remainder were fished in addition to existing 8" gear. The net result was a 20% increase in total number of nets fished and a shift in 9" gillnet use from 15% during 1997 to 53% during 2000. Use of 6" or 7" gear was reduced from 22% to 5%. Based on fishery gear profiles and mesh-specific steelhead and chinook catch rates, we estimate that the increased use of 9" gillnets allowed Zone 6 fisheries to access over 11,000 additional fall chinook within the prescribed steelhead harvest limit. Similar benefits can be expected in future years when chinook surpluses are similarly large. In years where chinook surpluses are smaller, the use of 9" nets can be expected to reduce steelhead impacts below prescribed limits and/or provide more scheduling flexibility for Zone 6 fisheries.

295 2000-058-00 Effects of Gas on the Reproductive Success of Adult Salmonids (BPA)

This project was initiated by the USGS – Biological Resources Division beginning in FY 2000. The goal of this project was to determine if acute exposure to TDGS affects the reproductive performance of female spring chinook salmon. To accomplish this goal we had several objectives: (1) determine the effects of acute exposure to various TDGS levels on pre-spawning mortality and fecundity of spring chinook salmon, (2) determine the impact of maternal exposure to TDGS on egg quality, fertilization rate and short-term survival of progeny of spring chinook salmon and (3) determine the effects of TDGS on disease resistance in maturing female chinook salmon. All of these objectives were addressed using fish from Little White Salmon National Fish Hatchery that received short-term (< 72 h), sub-lethal exposures to gas supersaturated water in shallow tanks. Results of this study have been submitted to the BPA on December 1, 2001.

296 2001-007-00 Evaluate Live Capture Selective Harvest Methods (BPA)

The Washington Department of Fish and Wildlife and the Oregon Department of Fish and Wildlife initiated this study in FY 2001 to apply selective fishing gear and methodology largely developed in Canada within current lower Columbia River commercial fisheries. Selective harvest technologies and practices allow a continued harvest, while protecting weak stocks. "Selective fishing", more accurately described as "live capture, selective harvest", is the ability of a fishing operation to avoid non-target species or stocks, or when encountered, to capture and release those animals in a manner that results in minimal mortality. Successful selective fishing requires that two objectives be met. First, a conservation goal must be achieved for the species or stock of concern, and second, a harvest goal must be met to make the fishery economically viable. Weak stocks of spring chinook salmon return to the Columbia River intermingled with healthy stocks returning to hatcheries and lower river spawning sites. Harvesting salmon with gill nets in these mixed stock fisheries is a problem because fishers inadvertently catch weaker species and stocks while targeting salmon from stronger runs. Because successful live release of salmon from a gill net is difficult, the only practical way these traditional gears can be more selective for the target species is by time and area closures. While these restrictions can be very efficient at reducing by-catch and meeting the conservation goal for the fishery, they necessarily reduce fishing opportunity for the target species and do not meet the harvest goals. In 2001, protecting weak salmon stocks required significant restrictions in commercial harvest even though fish from the healthy stocks were numerous. We therefore began working with the commercial fishing industry to develop acceptable live capture gears that will provide more fishing opportunity while continuing to protect weak stocks. Simultaneous with the development of selective fishing methods, large portions of the hatchery production of spring chinook salmon are being identified by the excision of the adipose fin before release as juveniles. When these fish return as adults, fishers can distinguish them from naturally produced fish that do not have the adipose fin excised. The tangle net is a possible substitute for gill nets that may meet the criteria for selective fishing. Tangle nets look similar to a gill net with a small mesh size (3.5"-4.5" compared to 8" in a conventional spring chinook salmon net). Tangle nets are made from multifilament web while gill nets are typically made from monofilament web. Both gears are fished in the same method and locations, but the similarities stop there. Unlike a gill net, which captures an adult salmon around the gills or body, the mesh size of the tangle net prevents adult fish from entering the net that far. Instead, the fish is caught by the maxillary or teeth, which allows it to continue respiring in the net so it can be released live. External and associated internal injuries are also reduced using this capture method. Modifications in fishing practices, including the use of fish revival boxes, short soak times, and careful fish handling, are as important as the gear in ensuring that fish are released live and unharmed. The untested premise of live capture, selective harvest is that the released fish survive to contribute to rebuilding their stock. It is assumed that fish released in good condition will survive, but there have been no published studies looking at the long-term survival of fish that have been captured and released from commercial gill nets. Studies evaluating the survival of fish captured in sport fisheries indicate that mortality of released fish is variable and likely depends on the species captured, the skill of the fisher in releasing the fish, the water temperature, and the fishing method. Survival of lake trout captured in gill nets in Lake Superior and held in tanks for 48 hours varied seasonally from 68% to 77% (Gallinat et al. 1997) and studies evaluating coho salmon released from commercial fishing gears in British Columbia have shown that mortality of fish held in net pens for 24 hours was less than 3% (Farrell et al. 2001). However, evaluations of post-release survival of salmonids held in net pens are unlikely to reflect the post-release survival of free-swimming fish, because the fish in net pens are not subject to predation, currents, or encounters with obstacles to migration (e.g. dams, shallow parts of rivers, etc.) which a severely stressed fish, such as those captured in gears (Farrell et al. 2000) must contend with. Many tagging studies evaluating migration and population sizes suggest that fish can be captured and released with some success, but these types of studies were not specifically directed at looking at the effects of the capture gears on survival. The main goal of this study was to test the fundamental assumption of selective fishing – that the released fish we are trying to protect really do survive at acceptable levels to contribute to rebuilding the weak stocks they are part of – by estimating the post-release mortality of spring chinook salmon released from tangle nets and conventional gill nets on the Columbia River. We also estimated and compared the immediate mortality and catch efficiency of the two gears and evaluated characteristics of fish caught in each gear. Gear changes may result in encounters with different non-target species (by-catch), and this is expected with the tangle net as many small fish species that dwell in the Columbia River can pass through the large mesh gill nets without incident, but would be captured in the smaller-meshed tangle net. Because it is undesirable to shift the impacts from one species to another, we also compared the capture of species other than spring chinook salmon in each gear. In fall 2001 we evaluated the tangle net for capturing marked coho salmon but requiring release of unmarked coho salmon. Our second objective was to examine the feasibility of using a floating trap net to capture spring chinook salmon and coho salmon in the lower Columbia River.

297 2001-026-00 Evaluate Status of Coastal Cutthroat Trout in the Columbia River Basin above Bonneville Dam (BPA)**298 2001-036-00 Ames Creek Restoration (BPA)**

The United States Forest Service initiated this project in FY 2001 to restore fish passage in Ames Creek, a tributary of the South Santiam River. This project will address the segment of the stream that flows through the main city park in Sweet Home, OR. The project will take place entirely within properties owned by the City of Sweet Home. This phase of the overall restoration efforts in Ames Creek has very focused objectives; provide Winter Steelhead passage around a dam; restore a segment of stream channel to provide anadromous fish rearing habitat and improve riparian vegetation to provide shade to lower summer water temperatures. This project will have immediate benefits to ESA listed Winter Steelhead. The old mill dam is the only thing stopping upstream migration. Re-establishing the stream channel around the dam will open four miles of spawning and rearing habitat that is mostly on private industrial forestland and as such will be protected under State Forestry standards and guidelines. This project will remove approximately 600 cubic yards of old concrete material from the stream channel. In addition, native wetland plant communities in the old millpond will be established, and additional riparian tree planting will occur to both stabilize bank structure and aid in providing shade.

299 2001-058-00 Removal of Ghost Fishing Nets - Feasibility (BPA)

The Columbia River Inter-Tribal Fish Commission initiated a study late in FY 2001 to determine the feasibility of locating, marking and removal of lost gillnets within the Bonneville and The Dalles reservoirs. Lost nets, commonly referred to as 'Ghost Nets' have been documented to continue to intercept fish long after loss. Within these two reservoirs fishing nets used by tribal fishers are lost each year as a consequence of fishing. Lost gillnets may be a factor in survival of adult salmonids migrating upstream contributing to unaccounted loss. In addition, resident fish such as white sturgeon may be affected by lost gillnets. New technology sonar equipment that uses a towed transducer is capable of producing high-resolution images of the bottom, fish, and other objects underwater. This study attempts to adapt this technology to locate, mark and ultimately remove nets and assess impacts. Phase I feasibility study attempts to adapt current technology toward finding and marking lost nets. If it is determined that significant numbers of nets are located and marked, then Phase II will be added to include a recovery operation. At that point, additional work to attempt to quantify loss will occur in Phase II. By implementing this study, we can begin assess the impacts of these nets and determine whether or not the impact of Ghost Nets warrants a more focused removal effort in subsequent years.

300 Grand Coulee Bell 500-kV Transmission Line (BPA)

The Grand Coulee-Bell 500-kV transmission line is proposed to remove the West of Hatwai Transmission constraint. The proposed transmission line begins at the Grand Coulee Dam in Douglas County and extends in an easterly direction for about 83 miles through Lincoln County, Washington to BPA's Bell Substation north of Spokane, Washington. The proposed route for the new 500-kV line uses an existing BPA transmission line corridor.

301 Hungry Horse Transmission Stability Study (BPA)

BPA's transmission business line will conduct a study and recommend alternatives such as additional transmission lines or other technical or operational solutions that ensure both voltage stability in the Flathead Valley and enable the full range of Hungry Horse Dam operations in support of endangered fish needs. The studies will be conducted in 2002 and 2003. A study report including recommendations will be completed in 2004.

302 Libby Transmission Stability Study (BPA)

BPA's transmission business line will conduct a study and recommend alternatives such as additional transmission line or other technical or operational solutions that ensure both voltage stability and enable a full range of Libby and Hungry Horse Dam operations in support of endangered fish needs. Varied Columbia Falls Aluminum Company operations have complicated studies. Transmission studies are scheduled for completion by December 2003.

303 Report on New Generation Resources and Associated Transmission Improvements (BPA)

New energy resource projects and transmission lines to integrate them are periodically proposed within the Columbia River basin. BPA evaluates the interconnection requirements for these resources when their sponsors request transmission services. Some new generator locations and/or proposed transmission lines (should their sponsors decide to complete them) would mitigate the effects of BiOp recommended spill. BPA will summarize new generation proposals in its Annual Implementation Plan Progress Report.

304 Schultz-Wautoma 500-kV Transmission Line (BPA)

The Schultz-Wautoma project will increase transmission capacity north of the Hanford reservation and thereby remove a constraint to full implementation of river operations recommended in the BiOp. The proposed route for the Schultz-Wautoma 500-kV transmission line begins at BPA's Schultz Substation in Kittitas County Washington north of Ellensburg and extends in a southeasterly direction for 62-miles to the site of a proposed new substation called Wautoma in northern Benton County.

309 HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (CORPS)

312 Adult Temperature Evaluation (CORPS)

1) Project Information: Purpose/Objective - Water temperature has the potential to effect the migration behavior of adult salmon (rate of passage, delays, wondering/straying, and survival through the hydrosystem), it also impacts the physiological processes that make spawning successful (egg viability and energy expenditure). Thus, the exposure to the longer duration of high temperatures during dam passage and through the tailraces, fishways and forebays are thought to be a significant contributor to adult salmon passage delays, losses of adults upstream of Lower Granite, and reduced spawning success. In recent years water temperatures have been recorded as high as 24 ° C in the fishways and forebays of the Lower Snake River dams. It is important to note that this temperature is near lethal levels for salmon, it is also 10° C above the optimal migrating temperature, and about 8° C above the temperature level that causes, even at short term exposures, a reduction of reproductive potential. Water temperatures encountered by adult salmonids migrating through the lower Snake River are higher and the period of high water temperatures is of longer duration than the temperatures that were encountered prior to construction of upriver storage reservoirs. Optimum migration temperature for chinook salmon is 14 oC and adult steelhead have been reported delaying at the entrance into the Snake River until water temperatures drop to 21 oC. Cold water releases from Dworshak Reservoir in the North Fork of the Clearwater River have reduced water temperatures in the lower Snake River. Although the extent to which high water temperatures may compromise the ability of adult salmonids to migrate to spawning grounds and successfully spawn is unknown, fish held in hatcheries at temperatures above 15.6 oC have a lowered reproductive potential. Little is known about the existence of cool water areas in the lower Snake River and their possible use by migrating adult salmonids. Previous telemetry studies have shown that steelhead migrating through the lower Columbia River enter the mouths of cooler tributaries possibly using them as temporary refuges from the higher water temperatures encountered in the mainstem of the Columbia River Description - During the relative ranking (for fish benefits) of construction actions being developed to improve passage at the hydroprojects and river system, it is important to consider the impact of temperature exposure on the long term success of adult upstream migration and successful spawning. Actions that may appear to cause non-significant passage delay with respect to time may in-turn be causing an unacceptable level of high temperature exposure. Baseline information is necessary to evaluate the consequences, and interaction of temperature with the different passage routes, fallback, delays and construction actions related to fishways, and spillway improvements necessary to maintain a successful adult upstream migration (i.e. productivity of spawning, egg viability). Without baseline information on temperature exposure to adult fish passing through the fishways, dams and hydrosystem, and the behavioral responses, we may unintentionally delay a construction action that may reduce the impacts of exposure on reproductive success during critical times of poor water quality. Product - Baseline Information: Fishway Improvements to Reduce Passage Delays - Includes actions that help to improve the passage through the hydroproject and reduce exposures to high temperature and dissolved gas, such as: a) Ladder Temperature Control b) Transition Pools Improvements, c) Fishway Fallout, d) Fishway Entrance Delays. Modifications that Effect Delay a) Actions that affect migration behavior in the tailraces increased time spent in the tailrace during spill and high levels of dissolved gas and provide migration behavior information that helps to determine if adult fish modify their migration routes to accommodate for poor water conditions. b) Spill and Dissolved Gas Compensation, c) Fallback through Spill and Surface Collectors, d) Collection Channel Holding, e) Structures to De-stratify Forebay Thermal Profiles. Delays Related to System Management - Provide additional information on the environmental conditions that are encountered during straying and wandering. This will help to separate the environmental effects that cause delay (temperature) from delays that may be caused by a reduction in the homing ability of adults that were transported as juveniles or exposure to multiple bypass systems. 1) Major Activities/Tasks - A telemetry study shall be conducted to document the temperature (and depth) histories of adult fish during their upstream migration. Results of the baseline evaluation shall provide temperature exposure (and depth of passage) information that will be used by the Corps in several ongoing efforts. a) Pilot Study – August 1999 through March 2000; b) Field Season - January 2000 through November 2004; c) Final Report - December 2005. Adult fish will be tagged with radio/depth and temperature data loggers, track through the hydrosystem to their spawning ground to correlate temperature exposure history to spawning productivity, identify potential trouble areas within the adult fishways, impacts caused by fallback and passage delays and to correlate passage to areas of cool water refugia. To initiate this study, a pilot study was conducted in late FY99 and FY00 to determine if the proposed technology will provide the data needed to correlate passage behavior to environmental characteristics of depth and temperature. Adult fish (chinook and steelhead) were marked at Ice Harbor Dam and successfully tracked through the Snake River hydroprojects utilizing new depth and temperature recording radio tags. Preliminary information from this effort has already provided passage information for the passage problems in the adult fishway transition pools. The full study is planned for three consecutive years to incorporate annual variability into the data set. a) To complement the adult telemetry study water temperature monitoring is being conducted in the adult fishways and in the forebays, and profiles 2,000 ft. upstream of the dam. In addition, water temperature profiles in the reservoirs will also be collected throughout the Snake River and extensively in the Lower Granite reservoir, including the confluence of the Snake and Clearwater Rivers. b) A model that will be developed to calculate/estimate the expected migration routes for adult salmon and steelhead based on water temperature, dissolved gas and water velocities. This will be used to relate the physical river environment to the migration behavior of adult steelhead and salmon. The MASS 2D depth-averaged model originally developed for the DGAS Program dissolved gas model is being expanded to include an additional upstream area. The model will be modified to include a method to estimate vertical temperature profile for the designated sample cells and potentially a 3D simulation of the confluence areas.

313 Albeni Falls Operation (CORPS)

The FCRPS dams will be operated during the winter season in order to achieve a high probability of water surface elevations within 0.5 foot of the flood control rule curve by April 10 and to refill by June 30, except as specifically provided by the TMT. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30. If both these objectives cannot be achieved, the TMT will make an in-season recommendation, weighing considerations unique to each particular year. Because research results indicate that increased flows have more direct survival benefits for summer migrants than for spring migrants, modest reductions in spring flows to facilitate reservoir refill would generally be preferable to refill failure. During the summer, the Action Agencies draft mainstem storage reservoirs within the BiOp's specified draft limits, based on flow recommendations provided by TMT. TMT considers a number of factors when developing its flow recommendations, such as: the status of the migration, attainment of flow objectives, water quality, and the effects that reservoir operations will have on other listed and resident fish populations.

314 Adult Fish Counting at Mainstem Columbia and Snake River Projects (CORPS)

The Corps annual adult fish counting program is contracted to Washington Department of Fish and Wildlife. The annual counting schedule is coordinated through the FPOM and may include special counting to gather information for setting maintenance windows and other O&M activities or issues of concern. The Corps also maintains a WEB site, with daily and annual fish passage counts, and publishes the "Annual Fish Passage Report" which contains daily and historical fish count information for each mainstem project. Costs for adult fish counting are included in the annual funding for operation of fish passage facilities at each project.

315 Avian Predation Measures at Mainstem Columbia and Snake River Projects (CORPS)

Avian predation issues and potential measures to discourage predation at the FCRPS projects are coordinated through the FPOM. Operating criteria are reviewed and updated annually as part of the Corps' annual Fish Passage Plan. Funding for avian predation measures is included in the annual funding for operation of fish passage facilities at each project.

316 Non-Routine Maintenance of Bonneville Lock and Dam Fish Passage Facilities (CORPS)

Repair Bradford Island/Cascades Island Ladder Systems (Action Item 126). Much of the existing facilities have been in service since 1938 and are in need of rehabilitation. Construct STS/VBS Inspection System (Action Item 145). Design and construct a portable video inspection system to reduce the out of service time on facilities so Fish Passage Plan inspection rates are met. Refurbish STSs (Action Item 145). STS's need to be placed on a three-year cycle for complete refurbishment in order for them to stay in good operating condition. This item would get the existing STSs on such a cycle. Dredge Bradford Island Fish Ladder Exit Area (Action Item 145) The fish ladder exit area is subject to siltation with potential for delay to adult migrating fish plus increased maintenance due to aquatic plant growth and debris plugging of the trash racks. Improvements to the Fish Counting Stations (Action Item 117). A report will be put together which identifies necessary improvements to the fish count station that will reduce observed delay and improve counting accuracy. Results of the report will result in budget submissions to implement the prioritized improvements. Repair North Shore Monolith (Action Item 145). The north fish ladder monolith is in need of repair. The structure associated with this monolith are difficult to seal from the river outside thus dewatering is extremely difficult. Dredge the Second Powerhouse Forebay Immediately Upstream of the AWS Fish Units (Action Item 145). The forebay area immediately upstream of the AWS fish units is subject to debris buildup which impacts the operation of the AWS fish units. This leads to increased down time of the AWS fish units to rake trash racks. Dredging will remove that debris pile-up making the AWS fish units more reliable.

317 Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (CORPS)

Operation of Fish Passage Facilities. Funding for operating and managing fish passage facilities. This includes daily inspection and operation of facilities, minor facility maintenance and fish screen inspections (cleaning staff gages, adjusting or calibrating fishway control equipment etc.), project biologist costs, fish counting costs, and District Office costs for managing the fish passage program, including ESA consultation. Maintenance of Fish Passage Facilities. Funding for major maintenance of all fish passage facilities including annual maintenance of fish screens, juvenile bypass systems, adult fish ladders, powerhouse collection systems, and adult fish pumps. These funds cover labor for maintenance staff and parts and materials.

318 Chum Flows Below Bonneville Dam (CORPS)

Flows will be regulated below Bonneville Dam to support spawning of chum salmon if the best hydrologic data available by early October indicate that precipitation, runoff, and reservoir storage are likely to support the operation from the start of spawning (late October or early November) until the end of emergence (generally through the start of the spring flow management season in April). The chum spawning operation cannot adversely affect implementation of NMFS' 2000 FCRPS RPA or the parties' ability to comply with the Vernita Bar agreement. If these conditions cannot be met, the Action Agencies will work with NMFS and the regional salmon managers to identify operations that would benefit salmon while maintaining these other fish protection measures. Such operations may include intentionally managing flows below what is necessary for mainstem spawning to discourage redds from being established in the area or shaping flows in a manner that would discourage redd development (reverse load factoring). The chum spawning operation calls for the FCRPS projects to provide a minimum flow below Bonneville Dam of 125 kcfs (or more as coordinated) from when chum salmon are found in the area around Ives and Pierce islands (but no later than November 1) through December 31. The flows from Bonneville Dam will be maintained within 5 kcfs of the established minimum. Operating to the Bonneville tailwater gauge was found to be an effective management tool during the 2001-operating year. The tailwater gauge better reflects the effects of tides, tributary inflow and groundwater influence below Bonneville Dam. If water supply conditions indicate that it is not possible to provide a minimum flow of 125 kcfs from Bonneville Dam, flow will be provided during the chum-spawning season at times to allow access to Hamilton and Hardy Creeks. Details will be set through coordination in TMT. From January 1 to the start of spring flows April 10, if the chum operation is possible, the flow from Bonneville dam will be the daily minimum flow or minimum water surface elevation established by coordination in the TMT. If the minimum flow established for the fall chum operation is 125 kcfs the minimum flow shall be 125 kcfs or the equivalent tailwater gauge elevation. If the minimum flow for the fall chum operation is 135 kcfs or greater, the minimum flow for the winter chum operation will be 10 kcfs lower than the fall minimum chum flow. The minimum flow in no case will be greater than 150 kcfs.

319 Coordinate Water Management Decisions with TMT (CORPS)

The Action Agencies shall coordinate with NMFS, USFWS, and the states and Tribes in preseason planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process.

320 Cylindrical Dewatering Evaluation (CORPS)

1) Project Info - Purpose/Objective: Fish facilities have utilized submerged floor and side screen dewatering systems for most dewatering applications. Most systems on the Lower Snake river and McNary have proven to be problematic, both in terms of their effectiveness and mechanical reliability. At McNary in 1996 the floor screen system failed when the cleaning systems could not keep up with the debris accumulations. Due to the considerable problems experienced at the facilities, a new prototype cylindrical dewatering system has been constructed and is planned for testing in 2001/02. McNary project was identified for prototype testing due to debris loads of both fine aquatic (generally from the Columbia system) and coarse woody debris (generally from the Lower Snake). Results of the prototype tests may have applications at new or existing bypass and collection systems. Description - In FY02, a prototype system will test the cylindrical wedge-wire screen system, which would pass fish through the interior of the cylindrical screen and dewater through the drum. The drum would slowly rotate so the material can be easily cleaned off the surface, with some of the material being collected and removed. The system should reduce or eliminate screen-plugging problems. Advantages of the system include: greater wetted screen surface for lower through-screen velocities; larger total screen area allows the system to handle greater debris volumes; allows for above-water visual inspection during operation. Part of the screen is always out of the water and can utilize a simple, effective, above-water-level screen cleaning system. Some debris can be removed at the source and not be passed on through the fish facility. Recognizing there could be potential applications for any new or existing dewatering structures, a 1/4-scale pilot test facility has been constructed at McNary. The system is planned for initial debris and biological testing in FY 02. 2) Major Activities/Tasks – Milestones. FY 2002 - Reference data from the FY01 testing. Make corrections and improvements, if necessary: 10/01 - 9/02. Conduct verification debris and biological tests, if warranted: Conduct verification debris and biological tests, if warranted. Prepare feasibility report to identify potential applications at LSR and McNary. Coordinate with NWP for potential applications at Other federal hydropower projects: 4/02 – 8/02 and 10/01 – 9/02. FY 2003 - Prepare P&S contract to remove or relocate the prototype: 10/02 – 4/03. NMFS prepare final biological report with recommendations: 10/02 – 9/03. Plan for feasibility recommendations, as warranted: 9/03 +. FY 2004 - Issue contract to remove or relocate prototype. Leave water supply line for project uses. Repair deck areas, return area to original condition: 10/03 – 3/04. Initiate/develop technology at other sites as warranted. Original anticipated application for fish facility improvements at Lower Granite Dam: 10/03.

321 Delayed Mortality of Juveniles (CORPS)

1) Project Information: Purpose/Objective - Unexplained post-hydrosystem mortality has been described as the mortality that occurs above the rates observed in the historical data or above the expected rates based on the adult returns documented in similar systems. Speculation on the factors that may cause "extra mortality" have been attributed to unfavorable conditions in the estuary and ocean environments (often referred to as a regime shift), the viability of the stock, and a delayed detrimental effect of the hydrosystem on salmon survival. Overlapping the hydrosystem induced "extra mortality" is "delayed mortality", which has been expressed as the indirect mortality that occurs downstream of Bonneville (or following transportation) that can be attributed, specifically, to the operation, design or management of the hydrosystem. The definition of "delayed mortality" is usually expressed as the differences between the rates of post-system mortality that is dependent of the general route of passage through the hydrosystem (transportation, bypass facilities, spill/turbine passage) but with special emphasis on the difference in mortality compared to that of transported fish. Identifying the causes and their effects on "delayed mortality" for the specific salmon stocks and species for each route of passage through the hydrosystem will provide the critical post-hydrosystem performance criteria to which many of the items under the CRFM will be judged successful for the benefit of salmon. Results from previous transportation studies show that transported fish return at a higher rate than fish that are allowed to remain in river to complete their out migration. However, there appears to be a trend in the data that indicates transported salmon may have a higher rate of mortality after they leave the hydrosystem when compared to salmon that are not transported. This estimated "delayed mortality" appears to be highly variable depending on the year and season, however, since the rates of delayed mortality are not easily measured, the causes of "delayed mortality" remain unidentified. Speculation as to the causes of "delayed mortality" has been attributed to several sources. These include the physiological changes in fish that; reduce the ability of fish to make the transition to the saltwater environment, to grow, avoid predators, or increase in injury or exposure to diseases. Transportation, for example may alter the migration and schooling behavior of the smolts that make them more vulnerable to predators in the post-release environment. Also, the operation of the transportation program may deliver juvenile fish to the estuary too early in their life cycle to successfully enter the ocean, or may release fish at a location that exposes them to extreme levels of predation. Part of the Critical Risk Initiative identified the time period spent in the estuarine and early ocean life as one of the most critical periods in the life cycle of salmon. Any increase in survival during this period of a salmon's life may offer some of the greatest recovery benefits. Thus, information on delayed mortality that leads to improvements to the changes transportation program or the management of the hydrosystem to increase the estuarine and early ocean survival will provide progress toward the regional effort to recover ESA listed salmon. Description - This project attempts to provide more information on delayed mortality by reducing the variability in the current data sets and isolating the causes that contribute to long-term, post-system mortality in effort to reduce this effect. Product - Baseline Information: Since documenting the causes of "delayed mortality" will be difficult, it has been suggested that a systematic approach be used to evaluate the mechanisms that control or influence the rates of "delayed mortality". This includes evaluations that overlap many other programs of the CRFM: a) Difference in long-term survival observed in groups of fish with known passage histories; b) Evaluation of the differences in the migration characteristics and behavior during their passage through the estuary and the Columbia River plume into the near-ocean environment; c) Comparison of the physiological, health, and nutritional differences that occur in fish that migrate through the various routes of passage that effect post-hydrosystem survival; d) Evaluation of the effects of current and proposed barging strategies (seasonal transportation, release location and timing) on post-release survival. (The operation of the transportation program is being re-evaluated to try and develop a barging strategy that is based on the utilization of information related to the physiological condition of fish and the operational processes that result in the release the fish downstream of Bonneville at the optimal time and location for the highest salmon survival.). e) Evaluate the direct effects of project operations and the flows controlled by Bonneville Dam on the immediate estuarine and Columbia River plume hydrograph. Not only does this include the effects of the chemical and physical environment but, also, influences on the migration characteristics of the salmon and the distribution, abundance and cycles of salmon predators. Major Activities/Tasks - a) Continue to review historical current data to assess the adult return rates of juvenile salmon that completed their outmigration through the various routes of passage through the hydrosystem; Data Analysis - Part of ongoing adult passage evaluations. b) The direct approach of correlating differential survival of juveniles that have passed through these routes of passage is at best very difficult to obtain. Thus, a reduced approach is proposed to isolate the causes of differences in the rates of mortality. Fish with known passage histories (obtained through PIT tag detection and specific handling at the projects) will be collected and reared for a several months past their normal period of ocean entry, fish condition and mortality will be correlated to their route of passage. This work is under development and is proposed at a rearing facility at the Bonneville Dam juvenile bypass facilities. Three sample groups are proposed, a single PIT tag detected group (to represent inriver passage), multiple PIT tag detection (multiple bypass group), and a barge transportation group. The methodology and designs for sampling a barged transportation group is still under development. Utilization of rearing to asses "delayed mortality" for this type comparative evaluation can provide an indication of the success or impact of an operation on survival without the typical, high level, of fish handling. Studies that have been impractical in the past can now be considered. Examples of these types of evaluations included a comparative trucking versus inriver long-term survival study and survival evaluations for fish groups that experience multiple bypass passages in combination with being transported. Much of this study beyond FY 03 is in question, however, in that the pending construction, operation and effectiveness of the B2 corner collector may significantly affect the collection of fish for the study at Bonneville Dam. 1) Feasibility - March 2000 through November 2001; 2) Oversight Team Review - March 2001; 3) Field Season - January 2001 through November 2004?, 4) Final Report - December 2005, Annual Reports due in March, Annual Presentations due in November, Annual Study Plans presented to SRWG in September. c) Juvenile salmon passage through the hydrosystem may cause a decline in fish condition through stress that may not cause immediate mortality, but may be manifested once the added stress of saltwater entry is encountered in the estuary and near-shore ocean environment. This "delayed mortality" of outmigrating smolts in the near-shore ocean is not understood and research has been limited due to the problematic nature of conducting research in the ocean with small fish which are released hundreds of kilometers upstream. With recent advancements in technology however, this problem may now be evaluated. The beginning of the study addressed the feasibility of obtaining information on the differential and delayed mortality of juvenile salmon by incrementally partitioning and comparing mortality rates between the salt and fresh water interface in the estuary through the Columbia River plume in the near-ocean environment. Tracking of juvenile salmon through the salt/fresh water interface and Columbia River plume, coupled with information from the ongoing study to radio track salmon through the estuary to the salt water interface, will provide mortality rates from fish with known passage histories and help to identify where mortality occurs. This information will be used to focus on potential improvements that could be made to the management of the hydrosystem and transportation program. 1) Feasibility - March 2000 through November 2001; 2) Field Season - January 2000 through November 2004; 3) Final Report - December 2005, Annual Reports due in March, Annual Presentations due in November, Annual Study Plans presented to SRWG in September. d) Comparison of physiological differences (energy levels, health, smoltification, and growth) in the condition of fish that have passed through the various routes of hydrosystem passage will help to isolate the operational procedures that compromise the fish's ability to survive, or

aggravates a condition that reduces the chance for survival in the estuary and ocean. This work shall be coordinated with evaluations of multiple bypass evaluations and the transportation studies. 1) Comparison of physiological differences (energy levels, health, smoltification, and growth) in the condition of fish that have passed through the various routes of hydrosystem passage will help to isolate the operational procedures that compromise the fish's ability to survive, or aggravates a condition that reduces the chance for survival in the estuary and ocean. This work shall be coordinated with evaluations of multiple bypass evaluations and the transportation studies. 2) Evaluation of energy consumption in salmon with different migration histories. 3) Stress induced changes in enzymes that regulated osmoregulation. e) Investigate the feasibility of conducting a delayed mortality evaluation downstream of Bonneville. Number of fish required for rearing studies is relatively small when compared to the sample sizes necessary for the adult-return studies. It may be possible to modify the PIT tag detectors located on the PIT tag trawler to divert specific groups of PIT tag fish in sufficient numbers to conduct a rearing study in the estuary. The information provided from this type of study would supplement the proposed upstream rearing study by providing the additional system effects that may attribute to the environment downstream of Bonneville (environmental condition, predator avoidance, stress, energy depletion, disease transmission). Investigate Feasibility – November 2001.

322 Automated Alarm System for Adult Collection Channel Diffuser Systems (CORPS)

323 Modify Dworshak National Fish Hatchery System 1 Reuse System (CORPS)

Dworshak Dam has the capability of varying the temperature of water released from the dam through the use of selector gates on the turbine intakes. The selector gates are utilized to discharge water in the mid-40o F range during the summer to augment flows and cooling water temperatures in the lower Snake River for migrating adult and juvenile salmonids. Releasing water in this temperature range, however, retards the growth of juvenile steelhead in Dworshak Nation Fish Hatchery. This modification of Reuse System 1 will allow the hatchery to use heated water during the late fall and winter in reuse system mode to make up the loss of growth during the summer flow augmentation period, eliminating the conflict between hatchery water temperature requirements and Dworshak Dam discharges.

324 Dworshak Operations (CORPS)

1. The FCRPS dams will be operated during the winter season in order to achieve a high probability of water surface elevations within 0.5 foot of the flood control rule curve by April 10 and to refill by June 30, except as specifically provided by the TMT. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30. If both these objectives cannot be achieved, the TMT will make an in-season recommendation, weighing considerations unique to each particular year. Because research results indicate that increased flows have more direct survival benefits for summer migrants than for spring migrants, modest reductions in spring flows to facilitate reservoir refill would generally be preferable to refill failure. 2. During the summer, the Action Agencies draft mainstem storage reservoirs within the BiOp's specified draft limits, based on flow recommendations provided by TMT. TMT considers a number of factors when developing its flow recommendations, such as: the status of the migration, attainment of flow objectives, water quality, and the effects that reservoir operations will have on other listed and resident fish populations. 3. During the summer, releases shall be made from Dworshak to attempt to maintain water temperatures at the Lower Granite forebay water quality station at or below 68 F. The purpose of this action is to improve water quality (by lowering water temperature) in the Lower Snake River. During the summer (July–August) the Action Agencies shall operate Dworshak to help meet the flow objectives. The summer reservoir draft limit is 1,520 feet. This limit determines the maximum draft available for summer flow augmentation from Dworshak. 4. After summer fish operations flows from Dworshak shall be limited to minimum one turbine operation (approximately 1,500 cfs) unless higher flows are required for flood control. The purpose of this action is to assist in the filling of Dworshak reservoir.

325 Estuary PIT tag recovery (CORPS)

1) Project Information: Purpose/Objective - The relationship of abundance, timing, and migration behavior of juvenile salmonids passing through the estuary and near shore ocean environment on survival is not well understood. Acquisition of this information provides knowledge that is important to understanding of the relationship between estuarine survival and delayed mortality, the route of passage, post release survival, in-river (spill passed) and/or multiple passed juvenile salmonids. Future decisions on the new design or redesign of fish passage structures and or system management will be based, in part, on their impacts to salmon migration characteristics and survival throughout the estuarine and near-shore ocean environment. Survival or mortality downstream of the hydrosystem is not easy to assess. Currently system survival is assessed through the use of uniquely coded passive integrated transponder (PIT) tags that are injected into specific groups of fish. The detection facilities throughout the river system detect the unique codes of the PIT tags and provide the methodology to estimate survival through the hydroprojects on the lower Snake and Columbia Rivers. The lack of a stationary PIT-tag detection system downstream of Bonneville has been a deterrent to obtaining survival of salmon following their passage through the hydrosystem. Development of a PIT-tag trawler detection system provides for the monitoring of migration rates, migration behavior and the standardization of ocean entry times for the comparative survival groups of the multiple survival studies throughout the lower Snake and Columbia rivers. Partitioning losses between the hydro-system, estuary, and oceanic environment is an important element in the understanding of the impacts that system management has on long-term salmon survival. Observations of high avian predation initiated investigations and the development of methodology to recover information from bird colony islands in the estuary. The mortality attributed to avian predation throughout the hydro-system and estuary has been estimated through the use of PIT-tag detection technology development to recover tags from these islands. The PIT-tag information from avian islands helps to complete the survival databases by filling in the fate of thousands of lost PIT-tags. This information, in conjunction with the estuary PIT-tag recovery efforts help to partition survival throughout the estuarine and near shore oceanic environment. 2) Major Activities/Tasks – a) Assess relative abundance and timing, and migration patterns through the estuary and near shore ocean environment of PIT-tagged juvenile chinook salmon released for the evaluation of transportation and in-river migration from Lower Granite Dam, McNary, and other release groups where applicable. Verification of migration behavior, relative differences in species composition, abundance, depth, and location. (2001 – out years). 1) Continue the evaluation of estuarine migration behavior and ocean entry standardization for survival studies planned on the Snake River and Columbia River through the use of the PIT-tag trawler. 2) Recover transported and in-river migrating PIT-tagged steelhead and fall chinook (through 2006). 3) Divert fish with specific codes of PIT tags in the estuary to isolate fish for multiple bypass survival and delayed mortality evaluations. (through 2006). 4) Correlate migration behavior to radio and sonic telemetry of juvenile chinook through the estuary and Columbia River plume. b) Investigate the potential of incorporating a PIT tag diversion system into the PIT tag trawler for future delayed mortality evaluations. (2001-2003). c) Recovery of PIT tags from bird colonies in the estuary and river system (to provide data to fill in the data gaps for ongoing survival studies along with partition estuary mortality from oceanic for the planned survival studies. d) Evaluate avian predation and determine if differences in predation can be attributed to origin, passage history or fish condition of juvenile salmon. e) Monitor the success of the avian island rehabilitation project at reducing the level of avian predation on smolts. f) Identify and monitor areas of high avian predation in the reservoirs on the Columbia and Snake Rivers with special focus upstream of McNary Dam.

326 Fish Ladder Temperature Evaluation (CORPS)

1) Project Information. Purpose/Objective - There is evidence that indicates temperature gradients elicit a behavioral response in adult steelhead and, to some extent, adult chinook salmon. This is demonstrated by the holding behavior of adult steelhead and chinook salmon in response to temperature differences at the confluence of the Snake and Columbia Rivers. During mid summer when the Snake River warms more quickly than the Columbia River, and river temperatures are nearing the lethal limit for salmonid, some steelhead and chinook salmon hold for several weeks in the Columbia River. They enter the Snake River after temperatures have started to decline and the temperatures of the two rivers converge. This holding behavior is seen again as steelhead approach the confluence of the Clearwater River. In addition, several fish passage delays have been reported during temperature differences near adult fishways. Temperature differences of a few degrees at the confluence of the Lower Columbia and Snake Rivers and at fishways at other dams have caused adults to delay; it is logical to assume adults may behave in a similar manner when they encounter a temperature difference in or near the lower Snake River adult fishways. In addition, several occurrences of fish passage delays caused by temperature differences near adult fishways have been observed. Sockeye and steelhead passage was reduced at a Columbia River fishway that was heated to temperatures four degrees Celsius above the ambient river temperatures. A similar temperature blockage has been reported at the Pelton Dam on the Deschutes River (Oregon) during the summer when temperature differences ranged between six to eight degrees Celsius. Temperature data collected in the adult fishways have shown differences occur between the fish ladders and the tailrace temperatures. In general, these temperature differences are less than two degrees Celsius. However, during late summer in years of warm weather and low flows, a temperature difference of greater than two degrees Celsius can occur. To date, the largest temperature difference recorded is four and one-half degrees Celsius in 1992 at Lower Granite. If temperature differences of a few degrees at the confluence and at fishways at other dams may cause adults to delay, it is logical to assume adults may behave in a similar manner when they encounter a temperature difference in or near the lower Snake River adult fishways. This project is funded from the Columbia River Fish Mitigation Program. The long-term objective of this study has been to define any problems that may exist specific to effects of fish ladder water temperature on adult salmon and steelhead and to determine feasible methods of mitigating any adverse affects. Description - Temperature data is routinely monitored by project biologists. In addition, additional data was collected beginning in 1995 for Ice Harbor and McNary projects including forebay profiles. Other datasets exist for other projects and studies. The approach is to compile existing data, review for quality and compile into a database. 2) Major Activities/Tasks. Work Completed. During FY02, a data analysis report was prepared assessing and evaluating collected temperature data for Water Years 2000 and 2001 for all Snake River Dams and McNary Dam on the Columbia River. A draft report entitled "Water Temperatures and Passage of Adult Salmon and Steelhead in the Lower Snake River" was completed by the Idaho Cooperative Fish and Wildlife Research Unit. This draft report covers water temperatures and biological data collected at Ice Harbor and Lower Granite Dams during the summers of 1991-1998. Work Remaining. In FY03, a summary report will be prepared. Milestones: Complete Data Analysis Report – September 2002; Prepare Summary Report – September 2003.

327 Fish Ladder Transition Pool Evaluation (CORPS)

Project Information. Purpose/Objective – Radio telemetry studies underway since 1991 have indicated that approximately 70% of the adult salmon migrating upstream turn around near the transition pool in the adult fishways at the Columbia and Snake River Dams. Of the fish that turn around and move down the fishway approximately 50% fallout of the fishway back into the tailrace. Adults that have fallen out of the fishway may reenter the fishway immediately or may delay several hours in the tailrace. The average cumulative hydrosystem delay due to fallout of the fishway is approximately 3 to 4 additional days to the migration through the hydrosystem. Although there is no direct evidence that delays of a specific duration result in a reduced probability of successful spawning or fecundity, these effects are assumed. Salmon have a finite energy reserve available for migration and spawning delays have the potential to cause some individuals to die before completion of spawning. Also, delays during can increase exposure to high temperature and dissolved gas levels thereby increasing susceptibility to disease. Although the harm caused by fallout delay to adult spawning survival, success and productivity have not been demonstrated, improvements to the adult fishways and ladders are being investigated to eliminate the causes that induce turn around and fallout. Transition pools (the junction of the base of the ladder, the collection channel and a fishway entrance) are consistently shown to be an area of delay within the fishway. Description - This project is seeking to reduce the frequency of salmon turning around in or delaying at transition pools. Product – Baseline Information. Several processes occur within this area that make it difficult to identify the dominant factor that stimulates fish to turn around. The transition area is laden with the following problematic conditions: Low velocities through the transition pool. Measurements taken at Little Goose have shown that flows through the transition pool are less than 0.5 fps and less than 0.5 fps through the orifices in the lower weirs of the adult fish ladder (LGO). Attraction flows through the orifice should be greater than 4 fps; Submerged weirs may act as a physical obstruction or barrier. The first weir in which a fish must pass through or over is encountered immediately upstream of the transition pool area. In this confusing environment, the weir may be perceived as an obstruction instead of a passage route. Passage may be hindered by the complex and chaotic flows caused by the junction of the entrances, ladder, collection channel, and auxiliary water supply upwelling. Seasonal temperature gradients that may have the greatest difference over the auxiliary water supply diffusers may also contribute to confused behavior in the adult salmon in this area. Major Activities/Tasks - It should be noted that fishway fallout and delay is likely the combination of more than one problem with the adult fishway. Once turn around is initiated at the transition pool, factors contribute to the fish moving out of the fishway through an entrance into the tailrace. Also, after the fish has returned to the tailrace other factors contribute delay on re-entry. If turn around near the transition pool can be eliminated or reduced the other factors that contribute to fallout and tailrace delay have less opportunity to exert an influence on the adults. a) Review data to isolate the location at which the majority of the fish turn around in the transition pool and lower fish ladder, FY99 and FY00. Based on the analysis of data from fish passage at several fishways most of the fish were observed to turn around in the submerged weir section of the ladder. Although this data is limited for Little Goose and Lower Granite, turn around is expected to occur at the submerged weir section. This is based on the consistency at which this pattern is observed in the ladders at the downstream projects: Data Review - January 1999 through November 2001; Annual Presentation – November 2001; Letter Report - June 2001. b) Determine the common route of passage through the submerged weirs, orifices or over the weirs. As part of the pilot study to evaluate the temperature histories of adult salmon, the depths at which fish pass through the Lower Granite ladder were monitored, FY99 and FY00. Based on the result of this pilot study, most of the fish appeared to use the orifices to pass the submerged weir section of the adult ladder. This information elevates the importance of orifice flow velocities over the other conditions in the transition pool that may contribute to adult fish turn around: Pilot Study - August 1999 through November 2001; Annual Presentation – November 2001. c) Investigate the effects that an increase in velocities through the submerged weir orifices has on adult salmon turn around in the transition pool area. This is being accomplished by increasing the head differential over the submerged weir section of the Lower Granite ladder. The modifications should restrict the flow enough to create at least a 0.25 head differential across the weirs so that the velocity through the submerged orifices is at least 4 feet per second. The initial design is for a temporary modification suitable for prototype field-testing: Design a raised weir for the first five submerged weirs - December 1999; Construct raised weir - May 2000; Adult fish passage telemetry evaluation of the prototype weirs; Field Season - January 2000 through November 2002; Final Report - December 2003; Annual Reports due in March; Annual Presentations due in November; Annual Study Plans presented to SRWG in September. d) Depending on the results of the raised weir evaluations, investigations shall focus on reducing the turbulence, eddies, confusing direction and to increasing the velocities of the flows in and near the transition pool area. An alternate concept is the construction of a pair of wing-walls to help smooth out the flows as they transition from the junction pool to the collection channel. Higher velocities and less confusing flows at this location may help fish to move out of the collection channel and into the transition pool area. This may reduce the fallout of fish that previously would have turned around in the transition pool by quickly attracting them to move back upstream toward the ladder; away from the fishway entrances: Design and construct fishway wing walls - July 2002 to April 2003; Evaluate the success of the prototype in reducing adult fish fallout and improve fish passage behavior - January 2003 –2006. e) The intent of testing these concepts at Lower Granite is to identify the hydraulic condition that triggers the turn-around behavior in adult salmon. Once this stimulus has been isolated, concepts and solutions will be developed, designed and implemented for each adult fish ladder at the Snake and Columbia river dams. The results of the 2001 raised weir concept test were very encouraging. Therefore, we intend to begin preliminary design early in FY 2003 (or 2002) for a permanent solution based on its concept. If the results of 2002 test confirm a significant improvement, design will be completed with a goal of construction at Lower Granite in FY 2004. Testing will occur following construction. With good results, similar improvements will be designed and constructed at several other Snake and Columbia River Projects. If the results to the evaluations are unclear implementation actions will be delayed. Milestones: Letter Report Problem Analysis – June 2001; Raised Weir Evaluation - Draft Report – May 2003; Decision to construct permanent raised weirs at Lower Granite – June 2003; Evaluation of Fishway Wing-Walls; Test Design and Implement at Other Adult Fish Ladder – Start – December 2003.* Initiation of this work will depend on the results of the raised weir evaluation.

328 Fish Passage Plan Development and Implementation (CORPS)

The Corps Fish Passage Plan is updated in draft form and distributed to FPOM members in mid-December of each year for review and comment. Efforts are made to include or resolve all comments made on the draft Fish Passage Plan. Responses to all written comments received on the Fish Passage Plan are provided in writing to when the Fish Passage Plan is finalized.

329 Flow Objectives at McNary (CORPS)

1. The spring flow objective at McNary Dam is set according to the April final runoff volume forecast at The Dalles Dam for April to August. When the forecast is less than 80 maf the flow objective will be 220 kcfs. If the forecast is between 80 maf and 92 maf the flow objective will be linearly interpolated between 220 kcfs and 260 kcfs. If the forecast is greater than 92 maf the flow objective will be 260 kcfs. The planning dates for the spring flow objective will be from April 10 to June 30. 2. The summer flow objective at McNary Dam is 200 kcfs. The planning dates for the summer flow objective will be from July 1 to August 31.

330 Flow Objectives at Lower Granite (CORPS)

1. The April final runoff volume forecast at Lower Granite Dam for April to July determines the spring flow objective at Lower Granite Dam. When the forecast is less than 16 maf the flow objective will be 85 kcfs. If the forecast is between 16 maf and 20 maf the flow objective will be linearly interpolated between 85 kcfs and 100 kcfs. If the forecast is greater than 20 maf the flow objective will be 100 kcfs. The planning dates for the spring flow objective are from April 3 to June 20. 2. The summer flow objective at Lower Granite Dam is determined by the June final runoff volume forecast at Lower Granite Dam for April to July. When the forecast is less than 16 maf the flow objective will be 50 kcfs. If the forecast is between 16 maf and 20 maf the flow objective will be linearly interpolated between 50 kcfs and 55 kcfs. If the forecast is greater than 20 maf the flow objective will be 55 kcfs. The planning dates for the summer flow objective will be from June 21 to August 31.

331 Ice Harbor Adult Pit (CORPS)

Not available at this time.

332 Ice Harbor Emergency Auxiliary Water Supply (CORPS)

1) Project Information. Purpose/Objective – Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The bypass of adult anadromous fish upriver for spawning is a critical portion of their life cycle. Hydraulic criteria have been established to facilitate the efficiency of their bypassing the dams by using upstream migrant systems. Compliance, where practicable, to these criteria is essential to operating the systems optimally. The adult fishway auxiliary water supply systems at Ice Harbor have no spare or emergency capacity, and require modifications to operate in accordance with the actions set forth in the Biological Opinion (Bi-Op). The general criteria established by the Bi-Op requires: (1) that auxiliary water system provide an emergency spare capacity equivalent to one pump above the maximum normal auxiliary flows, and (2) that electrical reliability should provide for 100% back-up in the event of an outage due to a single failure of either the bus, switchgear, or transformers feeding the pumps. The objective for providing spare water supply capacity increases overall system reliability by providing emergency water supply for use during partial failures. It also increases the opportunity for practicing preventative maintenance on idle equipment without requiring system operation outside of the criteria established in the fish passage plan. In addition actual operating time on equipment will be reduced, increasing the overall useful operating life. By configuring the adult fishway system with spare water capacity and improved electrical reliability, fish passage plan criteria can be maintained, thus ensuring that the passage of adult salmonids through the system will be at the highest percentage with minimal delay. Description - The 2000 Bi-Op (RPA actions 120, 121 and 129) requires development of improved adult fishway entrance conditions by conducting hydraulic analysis of the systems, developing maintenance records and procedures, and implementation of corrective measures as warranted. Phase I and Phase II Technical Reports were led by the COE to review several alternatives to determine the most cost effective and reliably sound method to achieve the actions required by the Bi-Op. Since the dam was constructed, the existing auxiliary water supply system has proven to be very reliable. Three electric motor-driven pumps each with a speed reducer supply the auxiliary water to the lower fishway and the fish ladder lower diffusers. However, this equipment has operated for 40 years and requires more than the standard overhaul and preventative maintenance work to assure continued reliable operation. The recommended course of action is to upgrade the existing pumps on the north shore, upgrade the electrical switchgear and provide redundancy, and provide additional bulkheads, cranes and hoists to facilitate routine O&M as well as emergency repairs. The south shore system will also receive upgrades to the electrical system components, providing improved reliability and redundancy. The pumping system already has spare capacity and no modifications are necessary to the mechanical systems. 2) Major Activities/Tasks - At Ice Harbor north shore system, it is recommended to upgrade and isolate the existing pump systems, modify the diffusers to allow more flow, install cranes for access and maintenance, and fund (through operations and maintenance funding sources) maintenance on existing systems and upgrade spare parts inventory. For the south shore system, it is recommended to upgrade and isolate the existing pump systems and fund (through operations and maintenance funding sources) maintenance on existing systems and upgrade spare parts inventory. The construction will take place over 2 years to allow for one ladder to be in operation at all times. Milestones: Phase I Construction on South Shore Electrical System – Jan. 2002; Phase I Construction Install Derrick and Bridge Cranes – Mar. to Aug. 2002; Phase II Construction on North Shore System Pumps 1 and 2 – Dec. 2002 to Feb. 2003; Phase III Construction on North Shore System Pumps 1 and 2 – Mar. to April 2003; Complete Construction – May 2003.

333 Non-Routine Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (CORPS)

Items listed are part of the Corps 5 year O&M plan required under RPA 6 and RPA 145 for ensuring long term reliability of fish passage facilities.

334 Operation and Maintenance of Ice Harbor Lock and Dam Fish Passage Facilities (CORPS)

Operation of Fish Passage Facilities. Funding for operating and managing fish passage facilities. This includes daily inspection and operation of facilities, minor facility maintenance and fish screen inspections (cleaning staff gages, adjusting or calibrating fishway control equipment etc.), project biologist costs, fish counting costs, and District Office costs for managing the fish passage program, including ESA consultation. Maintenance of Fish Passage Facilities. Funding for major maintenance of all fish passage facilities including annual maintenance of fish screens, juvenile bypass systems, adult fish ladders, powerhouse collection systems, and adult fish pumps. These funds cover labor for maintenance staff and parts and materials.

335 Ice Harbor Survival Studies (CORPS)

1) Project Information. Purpose/Objective – Passage through the hydroprojects via the spillway provides a route of passage that allows fish to avoid turbine mortality and reduces forebay delay, thus reducing opportunities of forebay predation. However, spill levels, patterns and spill duration to provide the best conditions for smolts (dissolved gas levels, injury, tailrace predation and egress flows) must be balance with the negative impacts of high spill on adult salmon passage, fallback and water quality. Spillway passage through In 1998 the modifications to the Ice Harbor Dam spillway were completed with flow deflectors on each of eight spillways and the construction of an adult fishway training wall to divert spill flows away from the adult fishway entrances. Biological evaluations have not been conducted to verify the performance of the modifications, specifically spillway survival, since the construction of these improvements. Thus, efforts are focused on confirming spillway passage survival for juvenile salmon under the normal range of project operations and on documenting the impact of the new adult fishway training wall on adult salmon fishway entrance behavior and passage through Ice Harbor Dam. Also, the eddy that forms in front of the Ice Harbor powerhouse during spill has become more severe since the construction of the flow deflectors. The flows in front of the powerhouse are drawn toward the stilling basin under the spill. This eddy has been suspected of increasing the levels of dissolved gas and passage times of juvenile salmon through the tailrace. Thus, exposing the juvenile salmon to poor water conditions and potentially higher levels of predation at the project. Complicating passage issues is the recent increase in the level of daytime spill at the Snake River hydroprojects up to the gas cap. Spill efficiency and effectiveness studies conducted in 1997 and 1999 indicated that increased levels of spill do not necessarily increase the efficiency of spill passage and appear to decrease the effectiveness of passage through spill. Other potential impacts of the increased daytime spill are to adult passage behavior, passage rates and increased adult fallback. Fallback may have serious accumulative impacts of delay that effect spawning success and productivity of the adult salmon. Survival studies have been conducted in 1999 for indication of immediate levels of survival and again in 2000 for longer term survival. Although the survival study in 2000 was compromised due to equipment failure the limited data indicates comparatively high survival for the spring summer chinook. However the same is not true for fall chinook survival through the spillway compared to a tailrace release group. 2001 studies were significantly compromised due to low flows and very limited spill. Studies were conducted in 2002 and results are pending. Depending on results of this study (particular summer fish) this study may be accomplished again in 2003. If 2002 results confirm the low survival estimate for subyearling chinook in 2000, a new suite of studies will be launched to determine the mechanisms and mitigation for the mortality. Description – Spill operations at Ice Harbor include 24 hr spill with the night time spill limited to the total dissolved gas cap as measured downstream and daytime spill is limited 45 kcfs for adult passage. This project uses radio telemetry and PIT tag to assess near term survival, comparative survival, tailrace egress and forebay delay under the current spill operation at Ice Harbor for spring/summer chinook and fall chinook. 2) Major Activities/Tasks - Evaluate Ice Harbor passage distribution and eddy passage through the use of radio tags. Conduct spring chinook in FY01 and reassess fall chinook survival through spill by re-locating the tailrace control release. Evaluate spillway survival at Ice Harbor (including a comparative evaluation of increased spill recommendations prior to implementation). Telemetry shall be used to partition survival through Ice Harbor to McNary Dam. A comparison of methodology (radio tags versus PIT tags) shall be incorporated into the spillway passage survival study to confirm the reliability of the telemetry data. Evaluate the effects of eight flow deflectors on adult passage rates, entrance usage, and fallback through spill. Correlate entrance behavior to deflector and training wall effects. Continue to evaluate spill effectiveness and efficiency and spillway passage survival (versus specific spillbay passage survival) at Ice Harbor. Milestones: March 2002; Decision if 2003 program must determine cause of low subyearling survival – November 2002.

336 HGMP Development for Bonneville Fish Hatchery and Spring Creek National Fish Hatchery (CORPS)

Hatchery and Genetic Management Plans (Action Item 169) - Development of these plans is required by the three year check-in point and are intended to be used as guidance on reducing the negative impacts the hatchery program can have on listed fish. The plans will have suggested reforms to current hatchery practices or facilities. The high priority reforms are to be implemented.

337 Non-Routine Maintenance of John Day Lock and Dam Fish Passage Facilities (CORPS)

Rebuild Powerhouse AWS Turbines (Action Item 145). The turbines, which drive the AWS pumps, are aged and need to be rebuilt. This action would rebuild 1 turbine per year with the first year used to develop the plans and specifications for a contractor to rebuild the turbines. Improvements to the Fish Counting Stations (Action Item 117). A report will be put together which identifies necessary improvements to the fish count station that will reduce observed delay and improve counting accuracy. Results of the report will result in budget submissions to implement the prioritized improvements. Rehabilitate all STS and VBS (Action Item 145). If the project has not converted to an ESBS bypass system the original STS and VBS will be aging and in need of rehabilitation to continue to be reliable.

338 Operation and Maintenance of John Day Lock and Dam Fish Passage Facilities (CORPS)

Operation of Fish Passage Facilities (Action Item 144). Funding for operating and managing fish passage facilities. This includes daily inspection and operation of facilities, minor facility maintenance and fish screen inspections (cleaning staff gages, fish counting, adjusting or calibrating fishway control equipment etc.), project biologist costs, and District Office costs for managing the fish and wildlife program, including ESA consultation. Maintenance of Fish Passage Facilities (Action Item 144). Funding for major maintenance of all fish passage facilities. This includes annual maintenance of juvenile bypass systems (except at John Day where this is a separate line item), adult fish ladders, powerhouse collection systems, and auxiliary water systems for adult fish ladders. It does not include O&M of the Fish Water Turbines and Electrical Generators at the Bonneville second powerhouse or either The Dalles powerhouse or north fish ladder. These funds cover labor for maintenance staff and parts and materials.

339 John Day Minimum Pool Operation (CORPS)

John Day pool shall operate within a 1½-foot range of the minimum level that provides irrigation pumping from April 10 to September 30.

340 Corps of Engineers' Juvenile Fish Transportation Program (CORPS)

The Juvenile Fish Transportation Program is implemented in accordance with RPA's 40, 41, 42, 43, and 44 and a Section 10 Permit issued by NMFS. Operating criteria for the program is contained in the Corp's annual Fish Passage Plan under Appendix B, Corps of Engineers Juvenile Fish Transportation Plan. The Juvenile Fish Transportation Plan contains the requirements from the 5 RPA's and Section 10 permit regarding when juvenile fish will be transported from the Snake River collector dams and from McNary Dam on the lower Columbia River. The Fish Passage Plan contains provisions for spring spill at Snake River projects when seasonal average flows are expected to be above the 85 kcfs level (RPA 40) along with transporting fish collected at these projects, maximizing transport from Snake River projects during the summer (RPA 42), bypassing spring migrants at McNary Dam (RPA 41) and changing over to transport of summer migrants when river conditions are no longer spring like (RPA 43), and extending the period for barging Snake River summer migrants through July 31 of each year (RPA 44). The Corps also is continually reviewing the operation of the juvenile fish collection facilities and transport equipment (RPA's 52 and 53) and making necessary modifications or repairs as needed.

341 Libby Operations Andromous (CORPS)

1) The FCRPS dams will be operated during the winter season in order to achieve a high probability of water surface elevations within 0.5 foot of the flood control rule curve by April 10 and to refill by June 30, except as specifically provided by the TMT. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30. If both these objectives cannot be achieved, the TMT will make an in-season recommendation, weighing considerations unique to each particular year. Because research results indicate that increased flows have more direct survival benefits for summer migrants than for spring migrants, modest reductions in spring flows to facilitate reservoir refill would generally be preferable to refill failure. During the summer, the Action Agencies draft mainstem storage reservoirs within the BiOp's specified draft limits, based on flow recommendations provided by TMT. TMT considers a number of factors when developing its flow recommendations, such as: the status of the migration, attainment of flow objectives, water quality, and the effects that reservoir operations will have on other listed and resident fish populations. 2) The summer reservoir draft limit is 2,439 feet.

342 Little Goose Auxiliary Water Supply (CORPS)

1) Project Information. Purpose/Objective – Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The bypass of adult anadromous fish upriver for spawning is a critical portion of their life cycle. Hydraulic criteria have been established to facilitate the efficiency of their bypassing the dams by using upstream migrant systems. Compliance, where practicable, to these criteria is essential to operating the systems optimally. The adult fishway auxiliary water supply system at Little Goose has no spare or emergency capacity, and requires modifications to operate in accordance with the actions set forth in the Biological Opinion (Bi-Op). The general criteria established by the Bi-Op requires: (1) that auxiliary water system provide an emergency spare capacity equivalent to one pump above the maximum normal auxiliary flows, and (2) that electrical reliability should provide for 100% back-up in the event of an outage due to a single failure of either the bus, switchgear, or transformers feeding the turbine pump appurtenances. The objective for providing spare water supply capacity increases overall system reliability by providing emergency water supply for use during partial failures. It also increases the opportunity for practicing preventative maintenance on idle equipment without requiring system operation outside of the criteria established in the fish passage plan. In addition actual operating time on equipment will be reduced, increasing the overall useful operating life. By configuring the adult fishway system with spare water capacity and improved electrical reliability, fish passage plan criteria can be maintained, thus ensuring that the passage of adult salmonids through the system will be at the highest percentage with minimal delay. Description - The 2000 Bi-Op (RPA actions 120, 121 and 129) requires development of improved adult fishway entrance conditions by conducting hydraulic analysis of the systems, developing maintenance records and procedures, and implementation of corrective measures as warranted. Phase I and Phase II Technical Reports were led by the COE to review several alternatives to determine the most cost effective and reliably sound method to achieve the actions required by the Bi-Op. Since the dam was constructed, the existing auxiliary water supply system has proven to be very reliable. The existing auxiliary water supply system uses three hydraulic turbine-driven pumps with speed reducers to supply the auxiliary water to the lower fishway and the fish ladder lower diffusers. The recommended course of action was to construct a new emergency pumped supply utilizing the existing AWS pump intake, providing 850 CFS of EAWS flow to the AWS system. A design was completed in Aug 2001 with the following features. Three new electric motor-driven pumps will be installed in a new pump well, drawing water through openings created in the roof of the AWS intake. Water will be pumped to Diffusers No. 1 and 2, which are isolated from the rest of the AWS system during operation of the EAWS system. The electric wicket gate operators, controlling flow to the turbines, are susceptible to a single-mode failure, which would render them without electrical actuation capability until repairs can be made. Modifications will be made to provide electrical redundancy to the wicket gate operators. A detailed hydraulic model was developed for the Little Goose Adult Fishway system concurrent with the EAWS design. Preliminary model results indicate that it may be possible to operate the Fishway within specified criteria utilizing only 2 of the 3 turbine pumps. Based upon these initial results, the COE requested that the construction of the EAWS design be delayed so that more rigorous testing and verification of the model can be made. The model will be utilized to suggest and confirm structural modifications or changes to existing operational practices that are more cost effective than constructing a standby emergency pumping facility. 2) Major Activities/Tasks Completed. Plans and Specifications for Little Goose that will install a new emergency pump system, an automatic transfer switch to the wicket gate operator circuit, and add oil heaters to the speed reducers. Recommendation to fund (through operations and maintenance funding sources) an increased spare parts inventory. Current plans call for the construction to take place over a 7 month time period, starting with site preparation in August with the installation of the pumps during the normal January-February ladder outage. FY03 Major Activities/Tasks. Phase III will include evaluation of a two-pump operation of the fishway using the numerical model previously developed. In addition, field data collection of a two-pump operation will be completed. Field data will include channel velocity measurements made using a specially designed and instrumented frame to be deployed in various locations throughout the fishway channel. From these detailed velocity measurements, a complete set of governing equations will be determined for the entrance weirs and channel velocities will be documented over a wide range of operating conditions in the Lower Monumental Dam fishway, which previously have not been available. Future operation of the fishway depends heavily on accurate determination of flow over the entrance weirs. Initial computer simulations have indicated that the fishway may meet criteria during a two-pump operating scenario if certain operational changes are made to the fishway. The Phase III effort is comprised of two primary tasks: (1) Design and fabrication of an Acoustic Scintillation Flow Meter (ASFM) velocity measurement frame fitted into the stoplog slots of the fishway channel, and, using the velocity measurements made with this frame, (2) Revision of the existing numerical fishway model to reflect corrected entrance weir equations obtained with velocity measurements. Additional tasks include: (3) Collection of fishway hydraulic data at high tailwater elevation, (4) Evaluation of two-pump operation of fishway to meet EAWS criteria, and (5) Proposal of conceptual structural modifications to accomplish two-pump operation under EAWS mode, or (6) determination that additional pumping capacity is needed if two-pump operation fails to meet criteria. Efforts are being directed to finalize a report detailing operation of the fishway system using only two of the three auxiliary water supply pumps. This report will be distributed to outside agencies for their review and concurrence of the proposed emergency operating parameters. If approved construction of a new emergency auxiliary water supply system can be avoided, and efforts will be redirected to ensuring operational reliability of the existing adult fishway system. If the proposed two pump operation from the computer model is not acceptable to outside agencies, then a contract will be awarded to construct the emergency pumping facility as designed under Phase II. Milestones: Complete Computer Model – April 2001; Complete Plans and Specifications – Aug. 2001; Initiate Design of ASFM Frame – April 2002; Letter Report, Frame Design and Test Plan – May 2002. High Water Data Collection Site at Lower Monumental and Little Goose – May 2002; Deploy ASFM system and Collect Data at Lower Monumental Dam – May 2002; Deploy ASFM system and Collect Data at Little Goose Dam – June 2002; Remove ASFM system and turn over to government – June 2002; Verify Computer Model Calibrations using collected data – June 2002; Letter Report, Proposed operational and/or structural modifications – July 2002; Final Report, Designs of proposed operational and/or structural modifications – Sept. 2002; Phase I – Construction, Site Work/Freeze Wall – Aug. 2003; Phase II Construction, Pump Station Structure – Dec. 2003; Phase III – Construction, Electrical, ATS; Oil Heaters – Jan. 2004; System Startup and Testing – Feb. 2004; Complete Construction – Mar. 2004.

343 Little Goose Extended Submerged Bar Screens (CORPS)

1) Project Information. Purpose/Objective: Extended submerged bar screens (ESBS's) were installed at Little Goose in the spring of 1996. Many of the operational problems initially encountered, such as the brush control systems have been corrected. After the initial ESBS installations, perforated plate connections failed and caused extensive damage to the ESBS. It was determined that the bolted connections were not adequate, and the porosity plate "orifices" causes vibrations that may contribute to the bolted connection failure. After the cause of the problem was identified, field vibration tests were conducted in FY98 and physical modeling efforts were conducted in FY99 at Iowa Institute of Hydraulic Research. Several alternative plate orifice configurations were tested, with promising results. In addition, the perforated plates and the connections were redesigned. In FY99 and FY00, Fish Guidance Efficiency (FGE) and mechanical tests were conducted at Little Goose dam and confirmed the vibrations and accelerations could be substantially reduced. The tests also confirmed the new plate design did not adversely affect FGE performance. Description – In FY02 work on the ESBS's was initiated based on the ESBS system wide report that identified improvements that are necessary to ensure reliable operation. Some of the identified improvements are; replace the bladder valve stems with stainless steel; replace bar screen in upper right corner or install porosity panels behind that area of the bar screens; improve cable handling and wear issues, and investigate more reliable seals for the gear boxes. A related effort is vertical barrier screen (VBS) modeling completed at Waterways Experiment Station (WES) in FY01. In FY02 a report will be completed which may suggest potential actions required to resolve debris problems. 2) Major Activities/Tasks. Milestones FY 2002: Project personnel initiated ESBS improvements – Oct. 2001 – Feb. 2002; A report will be completed which may suggest potential actions required to resolve VBS debris problems – Sept. 2002; Milestones FY 2003: Project personnel will complete ESBS improvements – Sept. 2003; Finalize any outstanding contracts/actions. Finalize as-constructed drawings/specs/files – Sept. 2003.

344 Little Goose Flow Deflectors (CORPS)

1) Project Information. Purpose/Objective - The purpose of the additional deflectors and/or modifications is to allow higher spill levels for passing juvenile salmonids while staying below the 120% total dissolved gas (TDG) supersaturation level as recorded by existing tailrace fixed monitoring stations. Additionally, physical hydraulic model studies of the tailrace hydraulic conditions at Little Goose will be conducted to allow development of spill patterns to achieve acceptable tailrace hydraulic conditions for both adult fish passage and juvenile fish egress from the tailrace area. Deflector improvements will provide benefits in reduced TDG during involuntary spill events. A powerhouse/spillway divider wall will provide reductions in TDG loading to downstream water bodies during spillway operations. Description - Deflectors have been constructed on six of the eight spillway bays at Little Goose. These deflectors are only 8 feet long and do not have a radiused transition. Possible modifications include the addition of deflectors in end bays 1 and 8, adding radius transitions and pier nose extensions to the existing deflectors and possibly extending the deflector length to 12.5 feet. Consideration may also be given to relocating the deflectors at an elevation optimized for current operation. A spillway/powerhouse divider wall will also be examined in the models and addressed in a technical report. 2) Major Activities/Tasks – Work Completed. During FY02, testing of the spillway sectional model will be completed along with construction of a general physical hydraulic model of Little Goose dam. Testing of the general model will begin in FY02. Work Remaining. Testing of general model will continue into FY03. Once testing is complete, design of deflectors will be initiated along with required NEPA documents. A contract will be advertised for construction of the endbay deflectors in June 2003. Construction of deflectors is anticipated to begin in August or September 2003. Completion of the installation is anticipated by March 2004. New spill patterns for reductions of TDG production, improved juvenile fish egress and adult fish passage will be completed in FY03. A technical report addressing the costs and benefits of a powerhouse/spillway divider wall will be prepared by September 2003. Following the installation of the deflectors, a post construction TDG near field test will be completed in April or May 2004. Milestones: Contract and NEPA Documents complete – June 2003; Technical Report Complete – Sept. 2003; Construction Complete – Mar. 2004; TDG Near field test complete – May 2004.

345 Non-Routine Maintenance of Little Goose Lock and Dam Fish Passage Facilities (CORPS)

Items listed are part of the Corps 5 year O&M plan required under RPA 6 and RPA 145 for ensuring long term reliability of fish passage facilities.

346 Operation and Maintenance of Little Goose Lock and Dam Fish Passage Facilities (CORPS)

Operation of Fish Passage Facilities. Funding for operating and managing fish passage facilities. This includes daily inspection and operation of facilities, minor facility maintenance and fish screen inspections (cleaning staff gages, adjusting or calibrating fishway control equipment etc.), project biologist costs, fish counting costs, and District Office costs for managing the fish passage program, including ESA consultation. Maintenance of Fish Passage Facilities. Funding for major maintenance of all fish passage facilities including annual maintenance of fish screens, juvenile bypass systems, adult fish ladders, powerhouse collection systems, and adult fish pumps. These funds cover labor for maintenance staff and parts and materials.

347 Little Goose Trash Boom (CORPS)

1) Project Information. Purpose/Objective - Large quantities of floating debris tend to collect in the forebays of the lower Snake River dams. In addition to causing hazards to hydroelectric facility equipment, debris can be entrained in the juvenile bypass system, causing physical trauma to migrating salmonids. In an effort to divert debris away from the powerhouse at Little Goose Dam (and, in turn, away from the juvenile collection facility), a floating debris diversion structure (trash boom) was installed. It is not currently known if predatory fish, known to cause significant losses to migrating juvenile salmonids, will concentrate around the trash boom itself and/or the debris that may collect there. This objective is to determine the effect of the trash boom on the abundance and distribution of predatory resident fishes in the forebay of Little Goose Dam. Work is to be conducted in high and low flow years, corresponding to high and low amounts of floating debris. Funding is through the FCRMP. Description – The Corps has developed criteria for initiating debris removal at the new log boom. Coordination with NMFS occurred at an FPOM meeting held in the second quarter of FY01. Criteria established were 2 surface acres of debris in the spring and 1 surface acre in summer to begin removal of floating debris (personal communication Dave Hurson). The installation of the new Trash Boom at Little Goose Dam began in September of 2000. The first phase of the assessment of predator aggregation began prior to the installation of the floating boom and determined the abundance of predatory fish in the forebay of Little Goose Dam. The assessment of the predatory population was made using a mark recapture study conducted through November 2000. The second phase was conducted in FY01 and determined the abundance of predators in the forebay post-boom installation. Data collection was from March through November 2001 in the same areas of the forebay with the addition of sampling effort around the boom itself. The expected low water year for 2001 fulfilled the requirement for evaluation in low water years. Research for a high flow year will be scheduled based on anticipated occurrence. An additional option would be to conduct a radiotelemetry study of predatory fish to determine distribution in the forebay. Previous related work was conducted by Bjornn et al. 1999 and Bennett et al. 1999. Bjornn reported that the distribution of radio-tagged Smallmouth Bass and Northern Pikeminnow in the forebay of Lower Granite Dam occurred primarily along the shorelines during the smolt outmigration. Very few fish were located near the trash boom that was in place. Bennett reported that catch per unit effort for Northern Pikeminnow in the Lower Granite Dam forebay boat restricted zone and the forebay itself was lower than any other sampling location in the Lower Granite Reservoir. In addition, overall abundance of Smallmouth Bass was highest in the forebay of Lower Granite Dam, but had the lowest catch per unit effort. 2) Major Activities/Tasks – The major tasks include completing fieldwork for FY01 and completion of the report in FY02. Milestones: Conduct/Complete Low Flow Sampling at Little Goose Trash Boom – November 2001; Complete Final Report – April 2002; Conduct/Complete High Flow Sampling at Little Goose Trash Boom – November 2004; Complete Final Report – April 2005; Radiotelemetry Study – November 2003; Complete – April 2004.

348 Lower Granite Emergency Auxiliary Water Supply (CORPS)

1) Project Information. Purpose/Objective - Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The bypass of adult anadromous fish upriver for spawning is a critical portion of their life cycle. Hydraulic criteria have been established to facilitate the efficiency of their bypassing the dams by using upstream migrant systems. Compliance, where practicable, to these criteria is essential to operating the systems optimally. The adult fishway auxiliary water supply system at Lower Granite currently has one pump spare capacity as required with the actions set forth in the Biological Opinion (Bi-Op). The general criteria established by the Bi-Op requires: (1) that auxiliary water system provide an emergency spare capacity equivalent to one pump above the maximum normal auxiliary flows, and (2) that electrical reliability should provide for 100% back-up in the event of an outage due to a single failure of either the bus, switchgear, or transformers feeding the turbine pump appurtenances. The objective for providing spare water supply capacity increases overall system reliability by providing emergency water supply for use during partial failures. It also increases the opportunity for practicing preventative maintenance on idle equipment without requiring system operation outside of the criteria established in the fish passage plan. In addition actual operating time on equipment will be reduced, increasing the overall useful operating life. By configuring the adult fishway system with spare water capacity and improved electrical reliability, fish passage plan criteria can be maintained, thus ensuring that the passage of adult salmonids through the system will be at the highest percentage with minimal delay. Description - The 2000 Bi-Op (RPA actions 120, 121 and 129) requires development of improved adult fishway entrance conditions by conducting hydraulic analysis of the systems, developing maintenance records and procedures, and implementation of corrective measures as warranted. Phase I and Phase II Technical Reports were led by the COE to review several alternatives to determine the most cost effective and reliably sound method to achieve the actions required by the Bi-Op. Since the dam was constructed, the existing auxiliary water supply system has proven to be very reliable. The existing auxiliary water supply system uses two of three electric motor-driven pumps with speed reducers to supply the auxiliary water to the lower fishway and the fish ladder lower diffusers. The recommended course of action is to replace the gear reducer (Philadelphia Gear) with a spare gear reducer (Falk) so that all of the gear reducers will be of the same make and construction. A new gear reducer will be provided and stored on site as a spare unit to service any one of the three units. Modifications to the electrical service to the pump motors will be necessary to provide redundancy of the power supply and the motor starter enclosures will be reconfigured to provide isolation between all of the starter units to eliminate the potential for a single-mode failure of all of the pumps due to an electrical fault in one of the enclosures as now configured. A detailed hydraulic model will be developed for the Lower Granite Adult Fishway system as recommended in the Bi-Op and utilized to confirm or suggest modifications to existing operational practices. 2) Major Activities/Tasks - At Lower Granite it is recommended to install the spare Falk gear reducer on Pump #1, and provide a new Falk gear reducer for the plant spare. The electrical service to the pumps will be reconfigured to provide redundancy between the two bus feeders, and the motor starter enclosures will be reconfigured to provide isolation between each of the units. The construction will take place in one year during the normal January-February ladder outage. The Lower Granite Adult Fishway System will be computer modeled to evaluate the upstream migrant systems as currently configured. Information will be collected to determine geometry and operational practice for fish ladder system. Model input files will be developed to simulate hydraulic conditions for current operation and a recommended operation. The model will be used to develop final recommendations on the best operation of the adult bypass systems and potential structural modifications to the system. The model will also be utilized to predict operational criteria as a result of implementation of the proposed alternative. The tasks will include: (a) collection of Project "as-built" drawings to define geometry and system controls for the fish ladder, (b) development of hydraulic model to simulate the system, (c) verification of the model using existing data for the current operation of the system, (d) report preparation which describes the system geometry and operation, the computer model, verification of model, and preliminary recommendation to improve fish ladder operation, and (e) perform field verification of the model at low tailwater elevations. The Construction activities will include demolition of an existing gear reducer, installation of a spare gear reducer, and procurement of a new gear reducer for onsite spare parts inventory. Electrical redundancy will be provided for pump feeder circuits by installing one automatic transfer switch (ATS), connected between Bus No. 1 and Bus No. 2, and feeding Pump No. 1. Pump No. 2 would be permanently connected Bus No. 2 and Pump No. 3 permanently connected to Bus No. 1. In the event of an electrical failure of one of the buses, the ATS will switch Pump No. 1 over to the energized bus, thus always providing operation to two AWS pumps. Each of the starter enclosures will be isolated, either through physical separation or addition of barriers between the starter enclosures. Milestones: Complete Computer Model – May 2001; Complete Plans and Specifications – Aug. 2001; Phase I Construction, Electrical, ATS, Starter Modification – Nov. 2002; Phase I Construction, Gear Reducer Demolition/Installation – Jan. 2003; System Startup and Testing – Feb. 2003; Complete Construction – Mar. 2003.

349 Lower Granite Extended Submerged Bar Screens (CORPS)

Project Information: Purpose/Objective: Extended submerged bar screens (ESBS's) were installed at Lower Granite in the spring of 1996. Many of the operational problems initially encountered, such as the brush control systems have been corrected. After the initial ESBS installations, perforated plate connections failed and caused extensive damage to the ESBS. It was determined that the bolted connections were not adequate, and the porosity plate "orifices" causes vibrations that may contribute to the bolted connection failure. After the cause of the problem was identified, field vibration tests were conducted in FY98 and physical modeling efforts were conducted in FY99 at Iowa Institute of Hydraulic Research. Several alternative plate orifice configurations were tested, with promising results. In addition, the perforated plates and the connections were redesigned. In FY99 and FY00, Fish Guidance Efficiency (FGE) and mechanical tests were conducted at Little Goose dam and confirmed the vibrations and accelerations could be substantially reduced. The tests also confirmed the new plate design did not adversely affect FGE performance. Description – In FY02 work on the ESBS's was initiated based on the ESBS system wide report that identified improvements that are necessary to ensure reliable operation. Some of the identified improvements are; replace the bladder valve stems with stainless steel; replace bar screen in upper right corner or install porosity panels behind that area of the bar screens; improve cable handling and wear issues, and investigate more reliable seals for the gear boxes. A related effort is vertical barrier screen (VBS) modeling at Waterways Experiment Station (WES) in FY01. Potential actions may result depending on determinations and findings. 2) Major Activities/Tasks. Milestones FY 2002: Project personnel initiated ESBS improvements – Oct. 2001 to Feb. 2002; A report will be completed which may suggest potential actions required to resolve VBS debris problems. Milestones FY 2003: Project personnel will complete ESBS improvements – Sept. 2003; Finalize any outstanding contracts/actions. Finalize as-constructed drawings/specs/files – Sept. 2003; Project personnel initiated ESBS improvements – Oct. 2001 to Feb. 2002.

350 Lower Granite Flow Deflectors (CORPS)

1) Project Information: Purpose/Objective - The purpose of the additional deflectors and/or modifications is to allow higher spill levels for passing juvenile salmonids while staying below the 120% total dissolved gas (TDG) supersaturation level as recorded by existing tailrace fixed monitoring stations. Additionally, physical hydraulic model studies of the tailrace hydraulic conditions at Lower Granite will be conducted to allow development of spill patterns to achieve acceptable tailrace hydraulic conditions for both adult fish passage and juvenile fish egress from the tailrace area. Deflector improvements will provide benefits in reduced TDG during involuntary spill events. A powerhouse/spillway divider wall will provide reductions in TDG loading to downstream water bodies during spillway operations. Description - Deflectors have been constructed on all eight-spillway bays at Lower Granite. These deflectors are 12.5 feet long and have radiused transitions. Possible modifications include the addition of pier nose extensions and possibly relocating the deflectors at an elevation optimized for current operation. Additionally, a powerhouse/spillway divider wall may dilute high levels of TDG delivered to tailrace water during spillway operations. 2) Major Activities/Tasks: Work Completed. Testing of the Lower Granite spillway sectional model was initiated in FY02 to develop deflector performance curves of existing deflectors. Work Remaining. A near-field TDG test will be conducted to assess current TDG performance of existing spillway structure in the spring of FY03. Testing of the general model can commence once data is developed from the spillway sectional model. The general model investigations will focus on spill pattern development for juvenile tailrace egress and assessment of a powerhouse/spillway divider wall. A technical report will be prepared assessing costs and benefits of a powerhouse/spillway divider wall. Milestones: Test Sectional Model – Sept. 2002; Test General Model – Mar. 2003; TDG near field test complete – May 2003; Complete technical report – Sept. 2003.

351 Lower Granite Juvenile Bypass System (CORPS)

1) Project Information: Purpose/Objective - Lower Granite Lock and Dam is located at River Mile 107.5 on the Snake River near Pullman, Washington. Lower Granite Lock and Dam was completed in 1975. It includes six primary turbines, an erection bay, eight gated spillway bays, one navigation lock, one adult fish ladder, and an existing juvenile fish facility. The existing juvenile fish holding and loading facilities (operational since 1975) are located downstream of the dam on the south shore. Under the Endangered Species Act, section 7 (Consultation), a Biological Opinion (Bi-Op) was prepared by the National Marine Fisheries Service, dated March 2, 1995. In the Bi-Op, a number of actions were identified as immediate actions to be taken to improve survival of the Snake River Salmon. Included in these were development of plans to modify the existing juvenile fish facilities at Lower Granite Lock and Dam and construction of these modifications. In June of 1996, Feature Design Memorandum No. 43 (FDM 43) "Juvenile Bypass/Holding and Loading Facilities" was completed by the Corps which identified the modifications which would be made to the existing facility. FDM 43 recommended the following modifications: a) New fish orifices (one 12-inch-diameter and one 14-inch-diameter orifice per bulkhead slot). b) A modified collection channel. c) A new transportation channel linking the collection channel and the primary dewatering structure. d) A new primary dewatering structure. e) A new corrugated fish transport flume and pipe system. f) Modified juvenile fish holding, loading, and bypass facilities (including a new separator and related features, new sample tanks, new fish transport flumes and pipes, and a new temporary research building). Included in FDM 43, was a recommendation to investigate juvenile fish separator improvements for potential use at Lower Granite. This work was funded in FY97 and a report was prepared entitled "Letter Supplement Number 1 to FDM 43, Evaluation Separator". This Letter Supplement Number 1 recommended construction of a prototype test separator at Ice Harbor to evaluate various changes to fish separators to improve efficiencies of existing separators and to examine new potential methods of separation. In 1997-1998, a test separator was constructed at Ice Harbor. The test separator was evaluated biologically in FY99 and will again be testing in FY00 and potentially in FY01. A draft technical report is planned for completion in FY02. Another modification described in FDM 43 was a new dewatering structure. A new design "Cylindrical Dewatering" is currently being constructed at McNary dam as a test structure for biological evaluation. The biological testing is scheduled for FY01 - FY03. If the results of this new technology are positive, then a cylindrical dewatering structure would be incorporated into the new JBS at Lower Granite. FDM 43 also described the potential for incorporating a surface collection and bypass system as part of the JBS improvements. A prototype surface bypass and collection system (SBC) has also been constructed and biologically evaluated at Lower Granite dam over the past few years. Information has been presented to the region for decisions related to SBC. Description - A new report entitled "Lower Granite Juvenile Bypass System - Design Documentation Report" will be prepared which will replace the previous report (FDM 43). The Design Documentation Report (DDR) will address a new separator design, a new dewatering structure design and possibly incorporation of surface bypass and collection into the new juvenile bypass system at Lower Granite. The DDR will also address a new construction schedule and cost estimate. 2) Major Activities/Tasks - Work will begin on the DDR in October 2002 (FY03). This will allow completion of biological evaluations of the test separator at Ice Harbor and the Cylindrical Dewatering structure at McNary. The DDR will require about one year to complete. Contract documents will be prepared in FY04 based on regional decisions made based on recommendations from the DDR. Construction of these major modifications is expected to take about 18 months. A post construction biological evaluation will be needed to evaluate the new facility prior to the start of operation. The following table illustrates the activities, schedule and associated costs. Milestone: Complete Separator Evaluation at Ice Harbor (separate program); Complete Cylindrical Dewatering Evaluations at McNary (separate program) – Sept. 2003; Complete Design Documentation Report - Oct. 2002 to Sept. 2003; Complete Contract Documents – Oct. 2003 to July 2004; Construction - Winter 2004/05 and 2005/06. Post Construction Evaluation - Sprint 2006.

352 Non-Routine Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (CORPS)

Items listed are part of the Corps 5 year O&M plan required under RPA 6 and RPA 145 for ensuring long term reliability of fish passage facilities.

353 Operation and Maintenance of Lower Granite Lock and Dam Fish Passage Facilities (CORPS)

Operation of Fish Passage Facilities. Funding for operating and managing fish passage facilities. This includes daily inspection and operation of facilities, minor facility maintenance and fish screen inspections (cleaning staff gages, adjusting or calibrating fishway control equipment etc.), project biologist costs, fish counting costs, and District Office costs for managing the fish passage program, including ESA consultation. Maintenance of Fish Passage Facilities. Funding for major maintenance of all fish passage facilities including annual maintenance of fish screens, juvenile bypass systems, adult fish ladders, powerhouse collection systems, and adult fish pumps. These funds cover labor for maintenance staff and parts and materials.

354 Lower Granite Surface Bypass and Collection (CORPS)

1) Project Information: Purpose/Objective: Lower Granite Surface Bypass and Collection (SBC) has become a regional prototype test facility in which SBC concepts can be tested, with 76 potential applications at other Federal and non-Federal projects. The primary objectives for developing the SBC technology was to; increase the number of juvenile fish guided for bypass or collection through non-turbine routes, reducing fish stress, injury, migration delays; and reduce high-spill levels that are associated with dissolved gas problems and lost power generation. The SBC testing has consisted of several years of prototype testing of juvenile fish bypass efficiencies (attraction to fish bypass entrances), and occlusion (system to discourage fish attraction or horizontal redistribution in the forebay). The initial test, the prototype SBC was constructed in 1996. In 1998, the Behavioral Guidance Structure (BGS) and the Simulated Wells Intake (SWI) were constructed. The Removable Spillway Weir (RSW) was constructed in 2001 and comprehensive biological tests were conducted in the spring of 2002. The RSW concept is based on results of the SBC testing at Lower Granite and elsewhere. The existing spillways rely on 50-foot deep gates that subject the juvenile fish to rapid pressure changes and high velocities. The SBC testing has determined that surface flow provides the best attraction and highest effectiveness to pass juvenile fish. The RSW passes approximately 11-foot deep surface flow (6000-11000cfs) at the modified spillway at bay #1. The Lower Granite RSW is designed to be removable to return the spillway to original design capacity if needed to pass a major flood event. If the RSW performs as intended, based on tests planned for FY 02 and FY 03, it will become an operating prototype with extended application for fish passage. Additional tests using 3-D tags will also provide data to determine detailed juvenile fish behavior at the prototype structure. The data allows fine-scale research of juvenile fish responses under varying hydraulic and environmental conditions. The information will be examined using computational fluid dynamic modeling, detailed biological field tracking techniques, then correlated in models to yield explanations of fish behavior at the hydropower projects. This effort may lead to a more complete understanding of fish behavior to design more efficient fish passage systems at hydropower projects. The Biological Opinion emphasizes continued development of the bypass technologies (RSW's and occlusion systems) at other Snake and Columbia River sites based on presumed successful tests at Lower Granite. RSW and occlusion systems are anticipated to provide increased project passage rates via the RSW, reduced turbine passage, and less forebay delay. If spillway flows can be reduce while improving passage, there is potential to allow for reduced dissolved gas in the river in the spring. Description/background - In 1996 a prototype partial powerhouse SBC was constructed to test concepts of collection and bypass at powerhouse units 4,5 and 6. The partial powerhouse test was developed to minimize costs (vs. a full powerhouse prototype) and make performance estimates for a full powerhouse system. The prototype has been tested under various entrance configurations and flow conditions since the initial test in the spring of 1996. The primary test objective was to evaluate the effectiveness of vertical slots in attracting juvenile salmonids. The test was characterized as a "proof of concept" test. The 1997 test was a validation test of the 1996 configurations, with one significant change. The middle vertical slot was modified to provide an overflow weir effect versus an orifice effect previously tested. This modification was based on results of testing completed at Ice Harbor in 1995 that indicated juveniles had a preference for an overflow weir versus an orifice. The 1997 test results verified the hypothesis. The 1998 test evaluated the effectiveness of the vertical slots tested in 1996/97 in combination with two major modifications to the structure: 1) the installation of simulated Wells intake (SWI) and; 2) installation of the BGS. Results of this test were; fish passage through the Lower Granite SBC relative to units 4 – 6 went from 37% in 1997 to 51% in 1998, presumably because of the addition of the SWI. For the best entrance configuration, the percentage was even higher (53.6%). When the SBC was combined with the existing screen system, 89.5% of the fish passing the entire powerhouse did so by routes other than the turbines. The BGS, which is an 1100-foot long steel "wall" angled upstream from the south end of the SBC, diverted approximately 80% of the fish destined for the south half of the powerhouse. In FY 2000 the SBC scope and objectives were: a) Modify one SBC entrance to compare behavioral response to between the abrupt middle entrance and newly modified BGS entrance, to determine if collection performance of the entrances can be increased. Evaluate the performance of the SBC entrances utilizing significantly higher flows (3500 cfs vs. 2000 cfs at the middle entrance) and shallower entrances (approx. 20 feet weir depth) compared to past operations. b) Evaluate the performance of the BGS under design flows higher than was tested in 1998 and 1999. In those years only two turbines were operational due to plant equipment problems. In 2000, three turbine units were available for service on the south side of the BGS. c) Continue field and modeling research to determine, to the extent possible, how juvenile fish respond to various environmental conditions including hydraulic, acoustic, magnetic, illumination, and day versus night responses. This effort is a collaboration between Iowa Institute of Hydraulic Research (numeric CFD modeling), Battelle (field fish behavior monitoring, tracking, and research) and Waterways Experiment Station (fish behavior research and computational fish behavior analysis). Evaluate the performance of turbulent flow attraction tests to determine if guidance and SBC performance can be enhanced. Tests were conducted at Cowlitz Falls in 1999 (turbulent attraction and strobe light avoidance) and 2000 (turbulent attraction). Future applications being considered include: Evaluate turbulent flow to guide or attract juvenile fish into SBC entrances. Intent is to guide fish to a desirable location. Evaluate turbulent flows to guide fish past (occlude) the upstream gap in the BGS. Intent is to guide juveniles away from undesirable location. Evaluate avoidance response to strobe lights to test if fish can be guided away from undesirable passage routes such as turbine intakes. Evaluate attraction lighting to attract juvenile fish to near desirable passage route entrances. In FY 2001, the objectives were: a) Remove SBC connection at spillway #1 to south non-overflow section for subsequent installation of the RSW. b) Construct Removable Spillway Weir (RSW). c) Conduct Biological Studies – Due to delays in construction, and severe drought conditions in the Snake and Columbia River basins, the RSW spring biological tests were postponed. In November of 2001, an initial balloon tag test was conducted. Survival/injury over the RSW was determined to be comparable to existing spillways as a result of this limited test. In FY 2002, the objectives were: a) Conduct comprehensive biological studies on the RSW in combination with a deployed BGS – Conduct spring biological tests using radio telemetry, hydro-acoustics and 3-dimensional tracking. Conduct preliminary tests to determine tailrace egress times of the RSW compared to adjacent spillway bays under low flow to ensure adequate passage egress occurs at the RSW and spillways. b) Conduct engineering test of RSW in June 2002. Test controlled descent systems by "stowing" the RSW to the river bottom, then "deploy" upright back to the operating position at spillway #1. c) Design final modifications to the RSW as needed for longer term operations. d) Finalize the RSW operations and maintenance manuals. e) Conduct training for operations personnel for emergency operations or the RSW. f) Conduct fine scale turbulent flow tests at Cowlitz Falls in the spring of 2002. Conduct large-scale forebay turbulent flow tests in the summer of 2002. g) Investigate feasibility of a realigned BGS to occlude entire powerhouse (units 1-6) and guidance to RSW entrance. In FY 2003, the objectives are: a) Conduct second year biological studies on the RSW in combination with a deployed BGS – Conduct spring biological tests using radio telemetry, hydro-acoustics and 3-dimensional tracking. Determine overall RSW performances under varying flow conditions. b) If not conducted in FY02 - conduct engineering test of RSW (stow and deploy tests). Conduct follow-on training for operations personnel for emergency operations or the RSW. c) Prepare contract to realigned BGS to occlude entire powerhouse (units 1-6) and guidance to RSW entrance. d) Coordinate potential large-scale forebay turbulent flow tests, potential tests with realigned BGS in FY 04. e) Close out RSW construction contract administration and construction contracts.2) Major Activities/Tasks - Milestones FY 2003: RSW spring test verification. Install BGS for spring outmigration only. M&E to be determined (TBD) - Mar. 3003 to June 2003;

Coordinate potential application of turbulent flow concepts as warranted - Mar. 2003 to June 2003; Complete P&S (if determined feasible) for realigned BGS between unit 6 and spillway – Oct. 2002 to Sept. 2003; Initiate PED for RSW at LSR/MNA - Oct. 2002 to Sept. 2003; Prepare P&S to remove remaining components of SBC/SWI in FY 04 - Oct. 2002 to Sept. 2003. Milestones FY 2004: Remove prototype SBC/SWI winter of 03-04 – Dec. 2003 to Mar. 2004; Realign BGS to unit 6, if determined feasible – Dec. 2003 to Mar. 2004; Initiate E&D for permanent BGS system. BGS system to allow flexibility to transport in summer/spring as required due to river conditions – Oct. 2003 to Sept. 2004; Detailed P&S for RSW at LSR/MNA (location(s) TBD as warranted). Costs to be included in site specific multi-year plans - Oct. 2003 to Sept. 2004; Test turbulent flow concepts as warranted (along SBC face to RSW) – Mar. 2004 to May 2004; Operate RSW with full powerhouse occlusion (BGS). Monitoring TBD – Mar. 2004 to June 2004. Milestones FY 2005: Prepare P&S to remove prototype BGS – Oct. 2004 to Sept. 2005; Complete P&S for permanent BGS system. BGS system to allow flexibility to transport in summer/spring as required due to river conditions - Oct. 2004 to Sept. 2005; Operate RSW with full powerhouse occlusion (BGS). Monitoring TBD – Mar. 2005 to June 2005. Milestones FY 2006: Initiate contract - permanent BGS system – Oct. 2005 to Sept. 2006; Operate RSW. Monitoring TBD – Mar. 2006 to June 2006; Remove prototype BGS – June 2006 to Sept. 2006. Milestones FY 2007: Complete construction of permanent BGS system – Oct. 2006 to April 2007; Operate RSW and BGS. Monitoring TBD – Mar. 2007 to June 2007. Milestones FY 2008: Prepare and issue completion contracts, final operational adjustments – June 2007 to Sept. 2007; Operate RSW and BGS. Monitoring TBD – Mar. 2008 to June 2008. Beyond FY 2008: Operate permanent RSW/BGS systems - Per FFP.

355 Lower Monumental Auxiliary Water Supply (CORPS)

356 Lower Monumental Extended Submerged Bar Screens (CORPS)

1) Project Information: Purpose/Objective - Extended submerged bar screens (ESBS's) have been installed at McNary, Lower Granite and Little Goose projects. Lower Monumental currently has standard length screens. Improved fish guidance efficiency would enhance survival by diverting a higher percentage to bypass and collection facilities, and reduce direct/indirect turbine mortalities. Description - In FY02, a Letter Report will be prepared to identify the appropriate actions and schedule to implement extended screens or other alternatives at Lower Monumental Lock and Dam. There are six turbine units, similar to the other Snake river projects, with three slots per turbine intake, requiring a total of (18) turbine intake screens plus (1) spare anticipated. With additional fish collection capacity, the fish facility design should be reviewed to ensure maximum protection for the increased numbers of juvenile fish being routed. Based on the Letter Report/Scoping Document a coordinated plan will be initiated. It is expected that existing models at Waterways Experiment Station will be used, research of existing site conditions and constraints will be identified, and preliminary design will be initiated. Related documentation: McNary Juvenile Fish Guiding Efficiency Justification Report, April 1991; McNary Turbine Intake Screening System, FDM No. 33, March 1994; FDM No. 33, Supplement No. 1, McNary Turbine Intake Screening System, November 1997; Lower Granite Juvenile Fish Guiding Efficiency Justification Study, Feasibility Report; December 1986, Little Goose Juvenile Fish Guiding Efficiency Justification Study, Feasibility Report, July 1987; Lower Granite and Little Goose Locks and Dams, Turbine Intake Screening System, FDM No's 42 and 30, December 1994. 2) Major Activities/Tasks. Milestones FY 2002: Finalize Letter Report based on past reports, facility review, and site verifications – Nov. 2001 – Oct. 2002; Perf Plate Modeling – Jan. 2002 – Sept. 2002. Milestones FY 2003: Prepare DDR (Design Documentation Report) – Oct. 2002 – Jan. 2004; Prepare P&S for prototype screens – Jan. 2003 – June 2004; Prepare biological testing plans – June 2004 – Sept. 2004; Prepare/modify models – run initial tests (WES) and CFD modeling – Oct. 2002 – Feb. 2003.; Construct ESBS and VBS prototypes – Aug. 2004 – Dec. 2004; Install prototypes – Dec. 2004 – Mar. 2005; Biological testing (AFEP) – April 2005 – May 2005. Milestones FY 2005 - Biological data reports and screen selection reports – July 2005 – Sept. 2005; Prepare P&S for final screens, if warranted – June 2005 – Sept. 2005. Milestones FY 2006 – Prepare final DDR – Oct. 2005 – June 2006; Initiate contracts for remaining ESBS and VBS – Dec. 2005 – Sept. 2006. Milestones FY 2007 - Final installations ESBS-VBS – Oct. 2006 – April 2007; Post construction evaluations (AFEP) (two seasons, 06 partial, 07 all screens) – May 2006 and May 2007; Final screen selection reports – June 2007 – Sept. 2007.

357 Lower Monumental Flow Deflectors (CORPS)

1) Project Information: Purpose/Objective - The purpose of the additional deflectors and/or modifications is to allow higher spill levels for passing juvenile salmonids while staying below the 120% total dissolved gas (TDG) supersaturation level as recorded by existing tailrace fixed monitoring stations. Additionally, physical hydraulic model studies of the tailrace hydraulic conditions at Lower Monumental will be conducted to allow development of spill patterns to achieve acceptable tailrace hydraulic conditions for both adult fish passage and juvenile fish egress from the tailrace area. Deflector improvements will provide benefits in reduced TDG during involuntary spill events. A powerhouse/spillway divider wall will provide reductions in TDG loading to downstream water bodies during spillway operations. Physical modeling may also identify a better outfall location for the juvenile bypass system. Description - Deflectors have been constructed on six of the eight spillway bays at Lower Monumental. These deflectors are 12.5 feet long; one of which has a 15-foot radius transition. Possible modifications include the addition of deflectors to spillway bays 1 and 8, adding a radius transition to those deflectors in bays 3 to 7 and extending the downstream pier noses. Consideration may also be given to relocating the deflectors at an elevation optimized for current operation. A spillway/powerhouse divider wall will also be examined in the models and addressed in a technical report. Velocities will be documented throughout the tailrace region to identify locations for a potential new juvenile fish outfall site. 2) Major Activities/Tasks – Completed work. A contract was prepared, advertised and awarded for construction of end-bay deflectors in FY02. New spill patterns for juvenile fish egress and adult fish passage were developed. Remaining Work. Construction of deflectors will continue into FY03. Following installation of the deflectors a post construction near field TDG test will be completed. A technical report addressing a powerhouse spillway divider wall and juvenile fish outfall relocation will be completed under the Lower Monumental Outfall relocation project (see workplan). Milestones: Complete deflector construction – March 2003; Post Construction TDG near field test – May 2003; Technical report – September 2003.

358 Lower Monumental Juvenile Bypass System Outfall (CORPS)

1) Project Information: Purpose/Objective - The existing outfall site has been judged to be poor because the tailrace currents have been observed under certain operations to flow upstream toward the powerhouse. The outfall facilities have also recently been damaged by a transport barge. If needed, a new outfall shall be designed to return both PIT-tagged fish and primary bypass to the river. Description - This project is being addressed concurrently with the Lower Monumental Gas Fast-Track (Deflectors). A physical hydraulic model is being tested at WES in conjunction with spillway stilling basin erosion and deflector studies. Documentation for the model tests include particle tracking data which gives velocity data throughout the tailrace area. In particular, data will be collected in the vicinity of the existing outfall. Changes to spill patterns, operations (turbine vs spillway) to address tailrace egress issues, and changes to the spillway (deflectors, powerhouse spillway divider wall etc.) may have impacts on water velocities at the current outfall location and other locations. The approach is to resolve the erosion issues, and define all deflector issues including tailrace egress etc. before settling on changing the location of the current outfall. 2) Major Activities/Tasks - A technical report will be prepared addressing the powerhouse/spillway divider wall and define changes necessary for relocation of the outfall. The report will address planning, engineering, design and construction cost estimates and present recommendations. Milestone: Complete technical report – September 2003.

359 Non-Routine Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (CORPS)**360 Operation and Maintenance of Lower Monumental Lock and Dam Fish Passage Facilities (CORPS)****361 Lower Snake projects Minimum Operating Pool operation (CORPS)****362 Lower Snake River Juvenile Bypass System Improvements (CORPS)****363 McNary Extended Submerged Bar Screens (CORPS)****364 McNary Flow Deflectors (CORPS)****365 McNary Forebay Temperature Improvements (CORPS)****366 McNary Juvenile Bypass System Outfall (CORPS)****367 McNary Juvenile Fish Facility Debris (CORPS)****368 Non-Routine Maintenance of McNary Lock and Dam Fish Passage Facilities (CORPS)****369 Operation and Maintenance of McNary Lock and Dam Fish Passage Facilities (CORPS)**

370 McNary Juvenile Survival (CORPS)

371 Monitoring of Bull Trout at Mainstem Projects (CORPS)

372 Multiple Bypass Accumulative Impacts (CORPS)

373 Operate Turbine units at 1% efficiency range (CORPS)

374 Priest Rapids Flow Objective (CORPS)

375 Remove Obstructions from Turbine Environments (CORPS)

376 Separator Evaluation (CORPS)

377 Shift Flood Control to Maximize Snake River Water Storage (CORPS)

378 Spare Parts for Fish Passage Facilities (CORPS)

379 Non-Routine Maintenance of The Dalles Lock and Dam Fish Passage Facilities (CORPS)

380 Operation and Maintenance of The Dalles Lock and Dam Fish Passage Facilities (CORPS)

381 Improve Operations of Adult Fishway Main Entrances (CORPS)

382 Water Management Plan (CORPS)

383 Beaver Creek Water Acquisitions (USBR)

Beaver Creek is one of the five adjudicated Methow tributaries with 19 “classes” of adjudicated water. As such, it presents a rare opportunity to acquire water for instream flows in Beaver Creek for the three listed species. Local irrigators are working in coordination with the NRCS, Okanogan Conservation District, Washington Department of Fish and Wildlife, the U.S. Forest Service and USBR in developing a Coordinated Resources Management Plan that includes fish screening, barrier removal, riparian habitat restoration, and irrigation efficiency improvements both on farm and in irrigation water transmission systems. If more water becomes available as a result of the implementation of the Plan and through efficiency improvements by senior diverters, an opportunity for water leases or purchase of junior rights may become available.

384 Campbell Diversions (USBR)

The Batie (5 c.f.s) and Red Shirt (2 c.f.s.) Irrigation Diversions are located in the Beaver Creek drainage of the Methow Valley Subbasin in T34N, R22E, Sec. 35 and T33N, R22E, Secs 2 & 14. The two ditches irrigate about 150 acres on Beaver Creek and fill two storage ponds that provide water in the later part of the irrigating season. Mr. Campbell is actively cooperating with the NRCS, Farm Service Agency, and the Okanogan Conservation District and increase his storage capacity. At low flows, the present hand –constructed pushup dams reinforced by plastic sheeting are barriers to the three listed species found in Beaver Creek . The project objective is to replace these temporary structures with permanent structures incorporating engineered fish passage and compatible with an improved delivery system.

385 Chelan County/Wenatchee IFIM Study (USBR)

The Chelan County Watershed Planning group is seeking funding to undertake a comprehensive IFIM study. It would be a basin-wide look at the mainstem and larger tributaries. They are interested in looking at macro and micro habitat availability and taking a community based approach to the effort. The State has established minimum stream flows on the Wenatchee River through the Instream Flow Protection Program. The IFIM would look at those flows to determine if they need to be met, are being met or can be met. They applied for \$500,000 from the state Salmon Recovery Board but were turned down for the amount in the full request. The application though has sparked a discussion with the SRB about how and what to fund relative to instream flow studies.

387 Chewuch Ditch Diversion Structure (USBR)

The Chewuch Ditch Company diverts 30 c.f.s. from the Chewuch River 8 miles above its confluence with the Methow at Winthrop WA. The Chewuch River , a major tributary of the Methow, provides habitat for listed steelhead, spring Chinook, and bull trout and is identified as a Key Watershed under the Aquatic Conservation Strategy of the Northwest Forest Plan. The Washington Conservation Council’s Limiting Factors Analysis Report identifies it as containing stronghold populations for all three listed species. The Chewuch Ditch Company along with the other major diverters in the basin (including the U. S. Forest Service) have formed the non-profit Chewuch Basin Council and are currently engaged in negotiations with NMFS and the USFWS to develop a basin-wide Habitat Conservation Plan (HCP) under the ESA covering irrigation in the basin. As part of the proposed HCP the diverters are pursuing an aggressive strategy of infrastructure improvements addressing screening, water measurement, passage barriers, storage, and ditch efficiencies. The present Chewuch Ditch diversion is a concrete structure spanning the river with a fishway located on the west bank. Although the present structure allows passage with a small, antiquated fishway, the Washington Department of Fish and Wildlife has indicated that it does not meet their present policy guidelines for fish passage. The diversion structure itself is adequate but the fishway needs to be redesigned and replaced with a more effective version.

388 Chumstick Diversions (USBR)

Chumstick Creek is a small tributary to the Wenatchee River in the lower part of the basin. Biologist and water users familiar with the basin report that there are several small diversion facilities on each tributary that affect passage. These range from rock/cobble push up dams and concrete ecology block structures. It is thought that many could be improved with more permanent structures. Land owners will be contacted concerning their interest in receiving assistance.

389 Entiat IFIM Studies (USBR)

If adequate funding is available, Reclamation will participate in IFIM studies in the Entiat subbasin in FY 2003. Instream flows for the Entiat River Basin are being set by the Entiat Water Planning Unit a consensus-based group operating under State law that includes representatives from the Chelan County Conservation District, Washington State Department of Ecology, Washington State Department of Fish and Wildlife, Forest Service, and local stakeholders. The group has opted to use the IFIM method to set instream flows and is currently in the process of identifying specific tasks in a workplan and has hired a contractor to review existing data and do limited field work. This process will also be integrated with an EDT analysis being conducted in conjunction with the Yakama Nation. Some data gaps remain and some analysis of new and existing data must be performed to complete the PHABSIM portion of the IFIM. Specifically, winter temperature data is needed and a hydrographer must be hired for at least 6 months to complete the flow analysis portion of the model. At present, these activities are unfunded. This is a time critical project because the Planning Unit must complete its work, including proposing new instream flows, by the fall of 2003.

390 Fort-Thurlow Pump Exchange (USBR)

During some low flow years, Beaver Creek is completely dried up by irrigation diversions below the Fort-Thurlow diversion dam.. Because of this, many of the screening and barrier removal projects are sometimes rendered useless because spring chinook cannot move upstream to spawn. Reclamation has already provided a preliminary design for a pump exchange system that during low flows would pump water from the Methow River near its confluence with Beaver Creek and deliver enough water to maintain habitat in the lower mile of Beaver Creek. Implementation of this project would open over 10 miles of Beaver Creek habitat for spring Chinook salmon.

391 Fulton Diversion Structure (USBR)

The Fulton Diversion is located on the Chewuch River and diverts 24 c.f.s. of water from a point .2 miles above the confluence of the Chewuch and the Methow. The Fulton Ditch Company, a member of the Chewuch Basin Council, constructed a 10 foot high riprap dam across the channel and built a concrete fishway for passage. Although the present structure allows passage with a small, antiquated fishway, the Washington Department of Fish and Wildlife has indicated that it does not meet their present policy guidelines for fish passage. The diversion structure itself is adequate but the fishway needs to be redesigned and replaced with a more effective version.

392 Gold Creek Screen and Diversion (USBR)

Gold Creek is a major tributary of the Methow located below Carlton WA that has been identified by the Forest Service as a "stronghold" for spring chinook, steelhead and bull trout. About .75 c.f.s. is diverted from Gold Creek from a point approximately 1,500 feet above its confluence with the Methow. The present structure is a passage barrier at low flows in some years when the stream is blocked with a plastic sheet dam to fill a small pond from which to pump irrigation water. The present pump screen does not meet NMFS criteria. Several options will be explored including building a structure with fish passage, an infiltration gallery upstream, or converting to a well.

393 L-13 Diversion Replacement (USBR)

The L-13 diversion on the Lemhi River is a gravel push-up dam that can be an impediment to fish passage under low stream flow conditions. The landowner was contacted in FY 2002 about replacement of this structure with a permanent, engineered structure with a fish ladder. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. Completion is anticipated in FY 2003 pending landowner concurrence. This project would be done in conjunction with the L-13 Screen project. Another project will be substituted in the absence of landowner concurrence.

394 L-13 Headgate (USBR)

The headgate for the L-13 irrigation diversion on the Lemhi River is inadequate to deliver a controlled amount of water to the canal. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with the L-13 Screen and L-13 Diversion Replacement projects. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

395 L-13 Screen (USBR)

The perforated plate on the L-13 drum screen on a diversion from the Lemhi River does not meet NMFS criteria.. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game with Mitchell Act funds provided by NMFS. This project would be done in conjunction with the L-13 Headgate project. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

396 L-18 Headgate (USBR)

The headgate for the L-18 irrigation diversion on the Lemhi River is inadequate to deliver a controlled amount of water to the canal. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

397 L-20 Headgate (USBR)

The headgate for the L-20 irrigation diversion on the Lemhi River is inadequate to deliver a controlled amount of water to the canal. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

398 L-3 Diversion Replacement (USBR)

The L-3 diversion on the Lemhi River is a gravel push-up dam that can be an impediment to fish passage under low stream flow conditions. The landowner has agreed to replacement of this structure with a permanent, engineered structure with a fish ladder. In 2001, a Memorandum of Understanding was executed between the Lemhi Soil and Water Conservation District and Reclamation that identifies roles of each party in completion of this project. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. The State of Idaho Office of Species Conservation obtained funding for construction of this project through the BPA High Priority Project program.

399 L-35A Diversion Replacement (USBR)

The L-35A diversion on the Lemhi River is a gravel push-up dam that can be an impediment to fish passage under low stream flow conditions. The landowner was contacted in FY 2002 about replacement of this structure with a permanent, engineered structure with a fish ladder. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with the L-35A Headgate project and L-35Ascreen Project. Completion is anticipated in FY 2003 pending landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

400 L-35A Headgate (USBR)

The headgate for the L-35A irrigation diversion on the Lemhi River is inadequate to deliver a controlled amount of water to the canal. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with the L-35A Screen project and L35A Diversion Replacement Project. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

401 L-35A Screen (USBR)

The perforated plate on the L-35A drum screen on a diversion from the Lemhi River does not meet NMFS criteria.. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game with Mitchell Act funds provided by NMFS. This project would be done in conjunction with the L-35A Headgate and L35A Diversion Replacement projects. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

402 L-3A Diversion Replacement (USBR)

The L-3A diversion on the Lemhi River is a gravel push-up dam that can be an impediment to fish passage under low stream flow conditions. The landowner has agreed to replacement of this structure with a permanent, engineered structure with a fish ladder. A Memorandum of Understanding was executed between the Lemhi Soil and Water Conservation District and Reclamation that identifies roles of each party in completion of this project. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. The project would be done in conjunction with the L-3A Headgate project. The State of Idaho Office of Species Conservation obtained funding for construction of this project through the BPA High Priority Project program.

403 L-3A0 Diversion Replacement (USBR)

The L-3A0 diversion on the Lemhi River is a gravel push-up dam. The perforated plate on this drum screen on this diversion does not meet NMFS criteria. The landowner was contacted in FY 2002 and has agreed that a topographic survey of his diversion system can be done. Then the landowner will be presented with options to replace the screen and/or diversion structure. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program and/or Mitchell Act funds. Completion is anticipated in FY 2003 pending landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

404 L-3 Headgate (USBR)

The headgate for the L-3 irrigation diversion on the Lemhi River is inadequate to deliver a controlled amount of water to the canal. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with the L-3 Diversion Replacement project. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

405 L-6/S14 Water Exchange (USBR)

Irrigation withdrawals at the L-6 diversion have resulted in a passage barrier affiliated with inadequate streamflows in extremely dry runoff years. This project would exchange the diversion point for several water users at L-6 with a site on the Salmon River (S-14), which would improve flow conditions in the Lemhi River without impacting migration conditions in the Salmon River. The project includes designing the modified diversion structure at S-14 and the S-14 canal system, and obtaining all landowner agreements, water permit modifications for water right transfers, other construction permits, and NEPA and ESA compliance. Funding for construction would be provided through BPA's High Priority Project program. The Idaho Office of Species Conservation is the state project sponsor.

406 L-9 Diversion Replacement (USBR)

The L-9 diversion on the Lemhi River is a gravel push-up dam that can be an impediment to fish passage under low stream flow conditions. The landowner will be contacted to initiate replacement of this structure. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with the L-9 Headgate project. Completion of this project is expected in FY 2004. However, initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

407 L-9 Headgate (USBR)

The headgate for the L-9 irrigation diversion on the Lemhi River is inadequate to deliver a controlled amount of water to the canal. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with the L-9 Diversion Replacement project. Initiation of and progress on this project depends on landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

408 Marracci/Washington Department of Fish and Wildlife Diverson (USBR)

The 2 c.f.s Marracci Diversion provides water to three users on upper Beaver Creek. Beaver Creek is listed in the Washington Conservation Commission's Limiting Factors Report and the USFS Middle Methow Watershed Assessment as potential habitat for listed Upper Columbia steelhead, Upper Columbia spring chinook, and bull trout. At low flows, the Marracchi/WDFW Diversion structure is a barrier to these species. The project objective is to replace this temporary structure with a permanent structure incorporating engineered fish passage compatible with an improved delivery system.

409 USGS Hydrologic Model Upgrades (USBR)

Assist USGS with hydrologic model upgrades to evaluate ground-water losses and gains to major streams. Findings will be used for streamflow analyses.

410 Methow Valley Irrigation District Methow River Screen (USBR)

Assist with replacement of Methow River diversion screen owned by Methow Valley Irrigation District. The screen size is about 30 c.f.s.

411 Methow Valley Irrigation District Twisp River Screen (USBR)

The MVID is the largest agricultural water user in the Methow River Basin diverting over 60 c.f.s of water from the Twisp and Methow Rivers. Their outdated screens do not meet NMFS criteria for approach velocity and must be replaced. Replacement of this screen will allow the Twisp River diversion serving the west side of the Methow Valley below Twisp to continue to operate in conjunction with the potential pump exchange system described in the previous narrative. The maximum size of this screen will be for 30 c.f.s.

412 Methow Valley Irrigation District Twisp River Pump Exchange (USBR)

During low flows, MVID's 30 c.f.s. Twisp River diversion can cause temperature and passage problems for spring chinook salmon and other salmonids attempting to move upstream, rear, and spawn. Recent studies by the Pacific Watershed Institute have shown that the Twisp River system provides some of the best salmonid habitat in the Methow Basin, thus it is essential to recovery that access to this habitat is maintained. The Yakama Nation, Bonneville Power Administration, Washington State Department of Ecology, and National Marine Fisheries Service have all become involved with MVID to resolve this issue. This is a controversial project but it appears that the parties have agreed on a pump exchange system that would pump water into the MVID system from the Methow River during low flows, allowing MVID to seasonally cease its Twisp River diversion yet still provide its customers with water.

413 Middle Fork John Day Gaging Stations (USBR)

Fund one or more gaging stations in cooperation with the Oregon Department of Water Resources.

414 Middle Fork John Day IFIM Study (USBR)

IFIM or similar instream flow methodology studies to ascertain fish flow needs and become basis for water acquisitions.

415 Mission Diversions (USBR)

Mission Creek is a small tributary to the Wenatchee River in the lower part of the basin. Biologist and water users familiar with the basin report that there are several small diversion facilities on each tributary that affect passage. These range from rock/cobble push up dams and concrete ecology block structures. Many could be improved with more permanent structures.

416 Methow Valley Irrigation District Methow River Diversion (USBR)

Methow Valley Irrigation District's Methow River diversion structure was built after the 1948 flood destroyed their original head works. It is located approximately 600 feet downstream of the original point of diversion and consists of a deteriorating wooden barrier that stretches entirely across the mainstem Methow. Although the present structure allows passage with a small, antiquated fishway, the Washington Department of Fish and Wildlife has indicated that it does not meet their present policy guidelines for fish passage. This plus the deteriorating condition of the structure necessitates replacing the structure with a new one located at the original point of diversion. The upstream location will allow a much less obtrusive structure that will not require a constructed fishway for passage.

417 Methow Valley Irrigation District Twisp River Diversion (USBR)

The present Methow Valley Irrigation District (MVID) Diversion on the Twisp River consists of a pushup dam and constructed side channel that is subject to cobble sedimentation during the spring freshet. This requires MVID to periodically enter the stream with equipment to clear this blockage. Designing and constructing a new diversion structure and headgate would prevent this entry and minimize the effects of MVID's operations on listed salmonids.

418 North Fork John Day River IFIM Studies (USBR)

IFIM or similar instream flow methodology studies to ascertain fish flow needs and become basis for water acquisitions.

419 Okanogan Gaging Stations (USBR)

USBR will participate in a study by USGS, sponsored by Okanogan County, and Methow Basin Water Planning Unit to modify existing basinwide model to allow for simulation of more complex hydrologic features such as irrigation diversions and returns. The final model will be useful to simulate the hydrologic effects of different water-resource management options. USBR participation will fund stream gage data collection analysis. Previous grant funding for that purpose has been exhausted.

420 Panama Ditch Screen Replacement (USBR)

The project includes a siphon, screen, and passage structure to be installed where the ditch crosses Beech Creek. Reclamation is funding Grant Co. SWCD for engineering support.

421 Strawberry Creek Complex Screen Replacement (USBR)

The project includes a siphon, screen, and passage structure to be installed where the ditch crosses Strawberry Creek and could include several passage projects above this point once the confluence structures are modified. Reclamation is funding Grant Co. SWCD for engineering support and ODFW is providing screen technical assistance.

422 Upper John Day Gaging stations (USBR)

Fund one or more gaging stations in cooperation with the Oregon Department of Water Resources.

423 Upper John Day IFIM study (USBR)

IFIM or similar instream flow methodology studies to ascertain fish flow needs and become basis for water acquisitions.

424 USBR Entiat Subbasin Program Management (USBR)

A separate subbasin liaison will not be assigned to the Entiat subbasin. The Methow subbasin liaison, Mr. Knott will also be assigned USBR liaison duties in the Entiat subbasin. Mr. Knott who can be reached at 509-997-0028 has already initiated work in the Entiat subbasin but the current schedule does not call for full activities to start until 2003. The subbasin liaison's primary duties will be to facilitate project identification with landowners and to coordinate with subbasin watershed groups and representatives of state, tribal, and federal entities. During FY 2003, technical design work will be initiated on screen and barrier modification projects. Those projects have not yet been identified. The budget shown for FY 2003 would cover all program management, coordination, and specific project costs for the Entiat subbasin during that year.

425 USBR Lemhi program management (USBR)

Initiates program required by BiOp action 149 by establishing a liaison office in the Lemhi subbasin and initiating and completing a streamlined process for environmental compliance and program management. The USBR liaison officer in Salmon, Idaho is Al Simpson who can be reached at 208-756-6054. Mr. Simpson provides coordination with local watershed groups, agencies, and project owners. Mr. Spinazola is the overall Idaho subbasin projects program manager. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the Lemhi subbasin ESUs as well as the Middle Clearwater, Upper Salmon, and Little Salmon subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins. During FY 2002, discussions were initiated with NMFS and FWS concerning the prospects of programmatic Sec. 7 ESA compliance on construction projects in the subbasin; the disposition of those discussions is still unknown. The budget shown for FY 2003 would cover all program management, coordination, compliance, and specific project costs in the Lemhi subbasin.

426 USBR Little Salmon Subbasin Program Management (USBR)

In 2004, the USBR will create a new position to coordinate all activities in the Little Salmon subbasin. The Liaison Officer will not be selected until that year. His/her primary duty will be to facilitate project identification with landowners and to coordinate with subbasin watershed groups and representatives of State, Tribal, and Federal entities. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the Little Salmon subbasin ESU's as well as the Lemhi, Upper Salmon, and Middle Clearwater subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins. During FY 2002, discussions were also initiated with NFMS and FWS concerning the prospects of programmatic Sec. 7 & ESA compliance on construction projects in the subbasin; the disposition of those discussions is still unknown. During FY 2004, once the subbasin liaison office is established, technical design work will be initiated on screen and barrier modification projects. Those projects have not yet been identified.

427 USBR Methow program management (USBR)

Initiates program required by BiOp action 149 by establishing a liaison office in the Methow subbasin. The USBR liaison officer is Greg Knott who can be reached at 509-997-0028. Mr. Knott provides coordination with local watershed groups, agencies, and project owners. Mr. Kaumheimer is the overall Washington subbasin projects program manager. The budget shown for FY 2003 would cover all program management, coordination, compliance, and specific project costs.

428 USBR Middle Clearwater Subbasin Program Management (USBR)

In 2003, the USBR will create a new position to coordinate all activities in the Middle Clearwater subbasin. The Liaison Officer is not yet selected but the subbasin liaison should be in place on or near January 1, 2003. His/her primary duty will be to facilitate project identification with landowners and to coordinate with subbasin watershed groups and representatives of State, Tribal, and Federal entities. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the Middle Clearwater subbasin ESUs as well as the Lemhi, Upper Salmon, and Little Salmon subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins. During FY 2002, discussions were initiated with NMFS and FWS concerning the prospects of programmatic Sec. 7 ESA compliance on construction projects in the subbasin; the disposition of those discussions is still unknown. During FY 2003, once the subbasin liaison office is established, technical design work will be initiated on screen and barrier modification projects. Those projects have not yet been identified. The budget for FY 2003 is for all management and technical work in the subbasin during that year.

429 USBR Middle Fork John Day program management (USBR)

Initiates program required by BiOp action 149 by establishing a liaison office in the John Day subbasin and initiating and completing a streamlined process for environmental compliance and program management. The USBR liaison officer in John Day is [] who can be reached at []. [] provides coordination with local watershed groups, agencies, and project owners. Ms. Blakney is the overall Oregon subbasin projects program manager. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the Middle Fork John Day subbasin as well as the Upper John Day and North Fork John Day subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins. The budget shown for FY 2003 would cover all program management, coordination, compliance, and specific project costs in the Middle Fork John Day subbasin.

430 USBR North Fork John Day Program Management (USBR)

In 2003, the USBR will create a position to coordinate all activities in the North Fork John Day River subbasin. The Liaison Officer will not be selected until that year. His/her primary duty will be to facilitate project identification with landowners and to coordinate with subbasin watershed groups and representatives of state, tribal, and federal entities. During FY 2003, once the subbasin liaison office is established, technical design work will be initiated on screen and barrier modification projects. Those projects have not yet been identified. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the North Fork John Day subbasin as well as the Middle Fork John Day and Upper John Day subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins.

431 USBR Upper John Day Program Management (USBR)

Initiates program required by BiOp action 149 by establishing a liaison office in the John Day subbasin and initiating and completing a streamlined process for environmental compliance and program management. The USBR liaison officer in John Day is [] who can be reached at []. [] provides coordination with local watershed groups, agencies, and project owners. Ms. Blakney is the overall Oregon subbasin projects program manager. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the Upper John Day subbasin as well as the Middle Fork John Day and North Fork John Day subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins. The budget shown for 2003 would cover all program management, coordination, compliance and specific project costs.

432 USBR Upper Salmon program management (USBR)

Initiates program required by BiOp action 149 by establishing a subbasin liaison office in the upper Salmon basin and initiating and completing a streamlined process for environmental compliance and program management. The liaison office for the subbasin will be established by September 2002; in the interim Mr. Spinazola will provide coordination of subbasin initiation efforts. In FY 2002, a contract was underway to prepare programmatic NEPA compliance analysis for the Upper Salmon subbasin ESUs as well as the Lemhi, Middle Clearwater, and Little Salmon subbasin ESUs as a means to accelerate NEPA compliance once programs are initiated in those subbasins. During FY 2002, discussions were initiated with NMFS and FWS concerning the prospects of programmatic Sec. 7 ESA compliance on construction projects in the subbasin; the disposition of those discussions is still unknown. The subbasin liaison will provide coordination with local watershed groups, agencies and project owners. Mr. Spinazola is the overall Idaho subbasin projects program manager. The budget shown for FY 2003 would cover all program management, coordination, compliance, and specific project costs in the Upper Salmon subbasin.

433 USBR Wenatchee Subbasin Program Management (USBR)

In 2002, the USBR will create a position to coordinate all activities in the Wenatchee River subbasin. The Liaison Officer has not yet been selected, and in the interim, Mr. Kaumheimer, USBR's overall Washington subbasin projects program manager, is the primary contact until the liaison office is established. The subbasin liaison's primary duty will be to facilitate project identification with landowners and to coordinate with subbasin watershed groups and representatives of state, tribal, and federal entities. Although the subbasin liaison office is not yet established, technical design work has been initiated on some water quantity and fish passage screen. The budget shown for FY 2003 would cover all program management, coordination, compliance, and specific project costs.

434 Williams Creek Diversion Replacements (USBR)

Two irrigation diversions on Williams Creek are gravel push-up dam that can be an impediment to fish passage under low stream flow conditions. Landowners will be contacted in FY 2003 about replacement of these structures with permanent, engineered structures that include a fish ladder. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with corresponding Williams Creek Headgate and Screen Projects. Completion is anticipated in FY 2004 pending landowner concurrence. Another project will be substituted in the absence of landowner concurrence.

435 Williams Creek Headgate Projects (USBR)

Headgates on two irrigation diversions on Williams Creek are inadequate to deliver a controlled amount of water to the irrigation canals they serve. Landowners will be contacted in 2003 to initiate replacement of headgate structures. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game through the BPA Fish and Wildlife Mitigation Program. This project would be done in conjunction with corresponding Williams Creek Screen and Diversion Replacement projects.

436 Williams Creek Screens (USBR)

Three diversions on Williams Creek do not meet NMFS screen criteria. Landowners will be contacted in 2003 to initiate these projects. Reclamation can provide preliminary and final engineering design, NEPA compliance, consultation, and permit assistance. Construction funding would be provided by Idaho Department of Fish and Game with Mitchell Act funds provided by NMFS. These three screen projects would be done in conjunction with corresponding Williams Creek Headgate and Diversion Replacement projects.

437 HGMP Funding & Development-Leavenworth (USBR)

HGMPs for the Grand Coulee mitigation hatcheries, the Leavenworth, Entiat and Winthrop NFHs will be developed. They will be reviewed and approved by NMFS. Any reforms identified will be implemented as soon as practical after approval of the HGMPs.

438 HGMPs Implementation - Leavenworth (USBR)

Any hatchery reforms identified in the NMFS-approved HGMPs for the Grand Coulee mitigation hatcheries, the Leavenworth, Entiat and Winthrop NFHs will be implemented as soon as practical after approval of the HGMPs.

439 Reclamation Water Contracts (USBR)

Reclamation enters into contracts with irrigation districts, individuals, and municipalities for water supplies from federal projects. Any contract renewal or contract modification to increase the acreage served would require consultation with NMFS per this action.

440 Pursue water conservation at USBR projects (USBR)

This is an on-going Reclamation program. Efficient use of water has many potential benefits, including reduced energy requirements (for pumping), improved water quality (through reductions in soil erosion and reduced leaching of chemicals and nutrients), and improved streamflows, particularly near the location of the conservation improvements. In this regard it should be noted that some Reclamation projects are located in the migration corridor of NMFS listed fish, while other projects are far upstream of the migration corridor. Conservation induced increases in streamflows that occur at a diversion location may disappear as diverters located down-gradient exercise their lawful rights to water. On the other hand, when water conservation mechanisms are in place and water is managed more efficiently more water is potentially left in storage increasing the probability of a reservoir to fill (and spill) the following year. This also increases the probability for more water to be put in water banks for leasing for salmon migration flow augmentation or instream uses. This water may offer opportunities to alter reservoir management to improve streamflows. Water conservation will not significantly alter depletions to the Columbia River.

441 Investigate Unauthorized Use of USBR Water (USBR)

This action item recognizes that the unauthorized uses of Reclamation supplied water are activities neither authorized, funded, nor carried out by Reclamation. Resolving these situations often prove to be complex and require significant time and staff resources to resolve. In accordance with this action item, Reclamation will provide NMFS a detailed progress report of its activities in this area by December 21, 2002.

442 Chief Joseph Project ESA Consultation with NMFS (USBR)

The NMFS BiOp requires Reclamation to complete ESA consultation with NMFS on its projects below Chief Joseph Dam on the Columbia River. The Chief Joseph Project consists of several small irrigation units located along the Columbia River below Chief Joseph Dam. These include the Brewster Flats project near Brewster, Washington, the Bridgeport Bar unit near Bridgeport, Washington and the East Unit near East Wenatchee. All three of these units maintain pumping stations along the Columbia River. In 1997 and 1998 the screen on the East Unit and Brewster Flat pumping station were replaced to bring them into compliance with NMFS screening criteria and NMFS was consulted with at that time. The infiltration gallery at Bridgeport Bar was also examined and determined to be functioning properly to protect fish. All three of these units deliver water through pressurized pipe systems and there is no surface water return flow to the Columbia River.

443 Deschutes Project ESA Consultation with NMFS (USBR)

All Reclamation facilities located in the Deschutes River basin will be included in this BA. This includes at least three Federal reclamation projects (and possibly a fourth, the Wapinitia Project, depending on a determination of what Federal discretion remains). There are five (or six) major storage reservoirs associated with these projects. Irrigation deliveries are made from in these storage reservoirs. Actual day-to-day operations are conducted by the respective irrigation districts under contract with Reclamation.

444 Okanogan Project ESA Consultation with NMFS (USBR)

The NMFS BiOp requires Reclamation to complete ESA consultation with NMFS on its projects below Chief Joseph Dam on the Columbia River. Reclamation will complete ESA Section 7 consultation on a feasibility study to study "opportunities to better manage the water resources in the Salmon Creek watershed..." The purpose of the study is "to derive the benefits of and further the objectives of the comprehensive, independent study commissioned by the Confederated Tribes of the Colville Reservation and the Okanogan Irrigation District, which provides a credible basis for pursuing a course of action to simultaneously achieve fish restoration and improved irrigation conservation and efficiency." The Okanogan Irrigation Project uses between 11,000 and 21,000 acre-feet annually from two storage reservoirs to irrigate 5,032 acres of orchard crops, alfalfa, and pasture. The storage reservoirs are both on Salmon Creek, a tributary to the Okanogan River. Salmon Lake Dam (upper dam) impounds Conconully Lake (upper reservoir) and Conconully Dam (lower dam) impounds Conconully Reservoir (lower reservoir). Water is diverted from Salmon Creek Diversion Dam located about 11 miles below the storage reservoirs and delivered through carriage facilities operated by the Okanogan Irrigation District.

445 Tualatin Project ESA Consultation with NMFS (USBR)

The NMFS BiOp requires Reclamation to complete ESA consultation with NMFS on its projects below Chief Joseph Dam on the Columbia River. The Tualatin Project area lies primarily in Washington County in the northwest part of the Willamette Basin, west of and adjacent to the city of Portland, Oregon. Some 17,000 acres of land are furnished irrigation water. Several communities and an industrial corporation are furnished untreated water for municipal and industrial use, and for quality control purposes. Fish and wildlife enhancement, recreation, and flood control are also important project functions. Principal features include Scoggins Dam (53,600 af), Henry Hagg Lake, Patton Valley Pumping Plant, Spring Hill Pumping Plant, booster pumping plants, and piped lateral distribution systems.

446 Umatilla Project ESA Consultation with NMFS (USBR)

The NMFS BiOp requires Reclamation to complete ESA consultation with NMFS on its projects below Chief Joseph Dam on the Columbia River. The original Umatilla Project furnishes a full supply of irrigation water to over 17,000 acres and a supplemental supply to approximately 13,000 acres. These lands, located in north-central Oregon, are divided into three divisions. The East Division is the Hermiston Irrigation District, the West Division is the West Extension Irrigation District, and the South Division includes the Stanfield and Westland Irrigation Districts. In addition, there are approximately 3,800 acres not included in an irrigation district that are provided either a full or supplemental water supply from McKay Reservoir under individual storage contracts. Project features of the East Division are Cold Springs Dam and Reservoir, Feed Canal Diversion Dam and Canal, and Maxwell Diversion Dam and Canal. Three Mile Falls Diversion Dam on the Umatilla River and the 27-mile West Extension Main Canal are the principal features of the West Division. McKay Dam and Reservoir are the only features in the South Division.

447 Yakima Project ESA Consultation with NMFS (USBR)

The NMFS BiOp requires Reclamation to complete ESA consultation with NMFS on its projects below Chief Joseph Dam on the Columbia River. The Yakima Project provides irrigation water for approximately 464,000 acres. Reclamation contracts with private interests to irrigate an additional 45,000 acres. Consultation will consider the operation and maintenance of Bumping Lake, Lear Creek, Tieton, Cle Elum, Kachees, and Keechelus Dams (all storage dams), and 5 diversion dams, canals, laterals, pumping plants, drains, 2 power plants, and transmission lines.

448 Banks Lake Drawdown Study (USBR)

The Banks Lake Drawdown study will examine the effects of an additional 5' reduction in the surface elevation of the reservoir during the month of August. This would reduce the amount of water pumped into Banks Lake by about 130 kaf, which could effectively increase the amount of Columbia River water available for flow augmentation. The lake already operates in its top 5 feet (elevation 1570 to 1565 feet) to help increase Columbia River flows. Among the potential effects anticipated are those on the aquatic vegetation, resident fish, cultural resources, recreation, and shoreline erosion of Banks Lake. Power impacts will be examined including impacts on FCRPS power production, both on the Columbia River and at the pump-generation plant. There will also be an analysis of effects to the power plants in the irrigation system and water supply the irrigators in the Columbia Basin Project.

449 Water Acquisition from Reclamation's Snake River Projects (USBR)

This action item calls on Reclamation to continue activities that have been ongoing since 1993 – the acquisition of water from willing sellers to augment Snake River flows. Inherent in this activity is accomplishing willing seller acquisitions in accordance with state water law. Reclamation and NMFS are presently in active discussions about flow augmentation needs with the state of Idaho and Idaho water users, and Reclamation continues to explore opportunities to acquire additional supplies. A key process for long-term accomplishment is the successful completion of the Nez Perce settlement discussions under the Snake River Basin Adjudication.

450 Columbia Basin Project Wasteway and Drain Investigation (USBR)

The December 2000 NMFS BiOp requires Reclamation to investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. Reclamation will identify attraction problems with the wasteways and drains on the Columbia Basin Project and will work with NMFS to avoid or minimize such use, as warranted.

451 Return Flow Quality from Columbia Basin Project (USBR)

The December 2000 NMFS BiOp requires Reclamation to monitor water quality for irrigation wasteway return flows to the Columbia River to assess potential adverse affects on listed species populations. Reclamation has identified 9 major project wasteway flow paths that account for 98% of total return flow to the river. Monitoring Program analytes include: dissolved ions, nutrients, fecal coliform, heavy metals, selected pesticides, and standard physical parameters (DO, pH, turbidity, suspended solids, and temperature). Sampling (periodicity, site selection, field equipment calibration, flow and continuous monitoring operation specifics) and data processing (evaluation, corrections, analysis, and toxicity evaluation) requirements have been identified. The water quality monitoring program will undergo yearly 'rolling' review to assess sampling frequency, analyze constituency, and budget adjustment needs. RPA may require post project activity (Abatement Plan) if toxicity potential exists in project wasteways.

452 Fish Production/Flow Analysis (USBR)**453 John Day Basin Aerial Imagery Project (USBR)**

Identify scope of RPA181 with NMFS staff, and develop a work plan for accomplishing the task of producing the appropriate imagery, including budget and schedule. The plan will take into account existing and planned inventories.

454 Pushup Dam Research - John Day Basin (USBR)

Research project to monitor, analyze and report on the effects of removing push-up dams on the survival and production of juvenile mid-Columbia steelhead and the survival and reproductive success of adult mid-Columbia steelhead in the John Day River Basin.

455 John Day Basin Steelhead Data and Information Compilation (USBR)

The John Day Basin working group comprised of USBR, BPA, NMFS, ODFW, and the Confederated Tribes of the Warm Springs Reservation developed this project to collect, manage, analyze and disseminate all available information and data on the life-history of listed steelhead and other cohabitating fish species in the John Day River.

458 Effectiveness Monitoring Prioritization Project (USBR)

In conjunction with the RME work group, develop recommendations for identifying and prioritizing research projects for 8 categories of implementation actions under RPA Action 183.

459 TRT Digital Satellite Imagery Project (USBR)

Identify scope of RPA181 with NMFS staff, and develop a work plan for accomplishing the task of producing the appropriate imagery, including budget and schedule. The plan will take into account existing and planned inventories.

460 Tech Recovery Team Task Support-Columbia Basin ESU Identification (USBR)

TRT services related to setting priorities for selecting, implementing and monitoring projects under the 2000 FCRPS Biological Opinion. This effort addresses identification of individual populations.

461 Draw down Albeni Falls for kokanee egg-to fry-study (CORPS)

In the fall/winter 2001 (2002 water year) Albeni Falls shall be drawn down to an elevation 2,051 feet to cleanse shoreline gravels. The purpose of this action is to provide for the alternating lake drawdown and draw-up operation as part of the, kokanee egg-to-fry survival study at Lake Pend Oreille.

462 Libby Operations Bull Trout (CORPS)

1. Operational constraints will be implemented at Libby Dam intended to minimize adverse effects of rapid and severe river flow fluctuations on bull trout, including year-round minimum flows and ramping rates, seasonal water management, conducting studies to monitor the adequacy of the constraints, and providing for modification of the operational constraints depending on study results. Exact operational constraints are shown in paragraphs below. The following ramp rates will be used. Daily and hourly ramping rates may be exceeded during flood emergencies to protect health and public safety and in association with power or transmission emergencies. Variances to ramping rates during years where runoff forecasting or shortage shortfalls occur, or variances are necessary to provide augmentation water for other listed species, will be negotiated through the TMT process. This is expected in only the lowest 20th percentile water years. Note: The ramp rates will be followed except when they would cause a unit(s) to operate in the rough zone, a zone of chaotic flow in which all parts of a unit are subject to increased vibration and cavitation that could result in premature wear or failure of the units. In this case the project will utilize a ramp rate, which allows all units to operate outside the rough zone. The action agencies will provide additional information to the USFWS describing operations outside the "rough zone." 2. If Libby is below 2,439 on July 1 Libby will provide the USFWS bull trout minimum flow.

463 Libby Operations Sturgeon (CORPS)

1. Water shall be stored in Libby reservoir and supply, at a minimum, water volume during May and June based upon water availability or the "tiered" approach as defined through coordinated reevaluation to take place in 2002 among USACE, USFWS, MDFWP and other interested parties and summarized in the table below. This water shall be in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam. Accounting on these total tiered volumes shall begin when the USFWS determines benefits to conservation of sturgeon are most likely to occur. This may include releases timed to enhance survival of eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River. Releases may be timed to serve both wild fish and hatchery eggs/fish. Sturgeon flows will generally be initiated between mid-May and the end of June to augment lower basin runoff entering the Kootenai River below Libby Dam. Table 4. "Tiered" volumes of water for sturgeon flow enhancement to be provided from Libby Dam according to the April - August volume runoff forecast at Libby. Actual flow releases would be shaped according to seasonal requests from the Service and in-season management of water actually available.

2. Libby dam flows shall be regulated consistent with existing treaties, Libby Project authorization for public safety, other laws, and the 1938 International Joint Commission order, to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant sturgeon recruitment.

3. During sturgeon recruitment flow periods, local inflow will be allowed to supplement Libby Dam releases to the maximum extent feasible, while assuring public safety by monitoring water levels throughout relevant areas of the Kootenai River basin.

4. Efforts will be coordinated to attempt to limit sturgeon-spawning flows so they do not exceed a river stage elevation of 1,764 feet at Bonners Ferry. (Note: This may not always be possible during periods of unusual local runoff that may be beyond control of Libby Dam.)

5. Daily load following in the outflow from Libby Dam will be limited to the extent that levees in Kootenai Valley are no longer damaged, and public outreach materials addressing this issue shall be provided.

6. During the summer (July–August) the Action Agencies shall operate Libby to help meet the flow objectives for juvenile salmon out migration in the lower Columbia. Retention of July/August water in Lake Koochanusa is possible under a Libby Arrow water exchange but is not guaranteed. This exchange agreement also reduces the second flow peak created by July/August salmon flow through Kootenay Lake July and August. An agreement will be sought by October 2001. The purpose of this action is to reduce or eliminate the second peak. (Note: This type of exchange is allowed under the current Libby Coordination Agreement, which was signed February 16, 2000. Because the operation must have mutual benefit and the magnitude of the water year is not known earlier, the operation for a given water year is not finalized until June or July of that year.)

7. Libby outflow will fulfill the operational guidelines provided by the USFWS annually prior to and during the sturgeon spawning/incubation period. Specific release recommendations will be developed in consultation with action agencies and submitted annually through the TMT or similar regional process.

464 Seek USFWS concurrence on water storage (CORPS)

At all appropriate decision points the action agencies shall routinely seek timely input and concurrence from the USFWS on all matters affecting USFWS listed fish through the Columbia River Treaty, International Joint Commission Orders, and all other decision making processes involving transboundary waters in the Columbia River basin. This shall include notification of all meetings and decision points and provision of opportunities to advise the action agencies during meetings and in writing as appropriate.

465 AFEP; Kelt Research, Unaccounted Adult Loss and Straying and Marine Mammal Monitoring (C)

AFEP (Anadromous Fish Evaluation Program) - Evaluate operational aspects of fish passage. Kelt Studies – Evaluate passage, returns, and long-term survival of steelhead kelt in the Lower Columbia. Unaccounted Losses and Straying of Adult Salmonids – Account for adults undetected in traditional monitoring program through improved technology and effort. Marine Mammal Monitoring – Evaluate effects of sealions on adult salmonids immediately below Bonneville Dam and determine course of action depending on effects.

466 Regional Database (CORPS)

Project Information - Purpose/Objective: Part A: The purpose of the Northwestern Division Water Quality Database is to regionalize the USACE Northwestern Division water quality data collection efforts. It is expected to encompass the operational water quality data, as submitted to the WCDS, as well as water quality data used for water management and other physical, biological and chemical parameters being collected by the districts. The Water Quality Database will include a means to interface with DASLER / EPA STORET and will be available to the public to view. The database will be implemented and maintained by the Northwestern Division Reservoir Control Center Water Quality Team. Data in the database includes: 1. all water quality measurements, 2. project operational data associated with or impacting water quality, 3. Endangered Species Act Biological Opinion water quality requirements, 4. TMDL development and monitoring, including all parameters on the 303(d) list, and 5. system water quality modeling efforts including weather data. The database will contain information documenting the integrity of the water quality samples and the quality of the water quality measurements. Part B: The purpose of the North Pacific Regional Water Quality Distributed Data Warehouse (RWQDDW) is to provide a data architecture that will allow agencies to share water quality data in support of Endangered Species Act requirements and Clean Water Act compliance. Description - Part A: Currently the Northwestern Division offices are collecting water quality data. Each office maintains the data in their own systems. A regional database was identified as a need to standardize data formats and share data between offices. A specific example of data sharing would be the data from the project on the Lower Snake River and the Lower Columbia River. Currently different district offices maintain the data for these projects. The Northwestern Division Water Quality Database will be comprised of a relational database to capture water quality grab samples, analyzed in the field or by a laboratory, with quality control and quality assurance information and CROHMS/CWMS for capturing/storing all time-series data. CROHMS/CWMS will need to be modified to accommodate the storage of data collected for research purposes, which are comprised of transect data as well as monitoring at fixed locations. Part B: Multiple agencies are collecting water quality data for multiple purposes and multiple locations and storing data in individual data systems. The data is typically unavailable to other interested parties and cannot be cross-referenced with fisheries and habitat data. The RWQDDW is being proposed as a data architecture for sharing this information. A coordination team establishes and maintains common policies, definitions and dimension tables. Each agency utilizes the dimension tables to create fact tables that are shared with the region. A web based interface for querying and reporting data is proposed as the interface for sharing information.

469 Smith Creek Restoration (BPA)

Smith Creek, like other Kootenai Valley tributaries in Idaho, has been significantly altered for agricultural and flood control purposes. Currently Smith Creek reaches the Kootenai Valley floor, and within a half mile of doing so is forced into a straight, diked channel that flows directly to the Kootenai River for approximately one mile. Historically, Smith Creek meandered to the north, following the natural gradient of the valley, before flowing into the Kootenai River approximately two miles downstream. As with many other Kootenai Valley streams, a large (approximately 60 feet high) waterfall a short distance upstream from the Kootenai Valley floor presents an impassable barrier to upstream migrating fish. Smith Creek currently supports a remnant spawning run of kokanee which migrate from Kootenay Lake in British Columbia. Rainbow trout, burbot, and mountain whitefish have also been documented in lower Smith Creek. Idaho Department of Fish and Game (IDFG) propose to restore lower Smith Creek to its historic natural channel, and by doing so increase channel length, fish habitat quality, habitat complexity, and normal hydrologic processes. The historic channel is still evident as a grassy, wetland swale. This opportunity is created by the recent conversion of the land from agricultural to conservation management through the Natural Resources Conservation Service (NRCS) Wetland Reserve Program (WRP). We estimate that at least one half mile (potentially more) of high quality spawning and rearing habitat can be added to lower Smith Creek by restoring the historic channel, with and end result of increasing production of native sport fish.

471 2002-008-00 Reconnection of floodplain slough habitat to the Kootenai River (BPA)

The Kootenai River white sturgeon (*Acipenser transmontanus*) was listed as endangered on 6 September 1994 due to a declining population. Recruitment of juvenile fish into the population is the primary cause of the decline. Research shows that sturgeon age classes below age 25 are not represented in the population. While many factors are likely contributors to the decline, elimination of larval and juvenile rearing habitat is a primary cause. By examining reconnection of mainstem and off channel habitats, this proposal addresses larval and juvenile rearing habitat that has been cut off from the river by channelization and diking. The final Kootenai River White Sturgeon Recovery Plan specifically identifies two, priority one tasks directly related to this project. Therefore, implementation of this project is considered critical for the persistence of Kootenai River white sturgeon and is, by definition, a high priority action.

472 Restoring Bull Trout Habitat in The Blackfoot River's North Fork (BPA)

This project proposal involves a suite of activities designed to provide direct and immediate benefit to the bull trout, a salmonid native to Montana that is listed as threatened under the Endangered Species Act (ESA). The site of the proposed work is the North Fork of the Blackfoot River and its tributaries. The North Fork is one of the most important strongholds for bull trout left in Montana, and yet bull trout populations are still considered to be well below their potential. This project is designed to address specifically the habitat elements of the North Fork that are limiting bull trout spawning and rearing. Timely completion of the proposed project is critical to recovery of bull trout populations in Montana. The proposed work addresses de-watering and low flows, migration barriers and unconnected core habitat, and a degraded tributary stream bed and channel. The tools we will use to accomplish this work include: retiring irrigation water rights and dedicating that water to instream flows; converting open irrigation canals to lined ditches or pipelines; closing down irrigation ditches altogether; converting inefficient flood ditch irrigation to sprinkler systems and, in each case of water savings, protecting the saved water as instream flows; performing significant channel restoration; and, improving riparian grazing practices. It is an inter-connected and reinforcing suite of projects that work together to produce significant habitat gains for the imperiled bull trout. Private landowners in the river basin, state and federal agencies, and non-profit conservation organizations are collaborating on this remarkable effort. The proposed work addresses the major habitat-limiting factors on the North Fork of the Blackfoot River through a cooperative, multi-party effort that crosses numerous private property boundaries. All of the requested funds will be dedicated to timely, on-the-ground restoration work that is essential to bull trout recovery.

473 Secure and Restore Critical Fish and Wildlife Habitats (BPA)

When Hungry Horse Reservoir filled, 124 km of high quality stream habitat was lost, and 23,750 acres of low elevation forest, wetland, and riparian habitats were inundated. To replace these lost fishing sites, the Salish and Kootenai Tribes have been forced to rely more heavily on Reservation lands, which in turn have been degraded from over one hundred years of private and federal land management and development activities. Rapid residential and commercial growth now threatens the best remaining habitats. Rapid growth and development near or adjacent to lakes and streams has resulted in the loss or degradation of significant riparian and wetland habitats, which in turn has resulted in much lower fish and wildlife numbers than could otherwise be achieved. Fish migrations have been blocked by road culverts, dewatered stream reaches, and irrigation diversions. Channelization, road fill, bank armoring and other encroachments along stream segments have narrowed channels and limited meanders inside floodplains. These developments and others have led to a severe decline in the range and abundance of two native trout species. Bull trout were recently listed under the Endangered Species Act and westslope cutthroat are a species of special concern in the state of Montana. This program is designed to enhance efforts by the Confederated Salish and Kootenai Tribes (CSKT) towards securing critical fish and wildlife habitats within the Flathead Indian Reservation. Consistent with the goals and objectives of the 1994 Fish and Wildlife Program, it seeks to rebuild weak, but recoverable, native populations injured by the hydropower system to sustainable levels. The Flathead River and Kootenai River Subbasin Summaries identified the protection of habitats for these populations as one of the most critical needs in the subbasin. This project proposal will address these problems by securing habitats through land acquisition and conservation easements; enhancing existing and newly acquired habitats to maximize their value to fish and wildlife; utilizing a balanced system-wide, watershed approach to reverse the downward trends in native species and protect healthy populations. Target species include all native riparian species, cutthroat trout and bull trout.

474 1991-019-01 Hungry Horse Mitigation - Flathead Lake (BPA)

This project seeks to determine how habitat changes, species shifts, and the consequent dominance of new species—factors that have the potential to limit the success of mitigation measures—have affected native species. The fisheries component is a continuation of portions of BPA project number 9101901. That project, initiated in 1992, has been: (1) documenting trends in westslope cutthroat trout and bull trout populations as well as changes in the populations of several other major species through standardized gillnetting surveys; (2) conducting creel surveys that have defined the baseline condition of the Flathead Lake fishery in 1992-1993 and 1998-99 (Evarts et al. 1994; Hansen et al in press); (3) examining the competitive interactions with lake trout and *Mysis relicta*, and the possible absence of such species as white sturgeon; and (4) conducting basic research into foodweb interactions and factors controlling lake trout abundance (the predatory influence of lake trout on native species is high). This work includes cooperation with state management agencies and two universities. We have learned that this basic research is necessary to successfully mitigate losses of adfluvial trout in Flathead Lake.

475 Purchase Conservation Easement from Plum Creek Timber Company (PCT) along Fisher River (

The goal of this project is perpetual conservation of important fish and wildlife habitats while also allowing for responsible timber and other resource management activities, and public recreation. This will be accomplished through purchase of a perpetual conservation easement from Plum Creek Timber Company (PCT) on 56,400 acres within the Fisher River drainage. The project seeks \$500,000 in capital funding each fiscal year (2002, 2003 and 2004) to combine with Montana's Wildlife Mitigation Program, federal Forest Legacy dollars and a \$640,000 donation by Plum Creek Timber Company. Appraised value of conservation easement is \$13,031,550. The U.S. Forest Service has approved the appraisal as meeting federal appraisal standards. Planning costs were covered by Montana Wildlife Mitigation Trust Fund, 9608702, and the Rocky Mountain Elk Foundation. The Trust for Public Lands holds a purchase option on the property to provide MFWP time to raise money and complete this project. The option is good for 3 years with opportunity to extend for one additional year if necessary. MFWP will purchase the conservation easement in phases over 3-4 years as funding becomes available. The conservation easement: a) Limits forest management practices to those that meet or exceed Plum Creek Environmental Principles and Sustainable Forestry Initiative standards; b) Allows Landowner to manage other resources subject to the conservation easement; c) Prohibits the extraction of sand, gravel, and rock in the 100-year flood plain; d) Allows Landowner to continue permitted grazing at current levels under approved BMPs; e) Restricts future divisions of land to no more than 35 splits and prohibits commercial and residential development; f) Allows existing levels of commercial outfitting but prohibits exclusive outfitting; g) Allows continued public access consistent with current public use restrictions on PCT lands; h) Creates a Liaison Team to address future management of public access and other issues associated with implementation of the conservation easement. Both land management and easement monitoring plans have been written and approved by MFWP and PCT (MFWP 2000a). The land management plan is incorporated as a condition of the conservation easement. It can be updated through time with consent of both the landowner and MFWP.

476 2002-017-00 Regional Stream Conditions and Stressor Evaluation (BPA)

Evaluate status and trends of key factors limiting listed species within subbasins by developing a statistically based model to characterize baseline conditions and identify conditions at regional reference sites.

479 Yakima-Klickitat Fisheries Project - Manastash Creek Fish Passage and Screening (BPA)

The proposal is to restore safe passage for spawning and rearing populations of anadromous fish to the Manastash Creek watershed. This will require providing upstream passage over 4 irrigation dams and correcting five associated unscreened diversions. Because of the complex nature of this project, it will be necessary to implement it in two phases. The design phase is being initiated by the Yakama Nation Fisheries program under an on-going BPA grant, and will evaluate alternatives for diversion consolidation as well as alternatives for water transfers. Conceptually it would be a far better expenditure of rate-payer dollars to provide a portion of the irrigation water supply from the mainstem Yakima River (which has excess summer flows in the affected reach) and retain more flow in the tributary stream. The most practicable alternatives will be constructed in the second phase. The Manastash Creek drains a 100 square mile watershed, much of which lies within state wildlife lands, Wenatchee National Forest and commercial forest lands. The lower five miles of stream have been channelized in many places but the upper 35 miles (mainstem and two forks) are in good condition. Manastash Creek is known to have produced steelhead, coho and spring chinook salmon historically. Bull trout would have been present in the original species association of the watershed. The main factors limiting anadromous fish production in Manastash Creek are presently the barriers/impairments to passage presented by the irrigation dams, their associated unscreened diversions which entrain juvenile fish, and the diversion of 100% of stream flow during the summer/fall irrigation season between stream miles 1.5 and 4.9. The watershed is restorable for spawning and rearing of steelhead, coho and spring chinook (BPA 1990). The confluence of Manastash Creek with the Yakima River is downstream from the BPA Yakima Fisheries Project's Cle Elum Hatchery and its associated three acclimation facilities. Restoration of fish passage into this tributary watershed complements the BPA Yakima Fisheries Project. Anadromous fish restoration in Manastash Creek was identified early on as an element needed in the BPA Salmon and Steelhead Production Plan (Supplement 1, September 1990). The 2001 Yakima Sub-basin summary identifies the need to restore historical production areas such as Manastash Creek.

481 2002-028-00 Conduct Watershed Assessments for Priority Watersheds on Private Lands in the C Plateau (BPA)

The goal of the project is to systematically conduct watershed scale assessments in the Columbia Basin within Oregon. The project will utilize existing watershed analyses conducted on federal lands and focus efforts on watersheds that are dominantly private lands. The watershed assessments will be conducted using the Oregon Watershed Assessment Manual. The Manual will be modified to address wildlife conditions. Successful completion of the project will result in the completion of watershed assessments throughout the Basin that identify priority actions to assist in habitat recovery for listed and native species. The assessments will provide critical information to the subbasin planning program developed by the Northwest Power Planning Council.

483 1990-077-00 Northern Pikeminnow Management Program (BPA)

The goal of the Northern Pikeminnow Management Program is to reduce predation on juvenile salmonids through sustained harvest of northern Pikeminnow. The program is administered by the Pacific States Marine Fisheries Commission (PSMFC), with coordination and technical guidance from the Columbia Basin Fish and Wildlife Authority (CBFWA). Components of the program include a public sport-reward fishery operated by the Washington Department of Fish and Wildlife (WDFW), tribal dam-angling and site-specific fisheries coordinated by the Columbia River Inter-Tribal Fish Commission (CRITFC), and an evaluation of program effectiveness conducted by the Oregon Department of Fish and Wildlife (ODFW). Approximately 1.9 million northern pikeminnow have been removed from the lower Columbia and Snake rivers since 1990 by sport-reward and directed fisheries to decrease predation on juvenile salmonids. The concept of the Northern Pikeminnow Management Program (NPMP) is based on research conducted from 1983-86, which indicated over 1.4 million juvenile salmonids were consumed by northern pikeminnow in John Day Reservoir annually, and average northern pikeminnow harvest rate of 10 to 20% could result in predation reductions by 50% or more. The success of test fisheries by the NPMP in 1990 led to full-scale implementation of two major fisheries in 1991. The sport-reward fishery offers public anglers a monetary incentive to catch northern pikeminnow. Currently, anglers returning 1-100 fish to check stations receive \$4 per fish, those returning 101-400 receive \$5 per fish, and those returning more than 400 receive \$6 per fish. The second fishery is dam-angling, in which agency personnel angle for northern pikeminnow directly from dams. A gill-net fishery was added in 1994 to remove northern pikeminnow near hatchery release points, dams, tributary mouths, and other areas where high levels of predation may occur. The role of the Biological evaluation program component is to evaluate the success of the NPMP, in terms of harvest rate, estimated reductions in predation, and potential compensation for these reductions by other fish predators. Since implementation of the NPMP, annual harvest rates of fish larger than 11 inches total length have averaged approximately 12% (within the 10-20% target), with the sport-reward fishery contributing nearly 91% of the total catch. In recent years, the dam-angling and gill-net fisheries combined have contributed less than 1% of the total catch. Annual catch and harvest rate of the NPMP. Minimum size of NPM eligible for reward changed from 11 to 9 inches in 2000. Modeling results indicate that potential predation on juvenile salmonids by northern pikeminnow has decreased approximately 25% since program implementation; it is within the original range of expectations, and constitutes a significant benefit. Considering approximately 16 million of the overall migration of 200 million juvenile salmonids in the Columbia River were once consumed by northern pikeminnow, a 25% reduction may translate into approximately 4 million fewer juvenile salmonids being consumed by northern pikeminnow annually. Although any decrease in mortality from a specific source is subject to compensation from other sources, no compensatory response from other fish predators such as smallmouth bass, walleye, or surviving northern pikeminnow has been detected. To date, we have found no changes in growth, mortality, reproduction, or diet of these fish. Continued monitoring of the NPMP, including evaluations of potential compensation, is prudent. We will continue to monitor catch and harvest rate of northern pikeminnow annually. We plan to collect information on population dynamics and diet of northern pikeminnow, smallmouth bass, and walleye every 3-5 years.

484 2000-012-00 Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (BPA)

This project currently has and will continue to have two major components: smolt production and abundance and adult spawning and movement. Smolts will be monitored in Hamilton Springs with a modified fyke net or trap, Hardy Creek with a floating fyke net, Hardy Creek spawning channel with a D-frame fyke net, and Columbia River with a screw trap and/or fyke net. Abundance estimates will be calculated by: marking a sub sample of smolts in the caudal fin, calculating trap efficiency, and statistically analyzing the results. Egg-to-smolt survival will be evaluated by installing redd caps and monitoring swim-up timing. Also, installing piezometers and monitoring ground water quality will calculate temperature units for egg incubation. Weirs will be installed in Hamilton Springs, Hardy Creek, and Hardy Creek spawning channel to collect baseline biological data on adult chum salmon. Adults will be collected in the Columbia River via tangle nets and seines and fitted with radio tags. Radio receiver arrays will be installed in the various spawning areas to monitor movement. Spawning ground surveys will be conducted in Hamilton Springs, Hamilton Creek, Hardy Creek, and Hardy Creek spawning channel to evaluate spawning success and peak count. Piezometers will be installed to monitor upwelling water quality and quantify any differences with ambient water quality.

486 Water Quality Plan (CORPS)

487 Bonneville Spillway Flow Deflectors (CORPS)

Purpose/Objective The purpose of this measure is to evaluate methods to reduce high dissolved gas concentrations within the Lower Snake and Columbia River system. High dissolved gas concentrations within the Lower Snake and Columbia river systems have become a regional concern due to the decline in salmon runs and their listing as an endangered species. High levels of Total Dissolved Gas (TDG) generated by spill can harm and may cause mortality in juvenile and adult migratory fish, resident fish and other aquatic organisms. Because of the decline in salmon runs, voluntary spill at the eight federal dams on the Lower Snake Columbia Rivers has been requested by the National Marine Fisheries Services (NMFS) to improve juvenile passage. Management guidelines limit the saturation of TDG cause by voluntary spill to 120 percent as measured at the TDG monitoring station located within the project's tailrace channel and 115 percent TDG within the forebay of the downstream project. However State and Federal water quality standards have been established to limit TDG saturation of spillway flows to 110 percent of barometric pressure. Because of these standards, NMFS request annual waivers from the States of Oregon and Washington that grant exception to this standard within the management guidelines established for juvenile fish passage spill releases. Many of the Federal dams on the Lower Snake and Columbia Rivers have been retrofitted with spillway flow deflectors. Spillway flow deflectors redirect the spillway discharge and prevent it from plunging to depth within the stilling basin. Gas concentrations are reduced by effectively reducing the depth to which the aerated flow plunges. Thirteen deflectors were constructed on the Bonneville Spillway in the early 1980's. These deflectors were designed for involuntary spillway release, which occurs when river discharges exceed powerhouse capacities or demand. Because of the shift from involuntary to voluntary spill for fish passage, TDG super saturation during spillway operation has again become a regional concern. At Bonneville five additional deflectors are to be added in bays 1,2,3,16,17 and 18; the existing deflector must be removed. These deflectors will be installed about 7 feet lower than where the existing deflectors are located. After installation of the new deflectors, the Corps will conduct comparative tests to determine whether or not the new deflectors perform significantly better than the existing deflectors do. A decision document will be prepared to document the findings and assist the region in deciding whether or not additional deflectors should be modified.

488 1987-407-00 Dworshak Integrated Rule Curves/M&E (BPA)

Dworshak Reservoir was authorized in 1962 by PL 87-874 as a multi-purpose project, with the primary purpose of flood control and additional purposes of power production and navigation. Other uses include recreation and fisheries. Dworshak Dam was completed by the U.S. Army Corps of Engineers in 1972, and Dworshak Reservoir first filled in 1973. The 718 foot high blocked anadromous fish passage to all but the lower 1.9 miles of the North Fork Clearwater River drainage. Impoundment converted 54 miles of stream habitat to reservoir habitat and greatly changed the composition of the resident fishery. Typical of new reservoirs, productivity in Dworshak Reservoir was initially higher during the first few years following inundation, then rapidly declined. The reservoir is currently classified as oligotrophic along the thalweg and mesotrophic in some inlet arms, such as Elk Creek arm. Kokanee and smallmouth bass are the primary self-sustaining fisheries. Rainbow trout are also stocked for fishery mitigation. Native, self-sustaining bull trout (listed as threatened under the federal Endangered Species Act) and westslope cutthroat trout also inhabit the reservoir, with minimal contribution to the fishery. It is unlawful to harvest bull trout in Dworshak Reservoir. Significant operational changes occurred at Dworshak Dam in the early 1990s. At this time, Dworshak operations for anadromous fish flow augmentation incorporated summer releases to help cool the Lower Snake River, in addition to spring releases to meet Lower Granite flow targets. More recently, particularly since 1995, the trend has been to use most or all of the 80 feet of BIOP flow augmentation volume for Snake River cooling. Recent operations typically begin drawing down Dworshak pool during the first two weeks in July and complete the 80-foot drawdown by August 31. The NMFS's 2000 BIOP for the FCRPS calls for a study to determine the benefit to adult salmon migrants of using an additional 20 feet of flow augmentation volume during September. If implemented, the total summer to early fall drawdown of Dworshak Reservoir for listed salmon flow augmentation would be 100 feet. Because of the region's reliance on Dworshak Reservoir as the sole source of cold water Lower Snake River cooling, and because of the potential impacts to the Dworshak Reservoir resident fisheries and the supporting ecosystem from an 80- to 100- foot drawdown during the productive summer period, a biological impacts assessment tool is needed. Additionally, because of the varied and sometimes competing uses and resources associated with Dworshak Reservoir and dam operations, there is a need to integrate operations to achieve compatibility with as many needs, uses and resources as possible. The NMFS's 2000 Biological Opinion for Operation of the FCRPS (RA 17) calls for coordination with NMFS, USFWS, states and Tribes in the Technical Management Team (TMT) process to address operational issues. Contributing Dworshak assessment information is an important consideration in the TMT process. In recognition of these needs, Project 198740700 Dworshak Integrated Rule Curves/M&E endeavored to develop Biological and Integrated Rule Curves for Dworshak Dam and Reservoir, patterned after the approach that Montana Fish, Wildlife & Parks (MFWP) pursued for Hungry Horse and Libby Reservoirs (Marotz et al. 1996). The specific approach was to develop a Dworshak specific assessment model, using Dworshak specific operational parameters and data, and refining the hydrologic, thermal and biological production model components. Hydrologic and limnological modeling expertise was subcontracted with the University of Washington to convert the FORTRAN based Hungry Horse Reservoir Model (HRMOD) to a user friendly PC based version and to input Dworshak parameters and relationships for Dworshak specificity. FY 2000 and 2001 activities focused on model development. Pursuant to this subcontract Barber and Juul (2001) developed an initial Dworshak Reservoir Rule-curve Evaluation Model (DRCCEM). As in HRMOD, the DRCCEM is divided into three major computational elements that perform hydrologic, temperature and biological calculations. Over 75 FORTRAN subroutines and associated support files were converted to 45 PC-based Visual Basic Forms and 1 Module containing the methodology. The Visual Basic Forms produce user friendly windows requesting site-specific information for Dworshak Reservoir. Although substantial progress has been made towards constructing the DRCCEM model, a number of unresolved issues need to be pursued, including: calibration and debugging in the thermal routine; resolving "mystery" coefficients; refinement of biological and physical subroutines, and; additional research and/or expert opinion (at least temporarily) to fill data gaps. Notably, the methodology adapted from HRMOD does not address the issues concerning biological productivity of Dworshak Reservoir. The impacts of fluctuating water surface elevations on shoreline habitat and fish spawning, as well as consideration of nutrient limitations at Dworshak Reservoir, are not addressed in the subroutines. Barber and Juul (2001) suggested that included ; and, the reserv The DRCCEM consists of 45 the , Dr. Michael E. Barber and Dr. Steve T. J. Juul suggested potential advantages of using a kinetics-based model, rather than the current regression-based approach. Barber and Juul (2001) also identified the need for expanded investigations of field data for Dworshak to fill data gaps. This project intends to pursue refinement of the DRCCEM as a user-friendly impact assessment tool, and to continue to incorporate model subroutines needed to address Dworshak specific environmental issues. This project also intends to use DRCCEM and other appropriate regional assessment data to propose and refine integrated operations. Rule curves for primary individual operational needs have been defined through modeling exercises conducted as part of the Columbia River System Operation Review (1995). Comparison of these individual rule curves shows areas of operational compatibility, as well as conflicts. Additionally, this project proposes to identify specific data collection needs required for assessment modeling. This data collection effort, however is but one focus of current and potential data collection activities at Dworshak Dam and Reservoir. To maximize efficiency, promote coordination and awareness of activities, and to ultimately assure that needed data are collected, it is prudent to plan for data collection activities in consideration of near- and long-term monitoring and evaluation needs. In recognition of this need, this project is also proposing the development of a comprehensive monitoring and evaluation plan for Dworshak Dam and Reservoir.

489 1988-064-00 Kootenai River White Sturgeon Study and Experimental Aquaculture (BPA)

The white sturgeon (*Acipenser transmontanus* Richardson) population in the Kootenai River was listed as endangered by the U.S. Fish and Wildlife Service on September 6, 1994, due to a virtual lack of recruitment since 1974. The Kootenai River White Sturgeon Study and Conservation Aquaculture Project was initiated to preserve the genetic variability of the population, begin rebuilding natural age class structure, and prevent extinction, while measures are implemented to restore natural recruitment. A breeding plan has been implemented to guide management in the systematic collection and spawning of wild adults before they are lost from the breeding population. The implementation of the breeding plan includes measures to minimize potential detrimental effects of conventional stocking programs. The objectives of the conservation aquaculture program are to produce 4-12 separate families per year and use preservation stocking criteria to produce 4 to 10 adults per family that survive to breeding age (20 years). Monitoring and evaluation using genetic sampling, sonic tracking, gill-netting, and angling will assess genetic variability, survival, growth, movement, and habitat use of juveniles released into the Kootenai River. Success of the project will be determined by: 1) an increase in the number of juvenile sturgeon in the Kootenai River drainage; 2) survival of hatchery fish to sexual maturity; 3) retention of wild sturgeon life history characteristics and genetics in the hatchery reared population; and 4) an understanding of the life history characteristics and factors limiting natural recruitment of sturgeon in the Kootenai River. This project also proposes to evaluate the feasibility of using conservation aquaculture techniques and reintroduction for other declining native fish species in the Kootenai River, as well as providing compensatory harvest opportunities for Tribal members at dispersed sites, while actions are implemented to benefit declining native fish stocks.

490 1988-065-00 Kootenai River Fisheries Recovery Investigations (BPA)

The Kootenai River has undergone many physical and chemical changes. The most recent changes are due to operation of Libby Dam for hydropower and flood control, and lowering the elevation of Kootenay Lake B. C. by 2 m during spring. The operation of Libby Dam and its' impoundment have altered the river ecosystem by significantly changing the hydrograph and increasing the water temperature. The impoundment (Lake Koocanusa) is also a nutrient trap. Results have been: reduced productivity of the river, an altered fish community (more omnivores), inadequate recruitment of white sturgeon *Acipenser transmontanus* (ESA listed), collapse of the burbot *Lota lota* fisheries (petitioned for Emergency Listing), a reduction in the quality of rainbow trout *Oncorhynchus mykiss* fishing, and lower recruitment of bull trout *Salvelinus confluentus* (Threatened). Many resident species were listed as species of special interest in the 1994 Columbia Basin Fish & Wildlife Program. Our main goal is the restoration of the ecosystem and these important fisheries through designed research, flow experiments, and monitoring of target fish populations and environmental variables. The United States Army Corps of Engineers (USACE) provides mitigative flows for spawning and rearing of Kootenai River white sturgeon and research efforts have shown sturgeon responded to improved springtime flows. Numerous eggs have been collected, and several juvenile white sturgeon hatched during mitigative flow years were captured. However, the present level of recruitment is inadequate to delist this species. Additional factors, such as poor spawning habitat, are now believed to be playing a role in egg and larval survival. It will take a minimum of one generation (20 years) to restore the white sturgeon to delisting status. The burbot population is imperiled. Only one tributary is known to support burbot spawning and it is in British Columbia. The burbot stock in Idaho is genetically distinct from fish further upstream in Montana. Research information indicates burbot spawning migrations are impeded by high winter water velocities created during hydropower production and floodwater evacuation. Recent hypothesis testing has been incomplete because burbot needs are secondary to target elevations for Lake Koocanusa for floodwater evacuation. Also, warmer winter water temperature may be disrupting spawning synchrony of burbot. Recent genetic studies indicate burbot from Duncan Lake may be a suitable donor stock. Salmonid studies are focused on early life history and movement of adults. The source of bull trout recruitment is unknown. Rainbow trout are the most popular sportfish, but few juvenile rainbow trout are found in the river. Research indicates rainbow trout spawning in the Deep Creek drainage are adfluvial. The source of recruitment for the river above Bonners Ferry is not completely understood but recent studies indicate most of the spawning may take place in Montana tributaries. Although surveys indicate tributaries of the Deep Creek drainage may be fully seeded, reduced productivity and dewatering in the river above Bonners Ferry may be limiting rainbow trout spawning and juvenile trout survival.

491 1994-047-00 Lake Pend Oreille Fishery Recovery Project (BPA)

This project addresses the considerable impacts of the federal hydropower system on kokanee, and the indirect effects to bull trout, and rainbow trout in Lake Pend Oreille. It also addresses the losses of warm water fish habitat that occurred in the Pend Oreille River above Albeni Falls Dam. Major impacts were caused by Albeni Falls Dam consistently drawing the lake down to the maximum extent possible each fall (elevation 2051' msl). This reduced the amount of gravel along the shoreline of the lake that is usable for kokanee spawning. It also drew the Pend Oreille River down into the river channel causing the loss of much of the warmwater fish habitat. Fish populations declined commensurate with these habitat losses. In 1996 the Northwest Power Planning Council (NWPPC) requested that the Corps of Engineers change lake levels to benefit fisheries. Results of this previous study were promising, if not statistically significant. The ISRP recommended increasing the length of the study to 10 years to make the results more definitive. The USFWS, in its draft Biological Opinion for Bull Trout in Lake Pend Oreille, utilized the previous study's findings to recommend that the Corps change its management of lake levels. These changes were requested to increase kokanee abundance and thereby increase the forage for bull trout. Although not directly intended, a side benefit was that warm water fish habitat in the Pend Oreille River would increase seven fold. The goal of this proposal is to recover these impacted fish populations and to protect the threatened bull trout population. We propose to document the response of the fish populations to these new lake levels. We also propose to monitor changes in the shoreline spawning habitat to see that it is maintained in good quality. Information gained by this study will be presented to the USFWS in its annual review of lake level changes. This allows flexibility in the management of lake levels in future years. The kokanee population, however, is at the verge of collapse, if not already collapsing. Stocking hatchery produced kokanee may be necessary to keep kokanee from disappearing in the short term. Past stocking, however, has not produced higher numbers of adult kokanee. Since all hatchery kokanee for the last 5 years have been marked, we have the unique opportunity to examine and compare the survival of each year class of hatchery and wild fish. By doing so we can determine when survival is relatively the poorest, and gain insights into how to improve the hatchery program.

492 1994-049-00 Improving the Kootenai River Ecosystem (BPA)

The Kootenai River ecosystem has been altered and degraded during the past 75 years by diking, channelization, impoundment, and losses of floodplain habitat and ecosystem function. This ecosystem is currently ultraoligotrophic, in a collapsed state, and limited by post-development cultural denitrification. This project is designed to rehabilitate the post-development Kootenai River ecosystem. Ecosystem rehabilitation is needed to reverse declining trends in native populations of kokanee, burbot, interior redband trout, and ESA listed populations of bull trout and white sturgeon. Past single-species management programs generally failed to restore these populations because they often addressed symptoms (population declines) rather than underlying ecosystem problems. To address this ecosystem problem on an ecosystem scale, this project is designed to: 1) complete a series of AEA (Adaptive Environmental Assessment) workshops to identify and prioritize ecosystem limitations to native fish populations and supporting trophic levels; 2) generate an ecosystem simulation model through the AEA process to evaluate effects of various management strategies; 3) design and implement a standardized, annual monitoring program to provide pre and post-experimental biological databases for Kootenai River ecosystem indicator species; and 4) perform, monitor, and evaluate adaptive management experiments designed to improve ecosystem condition, system productivity, and status of native fish populations. This project is currently in the implementation phase. The AEA Workshops and the Kootenai River ecosystem simulation model were successfully completed. The pre-experimental baseline biological data set is nearly complete. Beginning in 2001, replicated mesocosm experiments will evaluate the controlled addition of limiting nutrients as a means to improve the Kootenai River ecosystem. If larger scale nutrient additions are warranted by the outcomes of mesocosm experiments, in-river experimentation will occur during subsequent years. If in-river nitrification turns out to be an inappropriate restoration tool, the AEA workshop and modeling process will be revisited to determine appropriate alternative adaptive management solutions.

493 2001-013-00 Evaluate the effects of nutrient supplementation on benthic periphyton, macroinvert and juvenile sturgeon in the Kootenai River (BPA)

The Kootenai River in Idaho and Montana has experienced post-development, cultural denitrification during the past century, due in part to impoundment by Libby Dam, extensive river diking (elimination of thousands of hectares of productive seasonally submerged floodplain habitat), and channelization. This research evaluates and documents effects of experimentally controlled addition of nitrogen and phosphorous on primary, secondary, and tertiary productivity in Kootenai River water to determine the river's current ultraoligotrophic status can be remedied (by nutrient additions). Experimental design of this research involves controlled, replicated mesocosm experiments detailed in subsequent sections of this proposal. This research is new and innovative for five reasons: 1) It represents the first project to evaluate nutrient assimilation and productivity in the Kootenai River across multiple trophic levels in three geomorphologically distinct river reaches. 2) It represents the first project to quantify nutrient channeling through assemblages of Kootenai River taxa, in a controlled and replicated fashion, within experimental apparatus in the Kootenai River water column, using Kootenay River water. 3) Past mesocosm experiments only investigated responses of primary and secondary producers. Thus, assimilation of primary and secondary production into tertiary trophic levels was always inferred. Our research introduces a tertiary consumer (juvenile Kootenai River white sturgeon) into the mesocosm units. With this innovative experimental design, growth response of white sturgeon in a replicated series of N, P, and N:P ratio treatments is directly measured, rather than inferred. Experimental control units allow empirical quantification of white sturgeon growth in the treatment units. 4) Unlike some past mesocosm studies, our research will reproduce (in the experimental units) the same thermal, substrate, and incident light conditions used by juvenile white sturgeon in Kootenai River benthic habitats. 5) This research helps evaluate the appropriateness of future in-river nitrification experiments, as part of a comprehensive adaptive approach to Kootenai River ecosystem management.

494 2002-002-00 Assess Feasibility of Enhancing White Sturgeon Spawning Substrate Habitat, Kootenai Idaho (BPA)

This project is a 2-phase collaborative interagency effort that uses innovative technologies to assess the feasibility for enhancing white sturgeon spawning substrate habitat in the Kootenai R., ID. This project is designed to assess sediment and bedform movement across spawning substrate, addresses effects of the backwater interface from Kootenay Lake on white sturgeon migration and spawning behavior and to address construction, implementation, monitoring and evaluation of in-stream structures which would enhance habitat for white sturgeon spawning. Phase I of the proposed project will use several, recently developed, innovative technologies to conduct a feasibility study for enhancement of white sturgeon spawning habitat, Kootenai R., Idaho. These technologies include: 1) the use of a bathymetry survey system to animate bedform movement in sturgeon spawning areas, 2) development of a surface water model to determine the effects of the backwater interface on white sturgeon spawning behavior and 3) assess the feasibility, specifically the stability and longevity, of placing cobble and rock above the current sand substrate to enhance sturgeon spawning habitat. Depending upon the outcome of Phase I, Phase II of the proposed study will incorporate the design, construction, implementation, monitoring and evaluation of in-stream structures which would potentially enhance habitat for white sturgeon spawning. The methods that will be used in this study have great transferability to other fish and wildlife investigations in the Columbia Basin, particularly those investigations that (1) must design appropriate enhancement structure for spawning habitat substrate, and/or (2) need to assess the likelihood of successfully enhancing spawning habitat substrate in order to aid recovery of salmonid populations, sturgeon populations, and benthic aquatic communities that provide foraging habitat for fish and bird populations.

496 2002-009-00 Lake Pend Oreille Predation Research (BPA)

Lake Pend Oreille is the largest natural lake in Idaho; 90,000 acres. Sport fisheries in the lake have been severely impacted by hydropower development on both the inflow and the outflow of the lake (Maiolie and Elam 1993, Fredericks et al. 1995, Paragamian et al. 1991). Consistently drawing the lake down 11 feet annually has taken the kokanee population from an estimated 5 million fish (able to support a 1 million fish harvest) to a population unable to support a sport fishery. The low kokanee population has declined to the point where it can no longer support the populations of rainbow trout, bull trout, and lake trout in the lake. (The diet of all three of these species is 60 to 80 % kokanee.) Until kokanee recover, the predator population needs to be reduced. To our knowledge, no literature exists which describes the balance point between a kokanee population and its predators. However, it appears we have past this point since kokanee survival rates from age 1 to age 2 have dropped from 80% to less than 20%. This bottleneck in the population has, for the last two years, prevented good year classes of kokanee from recruiting to the older age classes and benefitting the next generation. Reductions in survival of this magnitude will ultimately extirpate kokanee from the lake. Should kokanee collapse, bull trout, rainbow trout, and lake trout will be in direct competition for a limited forage base. This constitutes enough of a threat to the bull trout population that the USFWS in their draft Biological Opinion has recommended changing lake levels to enhance kokanee spawning and thereby reduce the risks to the bull trout population. However a short term predation problem is still thought to exist. This project proposes to develop methods to quantify pelagic predators in the lake (rainbows and bull trout) by using hydroacoustics. The uncertainty we propose to solve is to identify the species of fish seen on the echosounder. This will be done through cluster analysis of the echograms and tagging studies to show the habitat use of each species. By using hydrosonic tags and recording tags, we can learn the depth and temperature used by these predators at night, and then enumerate them on the hydroacoustic surveys. Secondly, the project proposes to define the balance point between predators and prey. Previous bioenergetic studies, with their many assumptions, have failed to estimate this point with much confidence. The kokanee population showed sharp declines in survival once the ratio of predator to prey got above 1 kg of predators to 6 kg of prey. Therefore we will use this as a starting point for our work. Lake Pend Oreille at the current time is a real world example of the conditions that exist as a kokanee population collapses. We can gain valuable empirical data of the balance of predator and prey by monitoring both predator and prey abundance, enhancing the kokanee population, and reducing the predator population. We can then document kokanee survival rates and abundance to determine the balance point. Balancing predator and prey will be considered from the standpoint of mass balance and production versus yield. The project proposes to help reduce predator abundance in the lake. Recent fishing regulation changes have greatly expanded the opportunity to harvest rainbow and lake trout which should help reduce predation. We propose adding prize money to two long standing fishing derbies that are held on the lake each spring and fall. Conceivably these two derbies could account for more lake trout and rainbow trout harvest than all the fishing the rest of the year.

497 2002-010-00 Acquire and conserve high priority bull and westslope cutthroat trout habitat in Trestle Creek (BPA)

Trestle Creek is recognized as one of the most important bull trout spawning streams in the Pacific Northwest, hosting an annual run of 500 to over 1,200 fish, representing 30-50% of the annual adult bull trout spawning escapement from Lake Pend Oreille (LPO). A comprehensive bull trout "problem assessment" cited residential development as the primary threat to the integrity of the Trestle Creek watershed and its continued suitability for bull trout. The LPO Key Watershed Bull Trout Problem Assessment (Panhandle Bull Trout Technical Advisory Team 1998) recognized Trestle Creek as the highest priority tributary stream in the LPO watershed. While rating Trestle Creek's bull trout population as having the highest probability of persistence of any stream in the LPO watershed, the assessment also notes that bull trout have highly specific habitat requirements and high sensitivity to human-induced disturbance. The Idaho Department of Fish and Game proposes to undertake a targeted program for purchasing fee title and conservation easements to prevent subdivision and development of private lands in the Trestle Creek watershed. Three factors suggest a high probability for success of this project: 1) Private lands comprise only about 1,000 acres in this primarily national forest drainage; 2) numbers of private landowners are limited (about 25); and 3) Trestle Creek landowners are supportive of bull trout conservation. Overall, this project will secure crucial habitat for threatened bull trout and thus meet the objectives of the Columbia Basin Fish and Wildlife Program (Section 10.5) which directs that after studies and evaluations, "on the ground projects should be identified and implemented as soon as possible to address the needs of this species".

498 2002-011-00 Implement Floodplain Operational Loss Assessment, Protection, Mitigation and Reh. on the Lower Kootenai River Watershed Ecosystem (BPA)

The operations of hydroelectric facilities in the Columbia Basin, particularly Libby Dam (Montana), has resulted in the functional loss of the floodplain ecosystem in the Lower Kootenai Watershed and associated tributaries, perennial and ephemeral wetlands, sloughs and pocket water. The regulation of floods by Libby Dam gave new life to the local agriculture market and signaled the end of Kootenai Tribe of Idaho "Duck Chiefs". The Kootenai Tribe of Idaho (KTOI) abandoned weir fishing and relied more heavily on native fish stocks such as kokanee (*Oncorhynchus nerka*), redband trout (*Oncorhynchus mykiss garideini*), westslope cutthroat trout (*O. clarki lewisii*) and bull trout (*Salvelinus confluentus*) as well as local upland wildlife populations. As more floodplains were drained, tribal lands were converted to the best economic use of the land, agricultural production. The Lower Kootenai Watershed floodplain approximately 50 miles long, up to 3 miles wide and is positioned between two major mountain ecosystems on the West and East, Selkirk and Cabinet-Yaak respectively. The floodplain ecosystem attracted a wide range of wildlife such as woodland caribou (*Rangifer caribou*), grizzly bear (*Ursus horribilis*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), elk (*Cervus elaphus*) and migratory waterfowl. Over a century of land conversions has made the "reclaimed" floodplain into vast stretches of grain fields and pastures. Once diverse floodplain wildlife habitats are now fragmented, declining, decadent or lost. Both the KTOI Wildlife Program and Tribal Fisheries Program, proposes to assess, protect, restore and/or enhance floodplain ecosystems, that include riparian, wetland, and closed associated uplands and tributary areas that have been impacted by the operations of Libby Dam in the Lower Kootenai Watershed in order to promote healthy self-sustaining fish and wildlife populations. The primary goal of this pilot operational loss assessment and mitigation project is the assessment of losses of floodplain ecological functions and processes by comparing natural analogues in unregulated systems to the Lower Kootenai River Watershed. Understanding the losses of functions and values, developing rehabilitation/restoration strategies and biological potential of the Lower Kootenai River Watershed is critical for natural resource management efforts by the Tribal Fish and Wildlife Programs. The KTOI proposes a holistic approach that assesses losses of ecological functions. KTOI proposal is initiated by the 1) review and selection of research designs to evaluate operational losses in the Lower Kootenai River Watershed, 2) assess operational losses with the intent to use same research designs on a regional basis, and 3) develop watershed strategies, and mitigate loss of functions and values to their highest biological potential. Throughout the process, KTOI proposes to reassess, monitor and reevaluate all aspects (research, assessments, mitigation, monitoring), and continually apply adaptive management techniques to promote a self-sustaining and functioning ecosystem. It must be emphasized that with the level of disturbance in the Lower Kootenai River Watershed ecosystem, the Watershed has little likelihood of functioning the same way it did 200 years ago. However, with operational loss assessments addressing limiting factors and developing a biological potential of the watershed, there is an opportunity to rehabilitate critical functions and values that will advance the recovery of the Lower Kootenai River Watershed ecosystem.

499 Report on use of Additional Canadian Storage To support mainstream flow objectives (BPA)

This action item directs BPA and the Corps to evaluate, request, and negotiate with BC Hydro for shaping and release of Canadian water (Treaty and/or Non-Treaty) for July/August flow augmentation in addition to agreements under action items 24 and 25. Options for achieving additional flow include the installation of additional turbines at Mica and Revelstoke. The Columbia River Treaty Operating Committee (BPA, the Corps, and BC Hydro staff) prepared a preliminary report on feasibility on increasing discharges from Canadian storage in July and August. The Operating Committee submitted the report in March of 2002 for the consideration of the Entities. No further action has occurred at this time.

500 Canadian Treaty Storage Agreement - Request/Negotiate Additional Storage (BPA)

The ESA purpose of this RPA action is intended to put more water in the mainstem Columbia River during the juvenile salmon migration season (April through August). This action item directs BPA and the Corps to continue to request and negotiate the annual non-power uses agreement with Canada. This agreement provides: 1) for the U.S., 1 Maf of spring/summer flow augmentation and assistance with Vernita Bar flows; and 2) for Canada, trout spawning flows and increasing lake levels in the spring for dust storm avoidance. In addition, the action item requests that the Corps and BPA seek additional amounts of storage for flow augmentation. BPA and the Corps will seek to negotiate a Non-Powers Uses agreement with Canada prior to the spring each year.

501 Non-Treaty Storage Agreement with Canada-Request Additional Storage (BPA)

The ESA purpose of this RPA action is intended to put more water in the mainstem Columbia River during the juvenile salmon migration season. This action item directs BPA to continue to request, and seek to negotiate an agreement for the storage of, water in Non-Treaty Storage (NTS) space during the spring for subsequent release during July and August. BPA will request and seek to negotiate a NTS letter agreement Canada to implement the desired operation as long as a NTS agreement exists with Canada annually (prior to May each year).

502 Bonneville 2nd PH surface bypass (corner collector) (CORPS)

Purpose/Objective The purpose of this measure is to increase project survival through high flow (approximately 5,000 CFS) surface bypass at the existing ice and trash sluice chute at the 2nd powerhouse. Biological studies conducted in 1998 show that significant numbers of juveniles entered the trash chute with flows slightly higher than 2,000 CFS. The existing chute outfall cannot handle large flow volumes without eroding the shoreline. In addition the plume is not in an optimal location to ensure juvenile survival. Therefore a new outfall location is required. The major components of the measure include lowering the existing upstream gate in the forebay to allow for increased flows into the sluice chute, construction of an ogee inside the chute to create conditions conducive to safe juvenile passage, construction of a new transportation channel, construction of a new outfall structure off the western end of Cascades Island, and a fifty foot deep plunge pool. Contract award will occur in 2002, with construction completion to allow operation for the 2004 outmigration. Two years of post-construction monitoring in 2004 and 2005 is included.

503 Bonneville 2nd PH fish unit trash rake (CORPS)

Purpose/Objective: The purpose of the program is to improve the automated trashrack cleaning system at the B2 fish units. A FY 2000 report indicated that the current system is not adequate to clean the trashracks. The trashracks clog up with debris, which must be hand cleaned several times each year. Also, the current trashrake has a tendency to push the debris to the bottom of the trashrack, where it builds up over time, rather than removing it. This situation results in the loss of head across the trashracks and makes it difficult to keep the fish ladder in criteria per the Fish Passage Plan. The report also noted that periodic maintenance dredging in front of the units would help alleviate problems with debris building up and ultimately getting inside the AWS system. Automated rakes can be designed and installed that will allow cleaning of the trashrack face without jamming the debris deeper into the grating. Also, the FY 2001 DDR determined that the lower 1/3rd of the trashracks could be closed. This would essentially provide a sump for materials to build over time and would make planning for maintenance dredging possible.

504 Bonneville 2nd PH FGE improvements (CORPS)

Purpose/Objective The purpose of this measure is to evaluate potential actions to improve guidance into the screened bypass system at the 2nd powerhouse. Improvements to the bypass system were completed in 1999, and results of evaluations conducted to date, show that fish are moving through the system with minimal delay and injury. A review of previous work to improve guidance in the 1980's was conducted to begin the study. This review recommended focusing on increased flow into the gatewell as the initial focus of the study. Other potential actions outside the trashracks could be considered in the future, depending upon results of the gatewell flow modifications. We are also focusing our efforts on actions that would not impact the effectiveness of the proposed corner collector at the south end of the powerhouse. Studies to date have shown that removing a portion of a beam to increase the size of the vertical barrier screen (VBS), providing perforated plate behind the VBS to balance the flow and reduce velocities through the VBS, provision of a turning vane, and a gap closure device significantly increase gatewell flow. Construction of prototype features on unit 15 was completed in April 2001 for a prototype test. The test evaluated guidance and fish passage through the gap above the screen and below the intake ceiling with and without the gap closure device. Other potential actions include raising the operating gate and blocking the trashracks in various configurations. The cost estimate and schedule shown below assume that these additional features will not be evaluated in the field, and that the results of 2001 and 2002 prototype testing will be positive. We modified unit 17 in 2002, and will test both units 15 and 17 for the 2002 test. Unit 17 will be tested to evaluate the effectiveness of the modifications with the cross flow that occurs at the ends of the powerhouse. The schedule and cost estimates are placeholders (have not been completely scoped), and assume an implementation decision will be made after the 2002 test. In addition, it assumes that all powerhouse units will be modified. Fyke net testing in 2001 in unit 15 showed guidance in the 70% range. However, hydroacoustic monitoring of the powerhouse showed high guidance at all units in the low flow 2001 year. We currently anticipate reviewing biological data from the 2002 test for an implementation decision. Depending on the results of the test, partial implementation across the powerhouse could be considered, with the remainder on hold pending evaluation of passage with the corner collector in operation.

505 Bonneville 2nd PH emergency AWS (CORPS)

Purpose/Objective: The purpose of the program is to provide the Bonneville Second Powerhouse with a backup auxiliary water supply. The current backup system, the ice/trash chute draws adult fish into the AWS system where they are trapped for extended periods of time. In 2000, an alternatives study determined that with the closing of the orifice openings along the collection channel and the selective closing of some diffuser and entrance gates, the collection channel flows could stay within criteria even with only one turbine operating. In 2001, a design document report was completed that recommended slide plates to close the downstream orifice openings and develop an operational manual for closing additional gates and diffusers under different tailwater and forebay conditions. In 2002 the contract was awarded.

506 Bonneville adult fallback (CORPS)

Purpose/Objective: The goal of the program is to determine the cause of adult fallback over the spillway at Bonneville Dam by adult fish exiting the Bradford Island ladder and to design, install and evaluate a corrective action that will reduce or eliminate the problem. The present plan calls for the development of alternative ladder modifications and continued telemetry studies of released adults. In 1999 and 2000, analyses of radio telemetry and forebay hydraulic model data did not reveal a correlation between hydraulic conditions and fallback rates, suggesting that the cause for fallback from fish exiting the Bradford Island fishway is due to shoreline orientation of adult salmonid migrants. However, analyses of fallback rates and environmental variables did show that fallback rates increase as total river flow and spillway discharge increase. Continued study, especially after the addition of flow deflectors on the remaining spillway bays is anticipated so that a wider range of spill conditions can be analyzed.

507 Bonneville flat plate detector (CORPS)

Purpose/Objective The purpose of this measure is to provide PIT-tag capability at the 1st powerhouse until a new bypass system or surface bypass system is implemented. A flat plate detection system has been installed at the powerhouse. A yearly placeholder for potential modifications to the system is included on an annual basis.

508 Bonneville juvenile fish studies (CORPS)

Purpose/Objective The purpose of this measure is to evaluate fish passage efficiency (FPE) and project survival at Bonneville Dam. This will aid in future decision-making regarding project operations and configuration. The measure also includes the cost for route specific survival estimates, including the new JBS system at the 2nd powerhouse and the spillway. Pilot test using radio tags to estimate project survival was initiated in 2000. Based on these results, project and route specific survival estimates are planned for 2001, 2002, 2003, and 2004. Tests in 2004 were added because of the unique flow conditions in 2001 and to focus on fish passage with the corner collector in operation. FY 2003 tests will focus on B1 sluiceway efficiency and survival, and may include a second year of B1 JBS spring and B1 MGR survival studies (based on 2002 results). FY 2004 tests include project FPE and survival estimates. The B2 corner collector measure includes funds for post-construction monitoring. We will evaluate our cost estimates for 04 for this program (juvenile fish studies), combined with the corner collector post-construction monitoring, to ensure we have not estimated more funds that are required due to the combination of the work in 2004.

509 Bonneville 2nd PH gatewell debris removal (CORPS)

Purpose/Objective The purpose of this measure is to evaluate a debris channel tying into the ice and trash sluice chute to remove debris from the gatewell in units 11 and 12. The schedule assumes this work will occur after completion of the 2nd Powerhouse corner collector in 2004. An automatic valve would allow debris and flow to enter an open channel flume and travel through a powerhouse wall into the ice and trash chute.

510 Estuary study (CRFM) (CORPS)

Purpose/Objective: The purpose of the program is to develop an understanding of juvenile and adult salmonid use of the Columbia River Estuary. These studies would support the actions to develop criteria estuarine restoration, restoration planning and implementation. Plume dynamics and estuary use potentially has a major effect on salmonid survival to adulthood. The estuarine and plume ecology of salmon in general and the use of the Columbia River estuarine habitat and plume, in particular, is poorly understood. Juvenile distributions relative to habitat type, food habits, prey preferences and the growth and physiological condition of juveniles entering and leaving the plume and estuary are important aspects of salmonid ecology. Information on these aspects of all salmonid life histories is needed to develop an understanding of salmonid estuary and plume use and any influences of the hydrosystem flows, turbidity, and nutrient delivery that might, in turn, affect salmonid ecology in the estuary and in the plume.

511 John Day salmon holding and jumping (CORPS)

Purpose/Objective: The goal of the program is to determine the cause of holding and jumping behavior in adult steelhead at the John Day south fish ladder and holding behavior in the John Day Transition Pool and develop, design, install and evaluate corrective measures if warranted. A significant number of adult steelhead migrating through the fish ladders at John Day Dam exhibit a behavior that is not common in other fish ladders at federal dams on the main stem Columbia and Snake rivers. These fish jump into the air during ascent through the ladder. Many strike parts of the ladder's concrete structures as they fall back into the ladder. Others fall onto the walkway or other areas outside of the ladder where they die unless quickly placed back into water. This behavior is believed to be a response of the fish to the environment within the ladder. The factor or factors within the many elements that comprise the fish ladder environment that provide the stimuli for this behavior are not known. Many fish also hold in the ladder for long periods.

512 John Day Ladder Temperature (CORPS)

Purpose/Objective: The purpose of the program is to determine the effects on fish passage, if any, due to variations in water temperatures at various sections of the John Day Fishways. If shown to have an effect, corrective measures would be designed and implemented. Data shows that water temperatures at various sections of the John Day fishways differ by as much as 5 degrees Fahrenheit at times. Effects of such differences on fish passage are unknown.

513 John Day N. Shore AWS (CORPS)

Purpose/Objective: The purpose of the program is to bring the John Day North Shore Fish Ladder into criteria for flow. Attention has focused on the six turbine pumps that were designed to furnish auxiliary water for the diffusers and transportation channel in the lower part of the ladder. Many operational complaints have been leveled at the ability of the pumps to meet present day fisheries criteria. New circuit breakers have been installed removing that item from the set of possible remedies. At least one motor has been damaged. Pin pointing whether these pumps have hydraulic problems or electrical problems would allow the selection of a remedy that would go directly to the core of the problem.

514 John Day surface bypass spillway improvements (CORPS)

Purpose/Objective – Investigate the benefits and costs of installing a removable spillway weir (RSW) and spillway flow deflectors at bays 1 and 20. The RSW installation and testing is intended to be a test of the skeleton bay surface bypass concept but could ultimately lead to a program where one or more RSW's are installed across the spillway in lieu of using the skeleton bays. Biological evaluation of tailrace egress while spilling flows that will mimic those anticipated once the RSW is constructed. It is anticipated that 2 years of testing will be necessary. In 2001, physical modeling of RSW spill seemed to indicate that major eddies would be created and that tailrace egress for juvenile salmonids could be negatively impacted. However, tailrace egress has not been formally studied in the past and it was agreed by the region that it should be tested prior to abandoning the RSW concept for John Day Dam. It is anticipated that 2 years of study will be needed before enough data is available to make a decision whether to proceed with the RSW. Installation of the deflectors at bays 1 and 20 is also on hold pending the results of this biological testing; however, the deflectors will be installed regardless of whether the RSW project is terminated. In that case a normal deflector would be constructed in Bay 20 rather than the extended deflector that would be needed were the RSW project to proceed. If the RSW does proceed, the deflectors will be installed and evaluated for water quality and biological survival before pressing on with construction of the RSW.

515 John Day Screens (CORPS)

Purpose/Objective - The existing 20-foot submerged traveling screens at John Day Dam will be replaced by 40-foot extended length submerged bar screens (ESBS's). The longer screen length will intercept a greater percentage of fish, increasing fish guidance efficiency. Existing vertical barrier screens (VBS) located in the bulkhead slot of each turbine unit, need to be modified due to the ESBS's diverting a greater volume of water into the slots. Prototype screens were tested in FY 97 and performed successfully biologically. Since 1997 biological and structural problems with the screens have been discovered, requiring additional analysis and testing of alternative designs. Structural/mechanical testing will continue when a biologically acceptable design has been installed and can be left in place for at least one year. The ESBS and VBS in unit 7 will be modified and biological, structural and mechanical testing will begin in April 2002. It is anticipated that the final results of the biological testing will be available by January 2003. Structural and mechanical testing will continue until the structural integrity has been verified.

516 John Day survival and passage efficiency studies (CORPS)

Purpose/Objective – Previous studies have indicated that 24-hour spill results in higher spill passage, and lower forebay retention time than 12-hour spill. Fish passage efficiency, however, has not been found to be different between 12 and 24-hour spill. The effect of 24-hour spill on passage distribution appears to be that fish normally guided into the juvenile bypass system at night are instead passed over the spillway during the day. Therefore, based on prior studies, it appears that the benefit of 24-hour spill is reduced forebay retention time. Survival studies designed to compare survival between 12 and 24-hour treatments indicate that spillway survival is significantly lower on days with 24 hour spill. The causes for reduced survival during 24-hour spill have not been determined, and will be the focus of future spillway survival studies. Further studies will be conducted to assess the value of operational changes as they relate to spill. Additionally, if it is determined that benefits can be realized from a change in spillway operation the Corps, in coordination with BPA, will determine the impacts that will result to the hydropower system. Description - A decision document will be prepared that weighs the benefits and costs/impacts of spill operational changes, the removable spillway weir, surface bypass through the skeleton bay(s) and extended-length screens. This decision document will consider impacts to navigation as well. Impacts to the hydropower system, including "lost revenue" will also be presented in the decision document. The studies will identify juvenile salmonid response to daytime spill in terms of spillway passage, forebay residence time, tailrace egress, predator response, and overall passage survival. The studies will seek to explain observed survival differences between 12 and 24-hour spill treatments. The studies will evaluate both spring and summer spill. Adult passage considerations and potential adult fallback will be considered in the study design.

517 Adult Lamprey Passage (CORPS)

Purpose/Objective: The goal of the program is to develop upstream migrant facilities at Bonneville Dam that will pass adult Pacific Lamprey without disrupting adult salmon and steelhead passage. [Pacific Lamprey populations have declined severely since the completion of the Federal Columbia River Power System. In 1993, the Oregon Department of Fish and Wildlife designated Pacific Lamprey at risk of being listed as threatened or endangered. Only 40% of fish released below Bonneville successfully pass the dam. The development and evaluation of alternative passage facility concepts in the experimental ladder, the design and construction of prototypes for selected alternatives and the evaluation in the field of those prototypes. In 1995, the Corps initiated a radio telemetry evaluation of adult lamprey, which indicated a low passage rate at Bonneville Dam. Several problem areas were isolated. These include the fishway entrances, entrance pools and count stations. In 1999, a test ladder was constructed to evaluate swimming performance and behavior in ladders and to test ladder modifications. In 2001 and 2002, the Corps evaluated a prototype in the collection channel of powerhouse 2 using radio telemetry. The prototype structure consisted of strips of plating placed over a section of floor diffuser grating, thus providing the lamprey an area to attach and rest as they make their way up the channel. Also, a spillway entrance is being modified to have smoother, rounder edges and this will be evaluated at different head conditions. Blood chemistry will also be assessed throughout the year to help understand physiological changes, sexual maturation, and migration readiness.]

518 The Dalles sluiceway outfall relocation and emergency AWS (CORPS)

Purpose/Objective: The purpose of this measure is twofold: To provide an emergency water supply for adult fish attraction along the powerhouse and south end of the spillway should one of the two existing fish water turbine units fail. To relocate the ice and trash sluiceway outfall to a location less prone to juvenile predation. The two existing fish units are required to run simultaneously (although not necessarily at the same volume) to provide approximately 4200 cfs of adult attraction water, required for the Oregon side fish ladders. An adult attraction backup water supply alternative analysis was completed in 1997, with installation of a 3-pump system recommended, at an estimated total cost of approximately \$33 million. A separate study to evaluate the feasibility to relocate the ice and trash sluiceway outfall to a location less prone to juvenile predation was also completed in 1997. A subsequent third study concluded significant savings could be realized if the two measures were combined for economy, utilizing a dewatering system in the relocated sluiceway channel to provide the backup adult water supply. A detailed Design Report (DDR), containing a design and cost estimate for the combined system was completed in May, 2001; however, the outfall site selected developed in the DDR was determined unsatisfactory, based on additional hydraulic model studies completed after the site had been developed in the DDR. Initiation of Plans and Specs for construction of the project will be delayed pending completion of a reanalysis of potential outfall locations. Consideration will now also be given to the impact on the outfall site of possible installation of spillway flow deflectors and/or other spillway basin modifications.. Work in FY02 will primarily include use of hydraulic models and numerical models (CFD) to determine if selected alternative outfall sites are satisfactory. The existing outfall site will also be reanalyzed. Due to the higher priority given to development of spillway improvements, the outfall model work has been delayed several months.

519 The Dalles project survival study (CORPS)

Purpose/Objective The purpose of survival studies at The Dalles Dam is to determine the best project configuration for fish passage. An important element of this program will be to determine if survival improvements can be achieved through spillway, stilling basin, and turbine modifications. The current juvenile fish passage strategy for The Dalles Dam is to maximize fish passage through the Spillway and through the Ice and Trash Sluiceway. Recent fish passage efficiency evaluations suggests that the spillway is highly effective at passing a large proportion of the juvenile run: at 40% juvenile spill it is estimated 77% to 85% of the run passes the dam via the spillway. Under this same spill operation, an additional 6% to 11% of the run passes via the sluiceway. Since 1996, survival tests have been conducted at The Dalles Dam. Early tests suggested that spillway survival was lower than expected, and later tests determined that the percentage of spill affects survival, with 30% spill resulting in a higher survival rate than 64% spill. As a result of these findings, regional salmon managers have temporarily reduced the percentage of forced spill at The Dalles from 64% to 40%, during the juvenile passage season. Spillway survival, while improved at 30-40% compared to 64%, is still unacceptably low for a primary passage route, however. In addition to spillway survival, turbine and sluiceway survival has been tested. Turbine survival rates were much lower than expected, based on estimates from other dams. Sluiceway survival rates varied by year and season, with an average of approximately 95%. A previous evaluations attempted to measure survival improvements under various spill conditions. These tests did not enable us to identify mechanisms for observed mortality (e.g. predation, shear forces or mechanical injury). The next step is to determine whether survival rates at The Dalles Dam can be improved through spillway, sluiceway and turbine unit modifications. The scope of survival studies has shifted from developing point survival estimates under various operating conditions, to identifying mechanisms for mortality, with primary focus on the spillway. This information will be used to guide spillway and sluiceway modifications and turbine rehab decisions. The survival study program is currently estimated to be complete in 2007, however is heavily dependent on the annual test results. FY 02 field tests will primarily utilize radio telemetry to collect fish behavioral data. Numerical modeling (Computational Fluid Dynamics, or CFD) and hydraulic model study data will also be collected and correlated with the field data. Measurement of pressures and shear forces at points in the spillway stilling basin is also planned, to determine if direct impact mortality may be occurring.

520 Turbine passage studies (CORPS)

Purpose/Objective: The Turbine Passage Survival Program (TSP) was developed to investigate means to improve the survival of juvenile salmon as they pass through Kaplan turbines located at Columbia and Snake River dams. The TSP is a joint Portland/Walla Walla District study. It is composed of two phases of study. The Phase I - TSP was initiated with little detailed information on existing operation of the Kaplan turbines and fish survival on the Columbia and Snake River system. The objectives during this phase include: (a) gaining a better understanding of the turbine environment, (b) optimizing operation of the turbine for better fish passage, (c) identifying the most promising turbine modifications for improved fish passage, and (d) defining the best strategy for incorporating these improvement into rehabilitation programs. Phase II – The TSP will take the information gathered in phase I and develop a plan for implementing design modifications into scheduled turbine rehabilitations. In addition, developmental and design work will be performed resulting in a prototype turbine to be tested at one of the main stem Columbia or Snake River dams. Additional testing on draft tube effects and tailrace egress will also be implemented to evaluate these portions of turbine passage. In 1994, the COE completed the System Configuration Study (SCS) to investigate various improvements to the Columbia and Snake River hydrosystems. The two major items corresponding to turbine passage survival resulting from the SCS were the Turbine Passage Survival Workshop and the Turbine Basecase Report. A draft of the Phase I report will be completed in September 2002 summarizing all work to date on the TSP. The report will also identify a detailed study plan for future Phase II work, to begin in FY03. Major Activities/Tasks.

521 Adult migration studies (CORPS)

Purpose/Objective - Adult salmon and steelhead migrating to their natal streams in the Columbia River Basin must pass up to eight or nine Columbia and Snake river dams. In some years, research has indicated mortality and unaccounted for losses potentially associated with the FCRPS. Mortality and reduction in reproductive success due to conditions caused by the FCRPS must be minimized in order to maintain and recover native runs of fish in the basin. The goal is to maximize reproductive success by minimizing direct and indirect migrational problems. Funding is through the FCRMP. Since 1990, the Corps and Bonneville Power Administration have funded research on the upstream migration of adult salmon, steelhead and in 1995 Pacific lamprey through the FCRPS and into tributaries. Fish were tagged with radio-transmitters and tracked past dams and through reservoirs from 1991-1994 in the Snake River and 1996 – 1998 in both the Snake and Columbia rivers. Results of the Snake River study reported migration characteristics, fishway passage parameters, and project operations effect on passage behavior (Bjornn, et al., 1998). Reports on general migration, fallback during spill, the effects of dam operation, the effect of a shad fishery on passage, and other specific objectives have been completed and are available at <http://www.ets.uidaho.edu/coop/download.htm>. Analysis and reporting for other objectives addressed in 1996-2001 are ongoing. In FY00, radio telemetry studies were added to: assess the effects of additional spill for juveniles on adult migrant fallback rates; evaluate transition pool modifications to reduce migration delay; evaluate fallback and delay in juvenile bypass systems; and assess temperature and gas exposure history for adult migrants. In addition, two studies to assess the delayed effects of dam passage on the survival and reproductive success of adult chinook salmon were initiated in 2000. One study used physiological telemetry to estimate the energetic cost of dam passage and the other to develop non-lethal lipid estimation techniques. A bioenergetic model will be developed and used to estimate the effect of energy expenditure on reproductive success. Activities for FY02 will include continuation of some of the radiotelemetry objectives: interdam loss, fallback through spill, turbines, and juvenile bypasses, temperature and gas exposure, and transition pool modifications among other studies. A second year of energy expenditure data will be measured as fish migrate through the dam and reservoir. These values will be used along with energy budget data to assess the long-term implications of events such as fallback and delay on survival and reproductive success. Depending on results of non-lethal lipid estimation pilot work from FY00, a field study to estimate the amount of energy reserves consumed on a system-wide basis by adult chinook salmon may be initiated. A new study that evaluates cranial lesions (commonly referred to as 'head burn') on salmon and steelhead will be initiated in FY02 as well. Continuing and potential adult radiotelemetry work in upcoming years include studies of migration delay; temperature effects; exposure to gas supersaturated water; inter-dam loss; fallback; straying; and delayed effects of dam passage on survival and reproductive fitness.

522 Adult PIT tag program (Bonn, The dalles, John Day) (CORPS)

Purpose/Objective: The goal of the program is to develop, install and evaluate adult Passive Integrated Transponder (PIT) tag interrogation systems in adult fishways (fish ladders) throughout the Federal Columbia River Power System (FCRPS). Most Corps operated hydroelectric facilities have the ability to detect juvenile salmonids that have been tagged with PIT tags as they pass through bypass systems. Detection of returning adults is needed to determine the effectiveness of juvenile survival measures. Adult PIT tag interrogation systems have been installed in all four of the adult fish ladders at the Bonneville project for use beginning in 2002. Also, the two fish ladders and one of the count stations at McNary project have been equipped. Significant problems with shields leaking and fall chinook using the overflow weirs has caused the implementation team to re-evaluate future deployments. A prototype system, previously tested in the lab, was installed in the Washington Shore ladder at Bonneville for evaluation in 2001.

523 Bonneville 1st PH FGE (CORPS)

Purpose/Objective The purpose of this measure is to evaluate potential actions to improve fish guidance efficiency (FGE) of the screened bypass system at the First Powerhouse. The main focus of the evaluation is extended length bar screens (ESBS), streamlined trashracks, modifications to the vertical barrier screens (VBS), and adding a turning vane to increase flow up the gate slot. Prototype structures were evaluated in 1998 and 2000. In addition, biological studies focused on fish behavior in front of the trashracks to evaluate whether or not prototype evaluations or relocated trashracks might have merit into increase guidance. Due to operational concerns and current biological criteria, the VBS porosity plates will be redesigned. Modeling and design work will have to be done. If prototype VBS can be procured and installed in time, we will proceed with survival testing in spring of FY03. If results of the survival testing look promising, a letter report for full powerhouse installation will be prepared. Preparation of plans and specifications, construction of permanent structures would follow as soon as funding is made available. Handling requirements for the ESBS are already covered through separate funding of a new intake crane. Two years of post-construction evaluation & monitoring is included.

524 Bonneville 1st PH Surface Bypass (CORPS)

Purpose/Objective The purpose of the measure is to evaluate the potential success for surface collector bypass technology to effectively pass fish at the First Powerhouse, and compare this system with an extended length screen bypass system. The measure includes all engineering, hydraulic, and biological studies required to evaluate surface bypass technology. The measure also includes the cost to construct prototype structures for biological field evaluations. The focus has been on a deep slot collector across the face of the powerhouse. A four-unit deep slot prototype (PSC) was constructed in front of units 3-6 in 1998 without a collection channel. Bypassed juveniles were able to pass through the back of the collector into either the existing screen bypass system or into the turbines. Due to some concerns over fish behavior in front of units 3 and 4, additional prototype structures were installed in front of units 1 and 2 for testing in 2000. If additional studies are conducted, we will evaluate and determine the slot width and system performance with a ramp into a collection channel.

525 Bonneville 1st PH JBS improvements (CORPS)

Purpose/Objective The purpose of the JBS improvements is to modify flow conditions in the collection channel, construct a dewatering facility that meets current criteria for flow through the screens, relocate the outfall to the recently completed structure on the Washington shore, and add juvenile monitoring capability inside the building housing the 2nd powerhouse facility near the outfall. Description P&S will be finalized in FY03 if funding becomes available (w/regional prioritization). A decision between implementing JBS improvements and potentially extended length screens, versus continued evaluation of surface bypass technology is scheduled to occur no later than January 2002. If implemented, additional orifices would be added in the powerhouse, which coupled with collection channel modifications, will decrease holding and injury in the bypass system. A new dewatering facility would be constructed outside the powerhouse, with an elevated flume bridging across the river to tie into a previously placed buried flume on the Washington shore. Adding monitoring capability for B1 would be performed by separate contract. Due to the impacts on the collection channel modifications, the existing ice and trash sluiceway will no longer provide debris/sluicing capability. Therefore, we would also construct and install a trash boom in the forebay. Potential extended length screen implementation is covered in the 1st Powerhouse FGE improvements measure. Studies for post-construction monitoring are included.

526 Bonneville 2nd PH JBS improvements (CORPS)

Purpose/Objective The purpose of the JBS improvements is to modify flow conditions in the collection channel, construct a dewatering system that meets current criteria for flow through the screens, relocate the outfall to a location approximately two miles downstream of the powerhouse to minimize predation, and provide a juvenile fish monitoring facility. The collection channel improvements and outfall relocation were completed in 1999, with the monitoring facility completed in 2000. Minor modifications to the system are required to ensure effective passage and will be completed through follow-on contracts. Follow-on work consists of improvements in the secondary dewatering system at the monitoring facility, modifications to the switchgate to ensure fry are not injured or killed, addition of a new PIT-tag detector, raising the grating in the collection channel, and other modifications. Post-construction monitoring of the system after 2000 is included in the juvenile fish passages studies measure, so no additional AFEP studies are included in this measure. In addition, surveys of the flume taken prior to the 2002 fish passage season showed localized areas where the flume had deformed. There is no immediate concern that the pipe will buckle. A hydraulic analysis of the flume, biological evaluation of fish timing through the flume, and evaluation of potential repair actions (if determined necessary) are being conducted in 2002. Additional surveys are planned for December 2002 for a final decision on flume repairs. The FY 2003 cost estimate is a placeholder for surveys and engineering analysis, and will be updated after development of potential repair scenarios.

527 The Dalles spillway survival improvement s (CORPS)

Purpose/Objective: The objectives of the Spillway Survival Improvement Study (SIS) at The Dalles are to assess possible modifications to the spillway and/or stilling basin that would be expected to improve survival and/or reduce Total Dissolved Gas (TDG) downstream of the spillway. Juvenile survival over the spillway at The Dalles is relatively poor, compared to other projects. Possible physical modifications currently being considered include spillway deflectors, removal or modification of stilling basin baffle blocks, sloping the stilling basin end sill wall and constructing training walls into the spillway. Physical and numerical models will be used extensively to analyze alternative improvements, prior to possible prototype testing. The FY02 focus is primarily on development of a feasibility level report, which will identify alternatives and recommend improvements for further study and development. A detailed design report, prototype testing (if required), plans and specifications and construction would then follow. Initial biological studies are being directed toward understanding the mechanisms of juvenile mortality in the stilling basin, primarily direct versus indirect mortality. Recent model studies of the spillway indicate a spillway guide-wall, extending from the spillway structure to the concrete end sill in the spillway stilling basin, may effectively block lateral flow that occurs along the base of the spillway, which is a result of the adopted juvenile spill pattern. The lateral flow may cause juveniles to be retained longer in the concrete portion of the stilling basin and may contribute significantly to spillway juvenile mortality. A prototype spillway guide wall (Spillwall) has been proposed to block the lateral flow, with testing as early as FY03, pending verification of ongoing model studies and biological field testing. The schedule below assumes a prototype Spillwall will be constructed and tested in FY03. Additional prototype tests of various possible modifications or alternatives are also assumed to be required in FY03 and FY04. Several variables and assumptions for future operation of the spillway will affect the outcome of this study, including the following: Spill pattern Spill volume Stilling basin energy dissipation requirements (modify or remove baffle blocks?). TDG reduction requirements below The Dalles.

529 The Dalles adult entrance channel dewatering mods (CORPS)

Purpose/Objective: The purpose of this item is to provide a dewatering system for the lower portions of the fishladder entrances and transportation conduit at the south shore fish ladders at The Dalles dam to allow inspection and maintenance to be performed under dewatered conditions. Previous attempts to dewater the system were unsuccessful, primarily due to high leakage through numerous stoplogs that are intended to seal the system. Discovery of damaged underwater screens within the adult entrance conduit at The Dalles reinforced the need for improvements, which would allow safe inspection and maintenance of the adult passage system. Plans and specifications for construction have been completed and the contract advertised. Under the contract, most stoplogs would be re-sealed with an improved seal design, several new stoplogs would be installed, and additional pumping capacity would be provided for dewatering the adult transportation system.

530 The Dalles surface bypass (CORPS)

Purpose/Objective: The long-term purpose of this measure is to investigate and evaluate surface bypass technology at The Dalles project. The program includes collection of biological behavior field data, hydraulic model testing of various surface bypass alternatives and development and testing of prototype surface collectors. Installation of a screened bypass system is currently shelved, pending the outcome of the surface bypass studies. The policy to utilize the spillway at The Dalles as the primary method to bypass juvenile fish in recent years has resulted in reduced emphasis and deferral of development of a powerhouse surface collector prototype. However, significant numbers of juveniles pass the project via the ice and trash sluiceway, which functions as a relatively small-scale (about 4500 cfs), yet relatively efficient, surface bypass system. "J" shaped Surface Guidance Improvement Devices (SGID's) were initially tested in Spring and Summer, 2001 in front of the Fish Water Units and Main Units 1-5 and are intended to reduce turbine entrainment of juvenile fish by diverting them to either the sluiceway or spillway passage routes. Due to the unusually low river flow, coupled with mechanical problems experienced with the prototype J-Frames, the FY01 test is considered inadequate and inconclusive. Additional tests of the J-Frames will be completed Apr-Jul, 2002, with verification tests currently planned in FY03. Assuming the SGID's prove successful, permanent installation of the prototype design would not be acceptable for operational purposes; therefore, a Detailed Design Report (DDR) is essentially completed which includes a feasible permanent design, cost estimate and recommended schedule for installation. The DDR is scheduled final printing in May, 2002. Development of Plans & Specifications for construction have been initiated, however decision to advertise for the procurement and installation of the system components will depend on FY02 and likely FY03 test results. Should the SGID's not prove successful, decision will need to be made regarding further development of a powerhouse surface guidance system, or reconsideration of an extended length screened bypass system.

531 Improve spawning conditions for chum salmon in the vicinity of Pierce/Ives Islands. (CORPS)

Chum Spawning in the area of Pierce/Ives Islands (Action Item 156) – Chum spawning in the area of Pierce/Ives Island is affected by mainstem river flows. This effort is directed at identifying non-flow modifications that will improve spawning potential for chum.

532 Operation and Maintenance of Bonneville Lock and Dam Fish Passage Facilities (CORPS)

Operation of Fish Passage Facilities. Funding for operating and managing fish passage facilities. This includes daily inspection and operation of facilities, minor facility maintenance and fish screen inspections (cleaning staff gages, adjusting or calibrating fishway control equipment etc.), project biologist costs, fish counting costs, and District Office costs for managing the fish passage program, including ESA consultation. Maintenance of Fish Passage Facilities. Funding for major maintenance of all fish passage facilities including annual maintenance of fish screens, juvenile bypass systems, adult fish ladders, powerhouse collection systems, and adult fish pumps. These funds cover labor for maintenance staff and parts and materials.

533 Brownsmead, Clatsop County OR, Section 1135 (CORPS)

Purpose: The proposed action would restore connectivity between the Columbia River and the Blind-Saspal-Grizzly Slough system. Restoration actions at the inlet and the outlets would aid juvenile salmonid ingress and egress to the slough system. An estimated 9.2 miles juvenile salmonid rearing habitat would be restored via flow improvements to the inlet and outlet structures plus internal features of the slough system. Description: The Brownsmead area is located approximately 17 miles east of Astoria, Oregon. Brownsmead abuts Prairie Channel, a major side channel of the Columbia River, between Columbia River Miles 28.2 and 30.7. Pasturelands are the dominant habitat feature of the area. The former sloughs remain and serve as major conduits for water drained via ditches from the land converted for agriculture and/or from the small streams flowing into the area from adjacent hills. Levees and tidegates prevent tidal influence and serve to drain the enclosed lands. Riparian forest is limited typically to the borders of sloughs and/or drainage channels. Wet, marshy conditions persist in the lower elevation sites in the Brownsmead area. The proposed action would restore fisheries access to the complex of sloughs, primarily for juvenile salmonids, via installation of a larger inlet system, water transfer to adjacent sloughs and the addition of more tidegates with lightweight aluminum doors. Improvements in water quality, flow, and circulation would improve habitat conditions for juvenile salmonids that enter the slough system. Acreage of slough habitat usable by juvenile salmonids would increase significantly with the proposed improvements. Implementation of the proposed measures would beneficially impact approximately 4.93 miles of slough channel in Blind Slough, 2.81 miles of channel in Saspal Slough and 1.47 miles of Grizzly Slough (Brownsmead Dike Road to railroad). The area was historically a complex of tidal sloughs and intertidal marsh/spruce swamp habitat. The sloughs of Brownsmead would have been dominated by resident fish species such as Coastal cutthroat trout and white sturgeon, plus juvenile salmonids passing through the area during emigration. Some salmonid species, such as juvenile fall chinook and Coastal searun cutthroat trout, would have reared in the tidal slough system for up to a year. Enclosure of the system of tidal channels and intertidal marsh habitat, plus the introduction of exotic fishes, has changed the species composition of the area. Common carp and various sunfish (largemouth bass, crappie spp., etc.) are the prevalent species in the enclosed system now. Major features of Proposed Project: Project benefits for anadromous fish in Clatsop Diking Improvement Company No. 7 would be achieved by: - Addition of a larger or second water intake structure at Aldrich Point, the upstream most portion of Clatsop Diking Improvement Company No. 7, to increase water flows and fisheries access to the slough system internal to the dikes plus channel improvements at the culvert outlet to Blind Slough; Enlarging the culvert(s) under the Astoria Railroad Line to increase flow transfer in Blind Slough; Excavation of a water supply channel and/or emplacement of water supply pipeline from Blind Slough through lands of the Long Island Dairy to provide increased flows to Saspal Slough; Enlarging the culvert(s) under Gertula Lane to increase flow transfer through Saspal Slough; Enlarging the culvert(s) under Leino Lane to increase flow transfer through Saspal Slough; and Installation of culverts with fish friendly tidegates in the Saspal Slough plug to allow for water export and fisheries ingress and egress; Project benefits for anadromous fish in Clatsop Diking Improvement Company No. 1 would be achieved by: Emplacement of a culvert(s) with water control structure under Brownsmead Dike Road and excavation of a water supply channel to provide flows from Saspal Slough to Grizzly Slough; Excavation of a water supply channel to connect segments of Grizzly Slough bisected by Barendse Road; and Replacement of tidegate culverts under Pentilla Lane to ensure adequate discharge for increased flows. RPA 160 calls for the Corps and BPA, working with the Lower Columbia River Estuary Partnership, to develop and implement an estuary restoration plan.

534 Estuary Restoration 536 Program (CORPS)

Purpose: Congress provided a new authority to the Corps, called Section 536, in the Water Resources Development Act of 2000. The primary purpose of the proposed actions in this plan under Section 536 is to protect, monitor and restore fish and wildlife habitat based on recommendations made by the Lower Columbia River Estuary Program (LCREP). Working with LCREP, the Corps and BPA have identified and prioritized 14 potential projects for construction. Assuming Congress appropriates requested \$2 million funding under the Corps Section 536 authority, several of these projects would begin construction in 2003. The most likely projects are listed below. The implementation of Section 536 will serve as the catalyst to bring together and implement current efforts by a number of governmental and private organizations to identify and cost share restoration projects in the estuary. These organizations include the Lower Columbia River Estuary Partnership, six state agencies from Oregon and Washington, four Federal agencies, recreation, ports, industry, agriculture, labor, commercial fishing, environmental interests as well as private citizens. The Corps has a separate Columbia River Basin General Investigation Reconnaissance Study also underway. Work under Section 536 will be coordinated with that study. Description of projects: 1. West Sand Island North of the Columbia River Navigation Channel between river miles 3 and 4, 6-10 acres. Expand the marsh area by excavating the gorse-covered dune to elevations that mimic the adjacent high intertidal salt marsh habitat. The export of salt marsh vegetation would add detritus to the system and thus provide benefits to the overall ecosystem. Time to completion: 8 months. Estimated Cost: ~\$600,000 Federal; \$150,000 non-Federal. 2. Skipanon Slough: Skipanon River and adjacent sloughs and intertidal areas within the City of Warrenton, Oregon at river mile 11. The proposed project would restore approximately 30 acres of aquatic, riparian and floodplain habitat along the lower Skipanon River. Two sloughs that were formerly connected to the river will be reconnected to allow tidal exchange and fish passage. Reconnection of tidal influences will allow the river and sloughs to naturally meander and form marsh and tidal channel habitats.. Time Frame: Project ready to go once funding secured, six months to complete. Estimated Cost: \$150,000-300,000. Project Partners: Corps of Engineers; possibly Skipanon Watershed Council, CREST, Port of Astoria. 3. Brownsmead: approximately 3 miles northeast of Knappa, Oregon and 17 miles east of Astoria, river mile 30. Tidal flow would be restored to about 9.2 miles of sloughs. The proposed project would include installation of a larger intake pipe at Aldrich Point to increase flows in the system, removal of restrictive culverts, reconnecting some channels and installation of tide gates to allow for drainage of the increased flows. Time Frame:13 months. Estimated Cost: ~\$500,000 Federal; ~\$170,000 non-Federal Corps, Clatsop Diking Improvement Company #7, CREST. 4. Rooster Rock Wetlands, approximately 10 miles east of Troutdale, 200 acres: Improve hydrology to enhance and restore habitats. Improved flows will enhance return of native vegetation and improve habitat values for a variety of species and provide improved access for migratory salmonids. Oregon State Parks has strong interest in developing a restoration and enhancement project. Potential partners are being identified. Time Frame: Need to do initial survey and develop plans. Estimated Cost: \$100,000 to \$250,000. 5. Southwest Washington Streams: 2 miles upstream of Chinook, Washington on the Columbia River shoreline. The Astoria Bridge bisects the project. Replacement of 9 culverts, restoration of passage, spawning and migration, between the Columbia River and the affected streams will primarily benefit coho and chum salmon, winter steelhead and coastal cutthroat Time Frame: 18 months Estimated Cost: \$4M Federal, \$1M non-Federal.

536 Estuary General Investigation Study (CORPS)

Purpose: investigate and recommend appropriate solutions to accomplish ecosystem restoration in the lower Columbia River and estuary, including wetland/riparian habitat restoration, stream and fisheries improvement, water quality and water-related infrastructure improvements. Description: Over time, the Columbia River Basin and estuary have experienced considerable changes in water resource needs and uses. In addition, significant environmental degradation has occurred within the lower Columbia system. Modification of the system by human activities has led to a marked change in the hydrologic regime, and caused pollution and substantial losses of instream, riparian and wetland habitats, and a concomitant reduction in fish and wildlife resources. Twelve salmon and steelhead species listed under the Endangered Species Act make use of the Columbia River estuary. ESA listings have broad implications to existing water resource uses, and future developments. Historic losses of 52,000 acres of wetland/marsh habitats, 13,800 acres of riparian forest habitat, and 27,000 acres of forested wetland habitat downstream of Portland have significantly impacted this ecosystem's ability to produce and sustain fish and wildlife resources. Much of this wetland loss can be attributed to the 84,000 acres encompassed by diking districts and the 20,000-acre increase in urban development that has occurred along the lower Columbia River. Other: The states of Oregon and Washington have agreed to jointly sponsor the study and have written a letter of intent dated May 1998. Both states understand the cost sharing provisions associated with the feasibility phase of the study. Milestones, Cost Estimate: see above. RPA 158, 159 call for inventory and plan for Columbia River estuary habitat restoration.

537 Estuary Mapping (CORPS)

Purpose: To develop highly detailed habitat information for the lower Columbia River and estuary which will provide baseline data for implementing a systematic, effective, and scientifically grounded habitat protection and restoration program aimed at restoring a continuum of habitats throughout the lower Columbia River. Description: The project has 4 objectives: 1. use newly classified habitat data derived from recent satellite (Landsat7TM) imagery, to develop a set of GIS queries that will assist in the identification of areas within the Lower Columbia River where detailed habitat assessments using high resolution hyperspectral imagery should occur. 2. evaluate the quality and prioritize recently acquired hyperspectral imagery aerial flightlines for processing and analysis based on stakeholder input. 3. Geometrically correct and classify high resolution hyperspectral imagery to produce a set of GIS data layers depicting important estuarine habitats. Habitat cover classes will be selected to facilitate comparison with previous habitat mapping projects and the needs of current projects, especially those habitats and habitat attributes critical for salmonids and other native species. 4. Utilize the datasets to provide both the baseline data and detailed habitat assessments necessary for implementing an effective habitat protection and restoration program and which supports a routine habitat monitoring program. Cost Estimate: Total study cost is \$300,000, approximately half in FY 2002; half in FY2003. This is cost-shared 50/50 by Corps of Engineers and Sponsor. Relation to other efforts: [language taken from PAS agreement] The project is a critical element in the effort to restore salmon runs in the Columbia River through habitat projection and restoration. The project focuses on the mainstem of the lower Columbia River. As such, it complements both the Oregon Plan and the Washington Salmon Recovery Planning efforts, both of which focus primarily on salmon restoration in the tributaries to the Columbia. In addition, it will complement the work of watershed councils in the tributaries on the Oregon side of the river and WIRAs on the Washington side of the river, providing that connection between the tributaries and the mainstem. The project is also an integral part of the salmon recovery plan of the Lower Columbia River Fish Recovery Board with a key section of that plan focusing on the mainstem and estuary. The project will also aid the research efforts underway by NMFS to identify historic and present juvenile salmonid habitat use patterns in the estuary. User groups such as Sea Resources, the Columbia Land Trust, CREST and others will use this data to help develop restoration projects. Finally it will provide all interested parties vital linkages in filling the information gaps that currently exist. RPA Action: 158 calls for the Corps and BPA, to (among other tasks) develop a plan to rapidly inventory estuarine habitat. 160 calls on the Corps and BPA to develop and implement a program to protect and enhance tidal wetlands and other key estuary habitats.

539 Research: Columbia River Estuary (CORPS)

Purpose: Much is unknown about salmonid use of the estuary. The Corps and BPA are working with NMFS to identify and accomplish needed research in the estuary. Planning is done with NMFS Science Center and projects are coordinated through the Corps AFEP process, LCREP and through the NWPPC Provincial Review and Subbasin Planning processes. Individual research projects are identified separately in the database. Description: Research will continue in the estuary in 2003-2007, guided by the NMFS Science Center and by regional review processes including the Corps Anadromous Fish Evaluation Program and the Council's Provincial Review and Subbasin Planning. The Corps funds its portion of the estuary research through the Columbia River Fish Mitigation (CRFM) project. BPA also funds a portion of the estuary research called for in the estuary RPA actions. Estuary research plans are covered under the Research, Monitoring and Evaluation (RM&E) section of this document. SEE ALSO: work plans for individual research items. [List project titles for these.] RPA 158 calls for action plan to identify limiting biological and physical factors and identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors. RPA 161 calls for monitoring and research program acceptable to NMFS and closely coordinated with the LCREP monitoring and research efforts to address the estuary objectives of the biological opinion.

540 Evaluate Flood Control Operations to Reduce River Ecosystem Effects (CORPS)

USACE will conduct a systemwide flood control study. No work is scheduled in 2002 pending appropriation of funds

541 Evaluation of Transportation Strategies (CORPS)

Purpose/Objective - Partitioning of mortality throughout the life cycle of salmon and steelhead, and attributing these losses to a specific (dependent) route of passage through the hydrosystem or to a random or an action independent of the hydrosystem is one of the biggest unknowns that have been identified by the analysis of anadromous fish data under the Lower Snake River Feasibility Study. Understanding when, where, and why losses occur will drive the future operation and mitigation actions on the hydrosystem. Information on survival rates of salmon through the hydrosystem is, in general, well known and continues to be evaluated for incremental improvements. However, further downstream and into the oceanic environment delayed mortality or losses are unknown as well as the effects of passage through various routes on these losses. Partitioning losses through these environments will allow for specific transportation strategies to be developed to increased survival. Survival downstream of the hydrosystem and through the estuary for in-river migrants and transported fish has been studied for spring/summer chinook. Results from these evaluations, although preliminary, suggest that there are several factors contributing to losses in the estuarine environment. These relate to exposure to avian and piscivorous predators, be it through poor barge release locations, and timing to the tidal cycle, flows or season of arrival to the estuary. Understanding of the estuarine loss help guide future barging strategies that may increase survival through this area. Avian predation continues to be a problem in the estuary. About 30% of the juvenile smolts are estimated to be taken by terns colonizing the dredge spoil islands. This predation rate coupled with new information on estuary migration behavior (i.e., passage routes through shallow grass flats, and holding in the fresh water lens, and ocean entry tied to tidal timing) that suggests increased smolt exposure to predation, suggests that mortality through the estuary may be reduced by providing transportation through this environment. Survival of transported fish from the comparative survival study from Lower Granite show a dramatic increase in the rate of adult returns of fish transported later in the season (~mid May) to those transported earlier. The factors contributing to this difference are unknown but understanding the factors (cyclic patterns of oceanic predators versus estuarine losses), contributing to the early season losses may have potential to reduce post-release losses. Past research on transportation has focused on juvenile salmon that migrate primarily during the spring and summer, and little to no work has been done to evaluate the effectiveness of transporting late migrants. Late migrants are predominantly fall chinook salmon, with a portion of these ESA-listed Snake River fall chinook. The median date of passage of naturally spawned PIT-tagged Snake River fall chinook salmon past McNary Dam ranges from early to mid August, meaning that half of these fish migrate in late August and into the fall given the protracted smolt outmigration. Beginning in 1992, smolt monitoring and transportation at McNary Dam was extended from October through December, and continues annually. Monthly smolt collections have ranged from a low of 1,838 in October 1998 to a high of 36,520 in November 1997. Of interest is whether these late migrating fish produce any adults at all, and whether the cost of late-season transportation is justified given its unknown benefit. The purported benefits of transportation for fall chinook salmon, such as reduced predation and less exposure to high water temperatures may not be realized during the fall. Conversely, few operational changes are made to improve in-river conditions for migrants in the fall. It is unknown whether transportation is better than in-river migration during the fall.

Description – Evaluations on the benefits of experimental strategies from Lower Granite for spring/summer chinook and steelhead (and ultimately fall chinook pending information from the comparative evaluation of transportation to inriver survival) for absolute and comparative return rates of smolts transported to smolts that complete their outmigration within the river. Following the recommended changes from the McNary transportation evaluation experimental strategies will be evaluated for spring chinook at McNary. In addition, the effectiveness of late-season transportation from McNary and Lower Monumental Dams will be incorporated in the fall chinook transportation studies. Evaluation of transport requires not only marking of juvenile salmon and the monitoring of returns as adults, but also the physiological assessment of changes in fish condition prior to transport, during and following transport; details on migration behavior following release from the barges; downstream timing, survival data, ocean timing and avian predation monitoring in and downstream of the hydrosystem; and the addition of sample groups in the delayed mortality rearing study. Major Activities/Tasks – a) Evaluate post-release survival, behavior, migration characteristics and habitat use of juvenile salmon through the estuary, plume and near shore environment. Methodology: radio telemetry, sonic telemetry – using buoyed receiver arrays and series of bottom receivers. (Fall chinook and steelhead 2000-2003). Identify potential trouble areas (delays and losses) and correlate to route of passage, stocks, seasons, and species. Determine differences in delayed mortality caused by difference in post-release behavior and habitat use in the estuary and plume. Determine seasonal differences in post-release mortality (species and stocks. b) Evaluate barging strategies to reduce mortality. (Pending the result of the steelhead and fall chinook post-release objectives). Determine adult returns of smolts transported and released downstream of Astoria Bridge near the saltwater interface. Evaluate post-release migration behavior, ocean entry timing and timing to the tidal cycle. Monitor with the PIT tag trawler, radio telemetry and sonic telemetry. Develop and compare transportation strategies to increase early season survival. Evaluate fish condition (including stress levels, health, smoltification, energy reserves and changes in nutritional status, including the concentration of macroelements that control osmoregulation), correlate to delayed mortality. Evaluate the effectiveness of late-season transportation at McNary and Lower Monumental Dams. c) Collect adult return information from marked fish from the Pacific States Marine Fisheries. Mark and transport adequate numbers of chinook salmon from October through December at McNary Dam and Lower Monumental to determine adult return contribution. Commission's databases, and determine adult contribution and its relation to time of release. Evaluate fish condition (including stress levels, health, smoltification, energy reserves and changes in nutritional status, including the concentration of macroelements that control osmoregulation), correlate to seasonal changes.

542 Juvenile Salmon Temperature Studies (CORPS)

Purpose/Objective - Hydro management has changed thermal regimes in the Columbia River basin from that historically encountered under free-flowing conditions. For example, Snake River fall chinook outmigrate later in the summer when flows are low and water temperatures approach the lethal maximum. Since temperature drives many biological processes in fish, smolt physiology and performance may be compromised by chronic exposures to thermal stress. Disease susceptibility also increases with temperature. As a result, indirect temperature effects may cause substantial extra and delayed mortality to smolts passing through the juvenile bypass and collection facilities. Mortality may also increase with the added stress of transport or by having migration-prolonged in-river when conditions are poor. Evaluating the thermal effects on both migratory scenarios will provide information to improve the survival of juvenile chinook salmon by identifying physiological indicators of acute and chronic thermal stress. Cold-water releases from Dworshak Reservoir cause a decrease in the mid-level water temperature in Lower Granite Reservoir of 3-5°C (Karr et al. 1998), which may be slowing the rate of feeding and growth of predators in the reservoir. Changing the temperature from 20.3°C to 15.0°C, as was observed in Lower Granite during a 24-d period in 1994 (Karr et al. 1998), and reduced the expected rate of predation by smallmouth bass on salmonids from 1 g/d to 0.5 g/d, respectively, based on bio-energetic modeling. Currently the only mainstem temperature information that is available in near real time is scroll case readings and measurements taken from water quality instruments used to determine dissolved gas levels. The scroll case readings are only taken once a day and can vary depending on data collection methods. The water quality instruments in the forebay are placed 15 ft deep directly in the middle of the dam or in the tailrace usually near the shore at 15 ft deep. Large temperature differences between these locations and other measurement sites have been noted from past studies (Karr et al. 98). Descriptions - Water temperature plays a crucial role in the management of Dworshak and Brownlee reservoirs for flow augmentation. Furthermore, temperature profile data could be correlated with adult radio telemetry studies that track both the locations of the adults as well as the depth at which they migrate. Adult tracking studies are currently ongoing for the 2000 migration season. This information would be valuable to determine potential trends in adult movements related to cool water flow augmentation. Similarly, sonic tag information will be available for juvenile migrants in the forebay from the 2000 spring evaluation in the end of year reports. A pilot study for sonic tags was conducted in 2000 at Lower Granite Dam forebay in conjunction with the surface bypass evaluation. The final report is scheduled for release during the last quarter of FY01. 2. Major Activities/Tasks - a) Evaluate and monitor the implementation of summer flow augmentation to optimize juvenile fall chinook salmon passage and survival through the Lower Granite reservoir. b) Review existing data for salmonid distribution behavior in Lower Granite and other reservoirs, especially with respect to temperature preferences. c) Monitor nearshore temperatures in Lower Granite Reservoir where predator-prey encounters likely occur. d) Monitor temperature and depth occupied by predators in Lower Granite Reservoir during June-August, especially before, during, and after release of water from Dworshak Res. e) Develop a spatially-explicit predator-prey model to quantify salmonid losses under different management scenarios. f) Identify physiological indicators of acute and chronic thermal stress. g) Identify performance-related changes of juvenile fall chinook salmon exposed to long-term sub-lethal temperatures and correlate to thermal exposure during dam passage. h) Compare the physiological indicators of thermal stress and performance of in-river migrants and fall chinook salmon in the transportation system. (2002-2002) (McNary 2002, LGR 2003 and John Day 2004) i) Estimate mortality of juvenile fall chinook resulting from the current range of temperature during in-river migration, bypass and transportation.

544 Juvenile salmon transportation evaluations (CORPS)

Purpose/Objective - Significant controversy surrounds the multi-year data sets of juvenile salmonid transport research. Although the majority of tests with spring chinook salmon, steelhead and fall chinook salmon show at least a measurable, if not significantly better return of transported to "control" fish, some entities question the validity of the data set due to concerns such as handling and marking effects on the treatment groups. To re-evaluate the question of transport benefit relative to immigrant survival, from Lower Granite, efforts have been made to redesign the experiment to answer critical questions relating to transport benefits (increasing the wild fish for the non-PIT tag detected group while reducing the numbers of wild fish to be marked. This study was designed to compare the benefits of transportation to maximized in-river passage using the best operation conditions that were designated for in-river passage conditions each year. Currently four years of releases have been completed (1995, 1996, 1998 and 1999 releases) from Lower Granite with chinook and (1999) steelhead under the original study design. The new study design was used in the releases for 2000 (wild spring summer chinook and steelhead), however fall chinook has not yet been incorporated into the study. Preliminary information from returns indicate that different barging strategies may offer additional increased survival, information from additional years of returns are needed to support future changes to the current operation. Evaluations on the benefits of transportation from McNary for spring/summer chinook, fall chinook, and steelhead will also be conducted to determine the absolute and comparative return rates of smolts transported to smolts that complete their outmigration within the river under various river, weather conditions. Description - This work focuses on determine the absolute and comparative adult return rates of smolts transported from Lower Granite and McNary to smolts that complete their outmigration within the river. The information from these evaluations will provide data the helps to narrow the range of variability of delayed mortality for transported fish. In management terms these study provide the foundations for refining the transportation program to provide the best strategies for transportation under a variety of seasonal and environmental conditions. 2. Major Activities/Tasks - a) Determine absolute return rates and comparison ratios of outmigration survival and return rates for transported and in-river migrating spring summer and fall chinook and steelhead smolts. (stock specific). Mark juvenile wild spring chinook and steelhead at Lower Granite (2000 - 2002) and fall chinook at hatcheries with PIT tags. (2001-2006). Mark juvenile chinook (fall and spring/summer) and steelhead at McNary with PIT tags (multi-year evaluation). Again, when possible correlate to specific stocks. (2001-2004) b) Evaluate fish condition (including stress levels, health, and smoltification) in each marking year throughout the season. (duration of study). Document changes in nutritional status, including the concentration of macroelements that control osmoregulation during the barging process as they relate to delayed mortality. (Pilot study 2000). c) Evaluate and correlate post-release survival and migration behavior of transported and inriver migrants through the estuary and Columbia River plume. Monitor with the PIT tag trawler, radio telemetry and sonic telemetry. (Steelhead and fall chinook 2000-2006). d) Monitor returning adults. (through 2008). By manual count or through Adult PIT tag detection. e) Evaluate the effects of handling and marking on survival (immediate and post-hydrosystem) and adult return rates. Explore the feasibility of pre marking wild fish in the tributaries.

545 Lower Monumental Survival/Efficiency Study (CORPS)

Action 82: "The Action Agencies, in coordination with NMFS through the annual planning process, shall investigate the spillway passage survival of juvenile salmonids at appropriate FCRPS dams. These investigations shall assess the effect of spill patterns and per-bay spill volumes on fish survival, across a range of flow conditions. The Action Agencies shall develop a phased approach (including costs and schedules) and set priorities, in consultation with NMFS in the annual planning process, to continue spillway passage survival studies in 2001 and future years."
Action 83: "The Action Agencies, in coordination with NMFS through the annual planning process, shall evaluate the effect of spill duration and volume on spillway effectiveness (percent of total project passage via spill), spill efficiency (fish per unit flow), forebay residence time, and total project and system survival of juvenile steelhead and salmon passing FCRPS dams. Studies shall include both collector and non-collector projects. Adult passage considerations and potential adult fallback shall also be considered in study designs. Little Goose and Lower Granite dams shall be specifically considered for daytime spill studies. An overall phased study approach for spill evaluations will be determined in the 1- and 5-year implementation plans."

546 Request/Negotiate 1 MAF of Treaty storage with BC Hydro (CORPS)

One (1) maf of Treaty storage shall be requested and negotiated with BC Hydro to be provided and released during the migration season.

547 Up to 3.5 MAF flow augmentation from Candian storage in July and August (CORPS)

BPA and the Corps shall continue to coordinate with BC Hydro on operation of Canadian storage. The preliminary report was a joint US-Canadian document. Canada must now follow its own planning process with local stakeholders before future work can be completed. The study explored major structural changes in Canada in order to deliver the water.

548 Revise Storage Diagrams for Libby (CORPS)

The purpose of the Libby storage reservation diagram study and investigating a new forecast procedure is to see if more water can be shaped into spring without reducing flood control protection. In water year 2002 the investigation of a new forecast procedure in November through January should be completed. If this new forecast procedure using SOI is promising, it must be expanded for use into January through June. Once that procedure is found to be viable new storage reservation diagrams may be explored. If the new procedure in November through January is not acceptable, the new storage reservation diagram will not be developed.

549 Rooster Rock Wetlands (CORPS)

Purpose: Improve hydrology to enhance and restore habitat on approximately 200 acres. Improved flows will enhance return of native vegetation and improve habitat values for a variety of species and provide improved access for migratory salmonids. Description: Mirror Lake, which is included in Rooster Rock State Park and the wetlands upstream of the lake, contains some high quality emergent wetland habitat. Further upstream, where State Parks eliminated grazing of former pastures in the early 1990s, wetland and riparian habitats are dominated by reed canary grass, blackberry and other non-native species. These areas were historically subject to annual flooding from the Columbia River but I-84 cuts off flood flows and limits the river's influence on the lower reaches. Major Features: - Schedule: Initial survey work needs to be done and plans developed. Estimated Cost: \$100,000 to \$250,000. RPA 160 calls for the Corps and BPA, working with the Lower Columbia River Estuary Partnership, to develop and implement an estuary restoration plan.

550 Redundant TDG Monitors - Dworshak to McNary Dam (CORPS)

Improve reliability of existing total dissolved gas monitoring stations on the FCRPS. This will include development of QA/QC process, procurement of additional backup instruments and physical improvements to individual station infrastructure. Accomplishments on this RPA will be identified in the Annual TDG reports.

551 Review of Forebay Monitors Lower Granite to McNary (CORPS)

Purpose/Objective In past years, TDG monitoring in forebays at mainstem dams has produced variable results associated with differences in dam operations and thermal effects. Forebay TDG monitors typically are located on the pier noses and other portions of hydro projects near turbine intakes or spillways. In-season management of biological opinion spill to improve juvenile fish survival relies on the physical TDG and the biological GBT monitoring programs. Based on comments received on the draft opinion and a recent Corps review of possible biases in TDG monitoring data from TDG fixed forebay monitors at dams on the mainstem Columbia and Snake rivers, NMFS believes some sampling locations may have to be altered to provide a more representative measure of TDG in the water mass passing through the dams. Description. This Multi-Year Plan covers those forebay fixed monitoring stations within the Walla Walla District including one site at each of the Lower Snake River plants -Lower Granite, Little Goose, Lower Monumental, Ice Harbor and two forebay monitors at McNary dam. Major Activities/Tasks. The major activities required to complete this effort include: a) field review and analysis of existing sites, b) identify recommended re-locations. c) Prepare memorandum for record – coordinate with agencies. d) Implement recommendations.

552 Dworshak Dissolved Gas Abatement Study (CORPS)

Purpose/Objective - Spillway, low level regulating outlets and some turbine operations at Dworshak Dam produces increased levels of total dissolved gas (TDG) in the tailwater area of the project. The levels of increased TDG can effect aquatic life and migratory salmonids which may be present in the river below the dam. The purpose of this work effort would be to examine current project TDG performance and identify and implement operational or structural methods to decrease the production of TDG to acceptable levels. Description - Total dissolved gas production at Dworshak dam may possibly contribute to elevated gas levels observed in the mainstem Clearwater River and at Lower Granite dam and can be problematic for a US Fish and Wildlife fish hatchery (Dworshak Hatchery) located immediately downstream from the dam on the North Fork Clearwater River. Major Activities/Tasks - The following tasks or activities are anticipated to address the Dworshak dissolved gas issues. a)conduct field investigations to define performance of individual project features ie. low level outlets; turbines, spillway. Additional field monitoring of mainstem Clearwater and Snake River above Lower Granite dam may be needed to assess Dworshak effects. a) conduct hydrological analysis to define 7Q10 and probability of certain operations and discharges. c) Identify and evaluate potential operational or structural changes which may alleviate or reduce production of TDG ie. Additional turbine installation, modifications to spillway etc. d) If needed, construct sectional spillway hydraulic model replicating gates, low level outlets and stilling basin. Purpose of model would be to evaluate potential structural changes to alleviate production of TDG. e) Prepare technical report documenting investigations, potential solutions and associated costs. Report will make recommendations concerning the next steps. f) Optional Task - Prepare contract documents. If recommendations from the technical report include structural modifications, then contract documents would be prepared for construction. g) Optional Task – Construct recommended modifications.

553 Temperature Modeling Plan Alternative Snake River Operations (CORPS)

Phase 1 - Development of plan to model water temperature effects of alternative Snake River operations. Phase 2 - Implementation of Phase 1 recommendations including model development, analysis and associated reporting. Project anticipated to run through 2008.

555 Salmon River Aquatic Ecosystem Restoration (CORPS)

Purpose: the intent of this project is to restore salmonid habitat quality within a 12-mile reach of the main stem Salmon River near Challis, Idaho. Description: The Salmon River drainage is one of the most important and visible production areas for ESA listed Snake River salmon and steelhead stocks in the country. Working in partnership with BPA, University of Idaho (U of I) and a consortium of state and local agencies and private individuals organized as a watershed group (Upper Salmon Basin Watershed Project), the intent of this project is to restore salmonid habitat quality within a 12-mile reach of the main stem Salmon River near Challis, Idaho. The approach utilized will be to improve the riparian corridor along with important aquatic habitat attributes by restoring the channel to its original geometry using natural fluvial processes to the extent possible. The initial focus will be to reopen abandoned or blocked side channels to provide additional rearing habitat and possibly contribute benefits via water temperature reduction. Use of BPA funds has been legislatively approved to be creditable towards the sponsor's cost-share for technical needs and products for the feasibility study. U of I has completed conceptual modeling of the reach. The Corps will utilize this modeling in the development of site-specific designs. RPA Action: 149 calls for the Corps to implement restoration actions to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. 154 calls on the action agencies to work with other agencies to ensure that subbasin and watershed assessments and plans are coordinated, and as plans are completed, the action agencies should identify habitat actions and implement them.

556 Skipanon Slough (CORPS)

Purpose: The proposed project would restore approximately 30 acres of aquatic, riparian and floodplain habitat along the lower Skipanon River. Two sloughs that were formerly connected to the river will be reconnected to allow tidal exchange and fish passage. Estuarine and riparian restoration is needed to begin to address the critical fish and wildlife habitat needs in the watershed. Reconnection of tidal influences will allow the river and sloughs to naturally meander and form marsh and tidal channel habitats. Waterfowl, salmonids and other estuarine organisms will all benefit from improved tidal flows and restored habitat. Description: The Skipanon River watershed is approximately 29 square miles. Historically, it had runs of salmon including Coho, Chinook and steelhead. Currently, Coho salmon are the major species remaining in the watershed. Many of the historic sloughs and river meanders have been cut off from the River by levees and much of the remaining estuarine zone is occupied by marinas and other dock facilities. Much of the historic spruce forested habitat has also been cleared for agricultural or urban development. The Skipanon River from the headwaters to the mouth has been listed on the 303(d) list of impaired water bodies for dissolved oxygen levels below the water quality standards. The Skipanon River watershed is listed as critical habitat for chum salmon, and would likely be critical habitat for coho, if listed. Major Features: Specific actions to be considered are as follows: replace existing tide gate and culvert at Skipanon Slough with a tide gate that will remain open at all times except when very high tides or flood flows in river reach a specified elevation; create a culvert/tide gate connection through an existing levee at unnamed slough to allow fish passage and tidal exchange; and effectiveness monitoring (vegetation, water quality, fish use) Schedule: Project ready to go once funding secured. Assume six months to complete project. Estimated Cost: \$150,000-300,000 RPA 160 calls for the Corps and BPA, working with the Lower Columbia River Estuary Partnership, to develop and implement an estuary restoration plan.

557 Spill for Juvenile Fish Passage (CORPS)

1) Spring spill for juvenile fish migration shall occur from (planning dates) April 3 to June 20 in the Snake River, and April 10 to June 30 in the lower Columbia River. Summer spill for juvenile fish migration shall occur from (planning dates) June 21 to August 31 in the Snake River, and July 1 to August 31 in the lower Columbia River. There will be no summer spill at the four collector projects (Lower Granite, Little Goose, Lower Monumental, and McNary). Spill levels and times are indicated below. a – Minimum generation requirements at the Lower Snake River Projects may not be needed all the time. b – Lower Monumental will not be spilling, for juvenile fish passage, for part or all of the juvenile fish passage season in 2002 due to stilling basin repair. At the time this report was written construction is scheduled to begin in May 2002. c – Collection of subyearling fall chinook for transportation at McNary Dam shall not be initiated until river migratory conditions are deteriorating (i.e., no longer spring-like). In general, the switch from spring to summer operation will occur on or about June 20. Spring-like is defined as favorable flow and water temperature conditions; i.e., river flows are at or above the spring flow target (220 to 260 kcfs) at McNary Dam, and ambient water temperatures are below 62°F (17°C). Actual dates shall be set by TMT coordination. d – Day and nighttime vary during the spill season and are set in the Fish Passage Plan. 2) Voluntary spill at all three Snake River collector projects shall occur when seasonal average flows are projected to meet or exceed 85 kcfs.

558 Steigerwald Lake, Camas, Washougal, WA, Section 1135 (CORPS)

Purpose: To improve fisheries access/egress and habitat conditions within the Steigerwald Lake NWR, particularly for juvenile anadromous fish, including coho and chum salmon, winter steelhead and coastal cutthroat trout that historically utilized such backwater habitats for foraging and rearing activities. The proposed action would strive to more closely mimic natural floodplain conditions. The proposed action would restore juvenile salmonid access to the complex of channels and marshes comprising Steigerwald Lake and Gibbons Creek, where they could rear under conditions approaching those historically available to them. Acreage of wetland, riparian forest, and mixed oak forest are expected to increase. Management capability for wetland habitat would be substantially improved leading to a greater natural species component to wetland vegetation rather than a dominance currently by reed canarygrass. Description: The proposed action would entail the restoration of Columbia River flows to the Steigerwald Lake floodplain, and thus fisheries restoration. Additionally, wetland and riparian forest habitat development would be enacted. Proposed actions would allow Columbia River flows during flood events and spring freshets to reenter the floodplain through a controlled intake/outlet structure. The feasibility study would also address restoration of Gibbons Creeks flows to Steigerwald Lake as historically occurred. Reestablishment of the Gibbons Creek – Steigerwald Lake connection may entail expansion of the project area to lands north of Highway 14 currently owned by the Columbia Land Trust to provide for a realigned stream channel and connection to Steigerwald Lake. The proposed action was substantially developed from discussions with the U. S. Fish and Wildlife Service personnel. Site visits, in conjunction with members of the Service, were used to elicit habitat improvement proposals and site specific information on the proposed actions. Major features of Proposed Project: Project benefits for anadromous fish at Steigerwald Lake NWR would be achieved by: Schedule: a) Construction of a controlled inlet/outlet structure to allow controlled ingress of Columbia River flows to a predetermined level, currently estimated at 18-20' NGVD, and to allow for control of water levels in Steigerwald Lake b) Construction of an inlet/outlet channel connecting the Columbia River with Steigerwald Lake; c) Construction of a fish passage facility at the inlet/outlet structure to allow for juvenile salmonid egress and adult salmonid ingress to Gibbons Creek and Steigerwald Lake; d) Construction of interior levees along the upstream and downstream boundaries of the NWR in order to maintain the current level of flood control protection for those properties outside the NWR; e) Removal of an estimated 1,450 lineal feet of the current elevated Gibbons Creek channel; and f) Evaluation of a realigned Gibbons Creek channel north of Highway 14 and reconnection to Steigerwald Lake. Project benefits for wildlife species in Steigerwald Lake NWR would be achieved by: a) development of an additional 193 acres of riparian forest; b) Development of an additional 183 acres of wetland habitat; and c) Development of an additional 82 acres of mixed oak forest. Feasibility - July 2002 – September 2003, Plans and Specifications - November 2003 – June 2004. Construction - July 2004 - September 2005. Project construction is time of year sensitive. Construction should be initiated during the summer and early fall to take advantage of favorable weather and soil conditions. RPA Action: 149 calls for the Corps to implement restoration actions to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. 154 calls on the action agencies to work with other agencies to ensure that subbasin and watershed assessments and plans are coordinated, and as plans are completed, the action agencies should identify habitat actions and implement them.

559 SW Washington Streams Section 206 (CORPS)

Purpose: The proposed project will restore adult and juvenile access to the affected streams restoring a significant portion of the 7.6 miles of former stream and 15 acres of wetlands habitat functions and values for salmonids and trout. Potentially as important is the habitat "connection" this project should provide between established up and downstream chum salmon supplementation projects. These projects are located at Columbia River miles 5 and 22. Project Description: The 7.5 mile stretch of highways 101 and 401 has 9 culverts that are considered salmon and trout passage restrictions or barriers. The proposed project would entail the replacement of all 9 culverts. Restoration of passage will primarily benefit coho and chum salmon, winter steelhead and coastal cutthroat trout. Replacing the 9 culverts will restore or significantly increase the presence of the previously listed species to approximately 7.6 linear miles of former spawning and rearing habitat in 6 streams, approximately 15 acres of former tidal marsh and current wetland habitat. During the early 1990's the Corps of Engineers constructed revetments along Highway 401 between mileposts 0 and 2 to protect the highway from wave action and the resulting erosion. The revetments have exacerbated the passage problem. Completion of other Corps mission directives on the Columbia and its tributaries related to hydropower and navigation have also had a negative impact on these species recruitment and survival. The overall cumulative nature of human terrestrial and aquatic impacts on the Columbia River basins aquatic environment's have resulted in a system significantly out-of-balance. The Corps has been approached by the Washington Department of Transportation (WDOT), the Pacific County Friends of Lewis and Clark (PCFLC) and the Columbia-Pacific Resource Conservation District (CPRCD) to assist in the correction of the passage/barrier problem. The proposed project was substantially developed from discussions with the above listed agencies and the Washington Department of Fish and Wildlife (WDFW) Major features of Proposed Project: Project benefits for anadromous fish would be achieved by: Replacement of 9 salmon and trout passage barrier culverts. a) Installation of 8 fishways and ladders to restore or enhance passage. b) Installation of culverts 30 percent oversized for peak hydrologic flows and the importation (mechanically at first and naturally later) of indigenous streambed material. This type of design allows a "natural" streambed condition to form inside the culvert. c) Enhancement of 15 acres wetland habitat for aquatic invertebrates, shorebirds and waterfowl. d) Restoration of coho salmon access to a cumulative acre of potential spawning habitat. e) Restoration of salmon and trout to 7.6 miles of spawning and rearing habitat. Project benefits for terrestrial flora and fauna would be achieved by: 1) Partial restoration of former tidal flows and associated saline regime to the mouths of affected streams. This would restore and/or enhance habitat for resident fish. 2) Restoration of a portion of the tidal hydrologic inputs to wetlands encompassed within the project. Natural removal of an infestation of Scots Broom allowing natural restoration of both native plant species and former habitat functions and values. Cost: The estimated project cost is \$3,199,000.00. Schedule: RPA Action: 149 calls for the Corps to implement restoration actions to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. 154 calls on the action agencies to work with other agencies to ensure that subbasin and watershed assessments and plans are coordinated, and as plans are completed, the action agencies should identify habitat actions and implement them.

560 Trout Creek Section 206 (CORPS)

Purpose: The project is proposed as a means to restore the natural sinuosity of the main channel of Trout Creek and to reestablish the connection between the creek and its floodplain. The project would also restore water quality, improve riparian habitat and stabilize streambanks. Description: The modification would remove levees, dikes, and berms along a 4-5 mile stretch of the stream. The work completed to date on the original 4 alternatives showed the previously identified areas not feasible. The area now being considered is the first disturbed area downstream of the reaches identified near Ashwood. The area is on privately owned land and is adjacent to Degner Canyon which is a narrow canyon approximately 5 miles in length. Because the canyon is relatively inaccessible it has not been subject to the level of human influence seen in some of the remaining reaches of the creek. Thus, restoration on this reach would result in a continuous reach of 10 miles of improved habitat. The project team will use the requested funding to analyze the new reach and discuss a conceptual plan with the Sponsor and landowner. Material from the embankments would be spread along the banks of the creek and also used for fill material where the width of the creek channel has increased disproportionately to its depth. The project will remove the problem berms and re-establish stream channel sinuosity that will assist in restoring natural floodplain functions and processes. In addition to channel modifications the proposed project includes riparian plantings to reestablish vegetation along the stream to further stabilize the streambanks. The plantings will also begin to establish shading along the stream and well as provide wildlife habitat. In limited locations bank protection will likely be required, where necessary juniper riprap will be used as a bioengineering solution. This technique has been used fairly extensively in the basin and appears to be effective on specific sites. Juniper riprap entails using cut juniper trees along eroding banks to catch and retain sediment in the stream, thereby both stabilizing the bank as well as removing fine grain sediments from the streambed. In order to ensure the juniper trees stay in place during higher flow events they will be secured in place with cables. Cost estimate: The combined planning and design phase, including the environmental assessment, is estimated to cost \$200,000. This estimate will change based on a review of the new reach for additional requirements. The current Construction cost estimate is \$750,000. Schedule: Since the federal cost is less than \$1,000,000, the combined planning and design phase will be used. Plans and Specifications / EA - April 1999 to April 2002, Construction - April 2002 to Sep 2002. The in-water construction period for Trout Creek is July 1 through September 30. RPA Action: 149 calls for the Corps to implement restoration actions to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. 154 calls on the action agencies to work with other agencies to ensure that subbasin and watershed assessments and plans are coordinated, and as plans are completed, the action agencies should identify habitat actions and implement them.

561 Walla Walla GI Feasibility Study (CORPS)

Purpose: Three year feasibility study with potential to lead to multiple habitat improvement projects. This effort is to restore in-stream flows, improve riparian habitat, and improve fish passage to allow for environment restoration in the basin. Description: Likely alternatives for the feasibility study would be: a) Increase instream flow, b) Headwater dams for instream flow, c) Water exchanges with Columbia River, d) Increase irrigation efficiency, e) Purchase water rights. The estimated cost of the feasibility study is \$5.2 million and is expected to be completed in two to three years. Construction of projects identified in the feasibility study could begin in 2005 depending upon congressional approval and funding. A series of public meetings and other forums will be held to gain stakeholder and community information. The Confederated Tribes of the Umatilla Indian Reservation are potential sponsor for this effort. RPA Action: 149 calls for the Corps to implement restoration actions to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. 154 calls on the action agencies to work with other agencies to ensure that subbasin and watershed assessments and plans are coordinated, and as plans are completed, the action agencies should identify habitat actions and implement them.

562 Asotin County Riparian Buffer and Couse and Tenmile Creeks Protection and Implementation Pro BPA)

The Asotin County Conservation District (ACCD), working in partnerships with the Natural Resource Conservation Service (NRCS), WDFW, Department of Ecology (DOE), US Forest Service (USFS), Nez Perce Tribe (NPT), and especially the private landowners, provides leadership in protection and implementation of watershed projects focused on improving watershed health. Working in concert with local, state and federal agencies strengthens our ability to develop, implement and leverage funds for economic feasibility based on sound science, which drives our protection and restoration projects. Wild steelhead spawning outside the Asotin Creek watershed in Couse and Tenmile Creeks needs to continue to be assessed for factors limiting production. Current technical consensus identifies these stocks as a local priority for protection and restoration projects. Currently ACCD is encouraging landowners to research the Conservation Reserve Enhancement Program (CREP) to see if it fits in with their goals and objectives. Cooperation and interest is beginning to take hold and we currently have more sign-ups for CREP than our current workload can handle in Asotin County. This proposals goals are to implement riparian buffer systems, upland BMP's and instream habitat in watersheds that drain to the Snake River and are home to ESA listed steelhead and chinook and address limiting factors recently identified in the "Asotin Creek Subbasin Summary" (Summary) draft, May 25th, 2001. It will dedicate 1 FTE to provide technical assistance and planning support needed to implement at least 22 riparian buffer contracts on approximately 1,323 acres covering an estimated 26 miles of anadromous fish bearing streams. Buffer widths will be between 50 and 180 feet on each side of the stream. Implementation will include prescribed plantings, fencing, alternative watering systems, lease payments on riparian areas will be for 10 – 15 year periods and related enhancements not covered by the USDA CREP funding. We envision BPA funds being utilized to enhance buffers and help landowners off-set cost related to bigger projects with enhanced activities including instream structures for ESA listed steelhead, chinook and resident rainbow / redband trout. This proposal meets a critical need in Asotin Creek subbasin. Technical staff shortfalls for developing plans has created a backlog of potential buffer projects. Within Asotin County area of the Asotin Creek subbasin 24 individuals have expressed interest in entering into long-term buffer program and there is a potential to enroll others. Successful completion of instream, riparian and upland projects in the Asotin Creek watershed has interested landowners located on other streams who are primed for protection and restoration projects. Local support received from private landowners and citizens is amazing and results in a holistic approach for habitat projects. Local technical agencies have identified these watersheds, which are almost exclusively privately owned, as priority areas because of use by a fair run of wild steelhead and resident rainbow / redband trout.

563 Assess Salmonids in the Asotin Creek Watershed (BPA)

Washington Department of Fish and Wildlife (WDFW), as part of ongoing Lower Snake River Compensation Plan (LSRCP) monitoring and evaluations, have conducted spawning ground surveys and summer electrofishing or snorkeling surveys in most southeast Washington streams (including Asotin Creek) to determine indigenous salmonid (steelhead/rainbow, chinook, bull trout, whitefish) distribution and relative abundance. Further, the surveys have provided some information about the distribution of native non-salmonids and introduced species within the basin. Extensive efforts have been underway in Asotin Creek (federal and State funded) to correct habitat problems which may have contributed to the decline and/or extinction of ESA listed populations of salmonids. The purpose of this project is to expand our monitoring and evaluation of steelhead and bull trout populations in Asotin Creek, and develop a habitat quality linked, spring chinook reintroduction plan. The assessment will require construction of one new adult salmonid trap in the basin, and will include trapping, tagging and monitoring of spawning for all species. Juvenile tagging will also be included in FY2002 to fully describe the productive nature of the creek and its tributaries, and life history patterns and survivals within the basin. Electrofishing and snorkeling will be used to capture juvenile fish, document densities and estimate populations during summer, and a rotary migrant trap located near the adult trap will be employed to estimate smolt outmigration. Smolt trapping would be initiated in Asotin Creek in 2002. PIT tags will be used to help estimate smolt to adult survivals and eventually parent-to-progeny survival rates, and identify life stage(s) within the populations that may be experiencing higher than expected mortality, possibly associated with habitat problems.

564 Protect and Restore the Asotin Creek Watershed (BPA)

Asotin Creek, a tributary to the Snake River in Water Resource Inventory Area (WRIA) #35 is home to ESA listed stocks of Snake River summer steelhead (*Oncorhynchus mykiss*), spring chinook (*Oncorhynchus tshawytscha*), and bull trout (*Salvelinus confluentus*) and is managed as a wild steelhead reserve by Washington Department of Fish and Wildlife (WDFW). High stream temperatures, sediment deposition in spawning and rearing areas and lack of suitable pools are factors limiting salmonid production as identified by the Asotin Creek Model Watershed Plan (Plan). The indigenous fish species most actively targeted for management in the watershed are summer steelhead and spring chinook salmon. The goals for these species are to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and genetic diversity of these species. This new project proposes to complement an on-going watershed restoration and protection effort to address sedimentation into fish habitat from upland forested areas of the watershed. All aspects of the project are performed collaboratively and cost shared with the Umatilla National Forest (UNF), Asotin County Conservation District (ACCD), Washington Department of Fish and Wildlife (WDFW) and private landowners. Local experts in fisheries management have stated prolonged introductions of sediment as a one of the highest limiting factor for chinook, steelhead, and bull trout populations. FY 2002-06 activities include projects that will continue to move toward reducing sediment deposition in spawning gravels and rearing areas by addressing sediment sources from forest roads on private and Umatilla National Forest land within the watershed. This proposal via a partnering/cost share agreement with the UNF, ACCD and private landowners will obliterate 10 miles of road per year, beginning with 22.04 miles of road that have been identified for obliteration in the Charley Creek subwatershed. Charley Creek, an upper tributary, has been determined to have some of the highest densities of juvenile steelhead in southeastern Washington according to local WDFW fisheries surveys. This project proposes to work with private, WDFW, and the UNF to survey, assess and identify roads for restoration treatment to reduce sediment delivery into Asotin Creek and tributaries. Project progress and lessons learned will be transferred to a multitude of audiences through newsletters, presentations, and project reports.

565 Oregon Plan Blue Mountain Province Fish Screening/Fish Passage (BPA)

The project provides immediate and long-term protection for anadromous and resident fish species in the Grande Ronde River Watershed Basin by replacing fish screening systems that do not meet the NMFS criteria. These outdated facilities can be an important source of fish loss, especially at the fry and sub-yearling life stages. This project follows the previous Columbia Basin Fish and Wildlife Program (FWP) Measure 7.10-Provide Passage and Protective Screens on Tributaries, particularly measures 7.10A, a.2 and a.3 which mandated: a. screening and passage criteria based on NMFS standards; b. the use of existing expertise of federal, state and private entities to accelerate implementation of fish screening and passage measures; and c. the maintenance of prioritized list of tributary screening and passage facility improvements – which will include both the construction of new facilities, upgrading, and maintenance of existing screen systems. Additionally, this project directly conforms to the near-term objectives outlined in NMFS' Basinwide Salmon Recovery Strategy (see Grande Ronde Subbasin Summary), specifically to Objective #2, "screen diversions, combine diversions and rescreen existing diversions to comply with NMFS criteria to reduce overall mortality." The expected outcome over the next year will be ongoing construction and installation to replace existing out of date screen systems remaining in the basins.

566 Adult Steelhead Status Monitoring - Imnaha River Subbasin (BPA)

Snake River steelhead (*Oncorhynchus mykiss*) are listed as threatened under the Endangered Species Act exhibiting significantly declining numbers and low level of abundance of adults counted at Lower Granite Dam (Busby et al. 1996; CRI 2000). Tributary specific quantitative information of steelhead status and population structure upstream of Lower Granite Dam is limited for B-run aggregates and virtually non-existent for A-run aggregates, making development of fisheries conservation or management actions problematic. Independent populations within the Snake River steelhead ESU have not been defined according to criteria in NMFS' Viable Salmonid Population document (VSP; McElhany et al. 2000). However, based on the limited available data, the NMFS assumes that there are at least five populations of A-run and five populations of B-run steelhead in the Snake River Steelhead ESU. The component populations are an indicator of the status of the entire ESU (McElhany et al 2000), and as such the NMFS Biological Opinion (2000) calls for defining populations based on biological criteria and evaluating population viability in accordance with NMFS' VSP approach. The VSP defines population performance measures in terms of four key parameters: abundance, population growth rate, spatial structure, and diversity then relates performance and risks at the population scale to risks affecting the persistence of the entire ESU. This study will provide tier 2 level baseline tributary specific status information through monitoring of adult steelhead escapement in tributaries of the Imnaha River subbasin. Annual non-biased and precise quantification of adult abundance and monitoring of spatial distribution will provide population growth rate and genetic stock structure information. Primary data and derived values will support: (1) evaluation of recovery efforts and NMFS Biop RPAs, (2) implementation and evaluation of management actions and harvest opportunities, and (3) evaluation of the hatchery steelhead contribution/impacts to natural reproduction within the subbasin in relation to the overall subbasin stock status

567 Evaluate Factors Influencing Bias and Precision of Chinook Salmon Redd Counts (BPA)

The ability to detect trends in fish populations depends upon obtaining reliable estimates of abundance in an efficient manner. Simply relying on a relative count that has not been adjusted for undetected individuals, may lead to misleading conclusions about population trends, spatial distribution, and habitat associations because of the unknown magnitude of the sampling bias. Redd counts in index areas are commonly used to monitor annual trends in chinook salmon (*Oncorhynchus tshawytscha*) populations where total adult escapements are unknown. The assumption is that uncorrected redd counts represent a constant proportion of true numbers of redds across time, which is unlikely given the myriad of environmental and other factors affecting redd sightability or redd distribution. Further, an index count provides a single number with no measure of precision, i.e., it does not include sampling variation. Despite the widespread use of redd counts to calculate measures of population performance, little is known regarding the accuracy of chinook salmon redd counts or the factors that decrease precision and introduce bias. Therefore, we propose new research to evaluate factors influencing bias and precision of chinook salmon redd counts. We will determine the true number of redds within a series of study reaches; apply the true counts to determine the accuracy of aerial and ground-based redd counts; measure environmental and habitat factors and model which variables most influence redd sightability; assess inter- and intra- year sources of variation in redd counts; quantify inter- observer variation in ground-based surveys; compare accuracy of single versus multiple pass counts; and evaluate and compare the effectiveness of a modified two-sample, Lincoln-Petersen mark-resight estimator and Huggins mark-resight estimator (including covariates) for obtaining unbiased and precise abundance estimates of redds. Results from this proposed research will have important implications for improving chinook salmon redd surveys conducted across the Snake River basin.

568 Riparian Conservation Easement Purchase of Scarrow Property on Lake Creek a Tributary to the River, Idaho (BPA)

We propose to purchase a riparian Conservation Easement on a private inholding on Lake Creek a headwater tributary to the Secesh River, Idaho. The property lies about three miles upstream of wild summer chinook spawning grounds on Lake Creek. The landowner has a timber sale proposed along with homesite development. The landowner is interested in a Conservation Easement in lieu of some timber and mining development along Lake Creek. We propose to purchase an easement on approximately a 12-acre riparian section of the property to protect the critical summer chinook spawning grounds downstream.

569 Restoration of the Yankee Fork Salmon River (BPA)

A 6 mile reach of the Yankee Fork Salmon River has been severely altered by dredge mining that has disrupted geomorphic processes within the basin and fragmented the remaining quality salmonid habitat in a once productive and important subbasin of the upper Salmon River. The dredged reach has been straightened, simplified, and isolated from its floodplain and is no longer capable of supporting a naturally functioning riverine ecosystem. The channel is wide, shallow, and planar, lacking the complex pool-riffle morphology, undercut banks, riparian shading, and diversity of aquatic habitat that is seen in adjoining, less disturbed reaches. A multi-year restoration plan is proposed to reclaim the historic aquatic habitat within the dredged reach and to reconnect the remaining quality habitat, thereby increasing the biological integrity of the basin. We propose a comprehensive, multi-disciplinary, and multi-agency plan that includes 1) pre-restoration study and design, 2) phased restoration and monitoring, allowing iterative improvement of methods, 3) long-term physical and biological monitoring, and 4) dispersal of gained knowledge through a variety of outlets. Several factors make restoration of this site particularly compelling: 1) it is an historically productive habitat for Snake River chinook that are now listed as threatened; 2) the dredged reach presents several threats to chinook viability with the basin (discussed further below); 3) the current channel is incapable of reworking the dredge piles that confine it and requires active intervention to restore this ecosystem; and 4) significant data collection and analyses have already been conducted in the basin, providing an unprecedented knowledge base for restoration activities.

570 Nez Perce Tribe Harvest Monitoring Program (BPA)

The 2002 project proposal describes the Nez Perce Tribe's efforts to monitor the fisheries currently ongoing. Sampling strategies are designed to provide greater data precision in catch reports, age distribution, and exploitation rates during our fishery seasons. Harvest management is intertwined with all Columbia Basin artificial production programs and affects the status of naturally produced stocks as well.

571 Potlatch River Watershed Restoration (BPA)

The 377,776-acre Potlatch River watershed is located in north central Idaho and is the largest tributary in the lower Clearwater River. The Potlatch River watershed is characterized by steep basaltic canyons rimmed by rolling cropland in the lower reaches and by timbered hills and high meadow terrain in the upper reaches. Approximately 78% of the area is privately owned, 13% Forest Service, 8% Idaho Department of Lands, less than one percent is Nez Perce Tribal lands, and less than one percent the Bureau of Land Management. Forestland encompasses approximately 57% of the watershed and 38% is in non-irrigated cropland, and 4% rangeland. (USDA-NRCS, 1994) The Potlatch River supports rainbow, brook, and Snake River steelhead trout (ESA listed threatened). The Nez Perce Tribe is conducting a coho re-introduction program. In 1999, the Nez Perce Tribe captured six adult and 12 jack fall chinook salmon (ESA listed threatened) at a weir located near Juliaetta in the Potlatch River watershed and eight redds were reported downriver from Juliaetta. (USBLM, 2000) In 1994, the Latah Soil and Water Conservation District (Latah SWCD) requested that the USDA Natural Resources Conservation Service (NRCS) conduct a Preliminary Investigation (P.I.) in the Potlatch River. The purpose of the P.I. was to: 1) develop criteria to prioritize subwatersheds for long-term treatment for anadromous and resident fish habitat enhancement and restoration; and 2) compile a list of treatment strategies based on identified resource issues to be implemented in the near-term. Analysis and long-term planning for enhancement and restoration of fish habitat was to have been done through the U.S. Department of Agriculture's Cooperative River Basin Study Program. This final planning stage was not completed because of NRCS staff cutbacks. This proposal requests funding for the Latah SWCD to complete analysis to use to prepare long-term implementation planning, begin short-term implementation work in cooperation with other NRCS programs, and augment the multi-agency monitoring work in the Potlatch River. This work will collectively provide the majority of documentation required for the development of the TMDL due in 2003.

572 Chinook Salmon Smolt Survival and Smolt to Adult Return Rate Quantification, South Fork Salmc Idaho (BPA)

Historically, the average annual salmon run in the Columbia River above Bonneville Dam was 5 - 11 million fish (CRIFTC 1996). In 1995 it was requested that Snake River spring/summer chinook salmon be listed as threatened under authority of the Endangered Species Act (ESA) (NMFS 1995). The South Fork Salmon River drainage in Idaho was probably the most important summer chinook salmon spawning stream in the Columbia Basin (Mallet 1974). Numerous studies have investigated factors that contribute to the decline of spring/summer chinook in the SFSR. These studies include passage problems associated with the Snake River and Columbia River dams, harvest levels, hatchery competition, and habitat degradation. There exists a need to develop performance standards to measure responses of adjustments that are employed to correct these problems. The Reasonable and Prudent Alternative (RPA) of the 2000 Federal Columbia River Power System (FCRPS) Biological Opinion (NMFS 2000) lists two performance standards: standards related to ESU status and standards used to evaluate how effective management actions produce an expected biological response. NMFS (2000) indicates that assessment of survival and recovery will be based on estimates of life stage survival and annual population growth rate (λ) and measures of productivity that include recruit per spawner (R/S) and smolt-to-adult returns (SARs). The NMFS considers the status of component populations as an indicator of the status for the entire ESU. The NMFS Biological Opinion 2000, Action 179, calls for defining populations based on biological criteria and evaluating population viability in accordance with NMFS' Viable Salmonid Population (VSP) approach. The VSP defines population performance measures in terms of four key parameters: abundance, population growth rate, spatial structure, and diversity. Additionally, the VSP relates performance and risks at the population scale with risks affecting the persistence of the entire ESU (McElhany et al 2000). This project proposes to conduct monitoring of the production, migration, and survival of spring/summer chinook salmon smolts and adults in the South Fork Salmon River (SFSR) basin. The portion of the SFSR basin to be studied includes Johnson Creek, Secesh River, and the upper SFSR. By utilizing new and existing research efforts in the SFSR basin, quality smolt-to-adult return rates (SAR) and recruit-per-spawner (R/S) ratios will be generated for all individual spawning aggregates in the SFSR and for the SFSR basin population as a whole. These performance indicators will define diversity, measure spatial structure, monitor straying of natural and hatchery fish, and monitor short- and long-term changes of abundance and survival in tributary populations and the sub-basin population. In addition, the performance indicators will evaluate progress toward recovery of Snake River spring/summer chinook salmon in the SFSR basin.

573 Holistic Restoration of Critical Habitat on Non-federal Lands in the Pahsimeroi Watershed, Idaho

The Upper Salmon Basin Watershed Project (USBWP) is by far the largest collaborative effort to restore salmon habitat on non-federal lands in the Salmon Subbasin or elsewhere in Idaho. The Project is a multi-stakeholder effort covering four hydrologic units that include the Lemhi, Upper Salmon, Pahsimeroi, and Middle-Salmon Panther watersheds. Efforts on the Project are coordinated through the Idaho Soil Conservation Commission, with the Lemhi and Custer Soil and Water Conservation Districts doing most of the direct work with private landowners. The USBWP, with a multi-agency technical team providing guidance, has implemented a diversity of important habitat restoration projects in areas where such activities had previously been quite limited. The USBWP program is now being reconfigured on a geographic basis in order to address past ISRP comments and new federal agency plans. In FY 2002 the USBWP will be restructured consistent with a geographic approach for project selection, planning, implementation, and monitoring. The following ongoing projects will be restructured into this approach: Idaho Upper Salmon Basin Watershed Habitat Projects, No. 199401700. Salmon River Anadromous Fish Passage Enhancement, No. 199306200. Upper Salmon River Diversion Consolidation Project, No. 199600700. The project described in this proposal covers the planning, design, construction, project implementation, O&M, and M&E activities the USBWP anticipates in the Pahsimeroi watershed during FY 2002 and into the near future. Because of the way in which collaborative groups such as the USBWP operate, the scope of this proposal is an expert generated "best-estimate" of the mix of analyses and projects that will be implemented over the next several years. The proposal represents a serious effort by the USBWP to upgrade planning and M&E efforts that have in the past been limited by staffing constraints.

574 Holistic Restoration of Critical Habitat on Non-federal Lands in the Lemhi Watershed, Idaho (BPA)

The Upper Salmon Basin Watershed Project (USBWP) is by far the largest collaborative effort to restore salmon habitat on non-federal lands in the Salmon Subbasin or elsewhere in Idaho. The Project is a multi-stakeholder effort covering four hydrologic units that include the Lemhi, Upper Salmon, Pahsimeroi, and Middle-Salmon Panther watersheds. Efforts on the Project are coordinated through the Idaho Soil Conservation Commission, with the Lemhi and Custer Soil and Water Conservation Districts doing most of the direct work with private landowners. The USBWP, with a multi-agency technical team providing guidance, has implemented a diversity of important habitat restoration projects in areas where such activities had previously been quite limited. The USBWP program is now being reconfigured on a geographic basis in order to address past ISRP comments and new federal agency plans. In FY 2002 the USBWP will be restructured consistent with a geographic approach for project selection, planning, implementation, and monitoring. The following ongoing projects will be restructured into this approach: Idaho Upper Salmon Basin Watershed Habitat Projects, No. 199401700. Salmon River Anadromous Fish Passage Enhancement, No. 199306200. Upper Salmon River Diversion Consolidation Project, No. 199600700. The project described in this proposal covers the planning, design, construction, project implementation, O&M, and M&E activities the USBWP anticipates in the Lemhi watershed during FY 2002 and into the near future. Because of the way in which collaborative groups such as the USBWP operate, the scope of this proposal is an expert generated "best-estimate" of the mix of analyses and projects that will be implemented over the next several years. The proposal represents a serious effort by the USBWP to upgrade planning and M&E efforts that have in the past been limited by staffing constraints.

575 Holistic Restoration of Critical Habitat on Non-federal Lands, East Fork Salmon Watershed, Idaho

The Upper Salmon Basin Watershed Project (USBWP) is by far the largest collaborative effort to restore salmon habitat on non-federal lands in the Salmon Subbasin or elsewhere in Idaho. The Project is a multi-stakeholder effort covering four hydrologic units that include the Lemhi, Upper Salmon, Pahsimeroi, and Middle-Salmon Panther watersheds. Efforts on the Project are coordinated through the Idaho Soil Conservation Commission, with the Lemhi and Custer Soil and Water Conservation Districts doing most of the direct work with private landowners. The USBWP, with a multi-agency technical team providing guidance, has implemented a diversity of important habitat restoration projects in areas where such activities had previously been quite limited. The USBWP program is now being reconfigured on a geographic basis in order to address past ISRP comments and new federal agency plans. In FY 2002 the USBWP will be restructured consistent with a geographic approach for project selection, planning, implementation, and monitoring. The following ongoing projects will be restructured into this approach: Idaho Upper Salmon Basin Watershed Habitat Projects, No. 199401700. Salmon River Anadromous Fish Passage Enhancement, No. 199306200. Upper Salmon River Diversion Consolidation Project, No. 199600700. The project described in this proposal covers the planning, design, construction, project implementation, O&M, and M&E activities the USBWP anticipates in the Middle Salmon-Panther watershed during FY 2002 and into the near future. Because of the way in which collaborative groups such as the USBWP operate, the scope of this proposal is an expert generated "best-estimate" of the mix of analyses and projects that will be implemented over the next several years. The proposal represents a serious effort by the USBWP to upgrade planning and M&E efforts that have in the past been limited by staffing constraints.

576 Holistic Restoration of Habitat on Non-federal Lands, Middle Salmon-Panther Watershed, Idaho (BPA)

The Upper Salmon Basin Watershed Project (USBWP) is by far the largest collaborative effort to restore salmon habitat on non-federal lands in the Salmon Subbasin or elsewhere in Idaho. The Project is a multi-stakeholder effort covering four hydrologic units that include the Lemhi, Upper Salmon, Pahsimeroi, and Middle-Salmon Panther watersheds. Efforts on the Project are coordinated through the Idaho Soil Conservation Commission, with the Lemhi and Custer Soil and Water Conservation Districts doing most of the direct work with private landowners. The USBWP, with a multi-agency technical team providing guidance, has implemented a diversity of important habitat restoration projects in areas where such activities had previously been quite limited. The USBWP program is now being reconfigured on a geographic basis in order to address past ISRP comments and new federal agency plans. In FY 2002 the USBWP will be restructured consistent with a geographic approach for project selection, planning, implementation, and monitoring. The following ongoing projects will be restructured into this approach: Idaho Upper Salmon Basin Watershed Habitat Projects, No. 199401700. Salmon River Anadromous Fish Passage Enhancement, No. 199306200. Upper Salmon River Diversion Consolidation Project, No. 199600700. The project described in this proposal covers the planning, design, construction, project implementation, O&M, and M&E activities the USBWP anticipates in the Upper Salmon watershed during FY 2002 and into the near future. Because of the way in which collaborative groups such as the USBWP operate, the scope of this proposal is an expert generated "best-estimate" of the mix of analyses and projects that will be implemented over the next several years. The proposal represents a serious effort by the USBWP to upgrade planning and M&E efforts that have in the past been limited by staffing constraints.

577 Holistic Restoration of Critical Habitat on Non-federal Lands, Upper Salmon Watershed, Idaho (BPA)

The Upper Salmon Basin Watershed Project (USBWP) is by far the largest collaborative effort to restore salmon habitat on non-federal lands in the Salmon Subbasin or elsewhere in Idaho. The Project is a multi-stakeholder effort covering four hydrologic units that include the Lemhi, Upper Salmon, Pahsimeroi, and Middle-Salmon Panther watersheds. Efforts on the Project are coordinated through the Idaho Soil Conservation Commission, with the Lemhi and Custer Soil and Water Conservation Districts doing most of the direct work with private landowners. The USBWP, with a multi-agency technical team providing guidance, has implemented a diversity of important habitat restoration projects in areas where such activities had previously been quite limited.. The USBWP program is now being reconfigured on a geographic basis in order to address past ISRP comments and new federal agency plans. In FY 2002 the USBWP will be restructured consistent with a geographic approach for project selection, planning, implementation, and monitoring. The following ongoing projects will be restructured into this approach: Idaho Upper Salmon Basin Watershed Habitat Projects, No. 199401700. Salmon River Anadromous Fish Passage Enhancement, No. 199306200. Upper Salmon River Diversion Consolidation Project, No. 199600700. The project described in this proposal covers the planning, design, construction, project implementation, O&M, and M&E activities the USBWP anticipates in the Upper Salmon watershed during FY 2002 and into the near future. Because of the way in which collaborative groups such as the USBWP operate, the scope of this proposal is an expert generated "best-estimate" of the mix of analyses and projects that will be implemented over the next several years. The proposal represents a serious effort by the USBWP to upgrade planning and M&E efforts that have in the past been limited by staffing constraints.

578 Evaluating stream habitat using the Nez Perce Tribe Fisheries/Watershed Watershed Monitoring and Evaluation Plan (BPA)

The NPTFW Watershed Monitoring and Evaluation Plan is an extensive, long-term monitoring and evaluation program. The focus of the plan is a comprehensive stream survey approach, evaluating habitat quality, water quality, and fish distribution. Data collected will elucidate the extent and quality of available spawning and rearing habitat, will be used to characterize stream response to watershed restoration and/or management activity, judge whether streams are in compliance with water quality standards and over the long term, will show whether watersheds are trending toward recovered states that will support self-sustaining populations of resident and anadromous fish. The WM&E plan will be implemented in all streams throughout the Mountain Snake Province where the Nez Perce Tribe has on going or proposed watershed restoration projects. In addition, monitoring sites will be located in streams where subbasin or watershed assessments have identified data gaps. Stream habitat surveys include parameters that are designed to characterize fish habitat such as cobble embeddedness and large woody debris as well as parameters that will evaluate how the stream has responded to watershed restoration such as sediment yield. Habitat surveys will be completed annually during low water. At the time of habitat surveys, fish distribution, presence and absence surveys will be completed in the lowest monitored reach of each stream. Data collection and reporting will be coordinated with all regional management agencies and with existing monitoring programs. The data from the stream and fish surveys will be compiled annually in a system compatible and accessible through StreamNet.

579 Protect and Restore Little Salmon River (BPA)

This project is designed to protect and restore in-channel, riparian and adjoining upland habitats along the Little Salmon River. The Little Salmon River is designated as critical habitat for Snake River spring/summer Chinook salmon, steelhead and bull trout, all ESA listed species. Unique opportunities currently exist for partnering with private landowners in efforts to restore presently degraded habitat conditions. Restoration efforts will focus on restoring wetland functions and values lost due to draining, water diversions, roading, diking, and livestock grazing. Required work will include riparian restoration, cattle exclusion, streambank stabilization, ditch reclamation and culvert replacement. Restoration will provide onsite habitat improvements for aquatic and terrestrial components as well as indirect habitat improvements realized in critical downstream reaches. Restorative actions will improve riparian/wetland functions, base flow conditions, water quality, stream channel morphology, fish and wildlife habitat and aesthetic values. Current landowner relations allow for restoration of approximately 2.5 miles of river frontage. Restoration will result in increased riverine-riparian composition leading to decreased stream temperatures and stabilization of chronically eroding banks. Fisheries will benefit by decreased sediment contributions, reduced temperature and improved habitat complexity. This project compliments ongoing work in the basin being completed by the Natural Resource Conservation Service (NRCS), Bureau of Reclamation (BLM), Idaho Department of Fish and Game (IDFG) and Fish and Wildlife Service (FWS).

580 Restoring anadromous fish habitat in the Lapwai Creek watershed (BPA)

Lapwai Creek historically provided spawning and rearing habitat for A-run wild summer steelhead in the Clearwater River Subbasin (Fuller, 1986). However, the regular occurrence of extreme high runoff events and low summer flows, high summer water temperatures, poor instream/riparian cover, and siltation of spawning gravels are limiting factors in the watershed. Low stream flows and a lack of adequate multi-layered riparian vegetation along with excessive sediment have reduced the suitability of Lapwai Creek and tributaries as quality spawning and rearing habitat for anadromous and resident cold water fish. In addition, sediment, nutrients, and bacteria from existing land-use practices adversely impact water quality. The primary pollutant sources and habitat degradations are agricultural, livestock, forestry and road practices (NRCS, 2000). The large percentage of private land and low agricultural commodity prices prohibit landowners from implementing BMPs to solve problems. The Nez Perce Soil and Water Conservation District developed this proposal to enhance steelhead trout natural production within the Lapwai Creek watershed by improving salmonid spawning and rearing habitat. The project funds coordination, planning, technical assistance, BMP design and implementation, monitoring, and educational outreach to identify and correct problems associated with agricultural and livestock activities impacting water quality and salmonid habitat. The project accelerates the implementation of the Lapwai Creek Public Law 566 small watershed program. It also addresses specific needs identified in the Clearwater Subbasin Summary 2001 Draft and the 2000 Columbia River Basin Fish and Wildlife Program documents. This proposal was coordinated with the Natural Resources Conservation Service (NRCS), Idaho Fish and Game (IDFG), Idaho Department of Environmental Quality (DEQ), University of Idaho (U of I), Nez Perce Tribe (NPT), Clearwater Focus Program, Clearwater Basin Weed committee, and Nez Perce County Board of Commissioners. This proposal meets objectives outlined in the NPSWCD Resource Conservation Plan. Project implementation will reduce erosion by 30%, sediment delivered to streams by 30%, reduce stream temperature along treatment areas, and improve watershed hydrology.

581 Evaluation of 1872 Water Rights to Supplement Flows Between Basins (BPA)

The restoration of instream flows and lowering of temperatures to tributaries of the Okanogan River system play a pivotal role in the Columbia River Basin Fish and Wildlife Program. The CCT is proposing an innovative approach to assist with the supplement of stream flows as identified in RPA action 151 as providing "innovative ways to increase tributary flows by, for example, establishing a water brokerage." This tribal proposal provides a cost effective, and manageable approach, to identifying short term availability of allocated water rights, and returning them to a beneficial use to support stream flows, and reducing stream temperatures. This proposed project will assist the CCT with development of an allocated water rights database, evaluation of documented water to determine if suspension, and/or existing rights may be placed in a water trust. Allocated water transferred into this trust will then be evaluated to determine most beneficial use. This evaluation will include determining if water should be left in place to assist with recovery of stream flows, and/or be transferred to adjacent basins to supplement flows in streams in which salmon recovery efforts are ongoing, or proposed. This proposed project will assist the proposed Okanogan Basin Water Strategy Committee in determining if immediate available waters are available, as managed by the CCT, to assist with steelhead, bull trout, spring, and summer Chinook habitat recovery efforts. The CCT is committed to restoring this habitat in order to increase fisheries in the Okanogan Basin. The water rights evaluation will be conducted on those areas in the western portion of the Colville Reservation (see Figure 1), in which available waters may be able to assist with salmon recovery. Upon identification of, and implementation of transfer of water, a monitoring program will be setup to assure the most beneficial use of the water trust allocation is being used. This project is consistent with the 2000 Fish and Wildlife Program, the Okanogan Subbasin Summary, and the Implementation Plan. In addition, it promotes the natural recovery of stream flows to tributaries, and has clear quantifiable objectives, is cost efficient, and ultimately will contribute to increased tribal and non-tribal harvest opportunities through the recovery of endangered species by increasing available habitat for rearing and refugia.

582 Adult Passage Counting and Trapping at Zosel Dam (BPA)

Adult passage counting and trapping capabilities are basic tools used to estimate escapement and run timing, determine run composition, conduct biological sampling for management and research, collect broodstock, and other purposes. No such facilities exist in the Okanogan Subbasin. The Okanogan is inhabited by sockeye, summer/fall chinook, and steelhead (ESA Endangered). Upper Columbia River Spring Chinook are listed as Endangered under ESA and considered extirpated from the Okanogan River. Spring chinook reintroduction efforts are currently underway in Okanogan. All species indicated above historically ranged into Canada. Zosel Dam (rm 78) is located at the outlet of Osoyoos Lake just down stream from the U.S./Canada border. Substantial unexplained losses of adult sockeye have been documented between Wells Dam on the Columbia River and spawning grounds in Canada upstream from Zosel Dam. Mortality resulting from elevated water temperatures is one proposed explanation. Work to assess the feasibility of conducting video and hydroacoustic counts of adult passage at Zosel Dam (a non-hydroelectric facility) was conducted in the early 1990's. A primary obstacle encountered was the upstream passage of adult fish through the Zosel spillgates. The proposed project will expand upon this earlier work through the assessment of using of modern technology to conduct fish counting at this site. Specifically, this project will assess the feasibility of developing adult counting facilities at Zosel Dam to help identify sources of sockeye loss and enumerate passage of anadromous species. Adult trapping facilities will also be designed, constructed, and evaluated to allow sampling of adult fish.

583 Restore Passage on Private Lands in Beaver Creek Drainage to Benefit Spring Chinook, Steelhead Bulltrout (BPA)

Culverts and dams currently block fish passage to important tributary habitat in the in the Beaver Creek drainage. Beaver Creek is a major tributary of the Methow River located in the Methow subbasin. Spring chinook, summer chinook, steelhead, and bull trout all use the Methow River for spawning, rearing and as a migration corridor. Spring chinook are known to use the area around the mouth of Beaver Creek for rearing, and steelhead and bull trout are known to use the Beaver Creek drainage for spawning, rearing and migration. Steelhead spawn and rear in Beaver Creek from between the mouth to Frazer Creek and South Fork Beaver Creek (WSCC 2000). A 1998 inventory of fish passage barriers conducted by the Washington Department of Fish and Wildlife's Salmonid Screening, Habitat Enhancement and Restoration Division (SSHEAR) in cooperation with the Methow Wildlife Area Manager, Enforcement Program officers, and property owners, identified 55 culverts and 23 dams which created partial and full fish passage barriers (39 full barriers and 39 partial barriers) in the Beaver Creek drainage (WSCC 2000). Since that time, all known water diversions in the drainage have been screened. Restoration and preservation of this important tributary habitat is an essential component of regional efforts to recover endangered and threatened fish species in the upper Columbia River. There are 21 remaining known fish passage barriers located on private property within the Beaver Creek drainage. These barriers include 12 culverts and 9 dams, which continue to impede fish passage on Beaver Creek, Frazer Creek and Shorer Creek. Washington Department of Fish and Wildlife (WDFW) proposes to restore connectivity and access to habitat within this drainage by addressing these 21 barriers. Correction of these passage barriers will restore approximately 48,000 square meters of spawning habitat and 102,000 square meters of rearing habitat (approximately 10 miles of stream).

584 1995-004-00 Libby Mitigation Plan (BPA)

Implementation of watershed-based habitat enhancement and fish recovery actions to mitigate the losses caused by hydropower in the Kootenai subbasin. Montana Fish, Wildlife & Parks collaborates with the Tribes of Montana and Idaho, IDFG and B. C., Canada.

585 1991-019-03 Hungry Horse Mitigation - Habitat (BPA)

Mitigation for the construction and operation of Hungry Horse Dam. Implements habitat restoration, improves fish passage, protects and recovers native fish populations and reestablishes fish harvest opportunities

586 Grand Coulee (USBR)

In season coordination through TMT shapes releases from Grand Coulee in an attempt to meet spring and summer flow targets at McNary. Coordination operations through TMT in-season management process. Reclamation is currently involved in the NEPA process to prepare an EA for interim implementation of VARQ at both Libby and Hungry Horse and an EIS for long term implementation of VARQ at both projects. Implementation of VARQ at Hungry Horse and Libby could have impacts on Flood Control operations at Grand Coulee. Grand Coulee flood control requirements are dependent on upstream storage space. VARQ requires less draft at Libby and Hungry Horse so for system flood control space must be shifted to Grand Coulee. Grand Coulee summer draft limit based on the July final April-August runoff volume forecast at the Dalles. If the forecast is in excess of 92 Maf then Coulee draft limit is 1280 feet, if the forecast is less than 92 Maf the draft limit is 1278 feet.

587 Entiat IFIM Studies (USBR)

If adequate funding is available, Reclamation will participate in IFIM studies in the Entiat subbasin in FY 2003. Instream flows for the Entiat River Basin are being set by the Entiat Water Planning Unit a consensus-based group operating under State law that includes representatives from the Chelan County Conservation District, Washington State Department of Ecology, Washington State Department of Fish and Wildlife, Forest Service, and local stakeholders. The group has opted to use the IFIM method to set instream flows and is currently in the process of identifying specific tasks in a workplan and has hired a contractor to review existing data and do limited field work. This process will also be integrated with an EDT analysis being conducted in conjunction with the Yakama Nation. Some data gaps remain and some analysis of new and existing data must be performed to complete the PHABSIM portion of the IFIM. Specifically, winter temperature data is needed and a hydrographer must be hired for at least 6 months to complete the flow analysis portion of the model. At present, these activities are unfunded. This is a time critical project because the Planning Unit must complete its work, including proposing new instream flows, by the fall of 2003.

588 Lemhi Subbasin IFIM studies (USBR)

IFIM or similar instream flow methodology studies to ascertain fish flow needs and become basis for water acquisitions.

589 Banks Lake Operations (USBR)

Reduce pumping to Banks Lake in August and allow the reservoir to elevation 1565 feet, this reduces the volume pumped by about 130 kaf. Refill Banks Lake after September 1. Coordination of operations is done through TMT in-season management procedure.

590 Hungry Horse Operations (USBR)

Implemented VARQ in 2001 at Hungry Horse dam. Reclamation is currently involved in the NEPA process to prepare an EA for interim implementation of VARQ at both Libby and Hungry Horse and an EIS for long term implementation of VARQ at both projects. Hungry Horse is operated to reduce impacts to resident species. In-season coordination through in-season management process of TMT shapes releases from Hungry Horse in an attempt to meet flow targets at McNary. Operations shall follow ramping rates and other requirements set forth in the FWS FCRPS to reduce impacts to resident species as outlined in the Water Management Plan. April 10 targets may not be met in dry years as minimum flow requirements below the project could prevent Hungry Horse from meeting the April 10 target. There could also be a potential delay in refill during wet years if reaching full on June 30 would potentially result in spill. Operate Hungry Horse to reduce impacts to resident fisheries while providing flow augmentation for the mainstem Columbia River.