Assessment of Salmonids and Their Habitat Conditions in the Walla Walla River Basin within Washington

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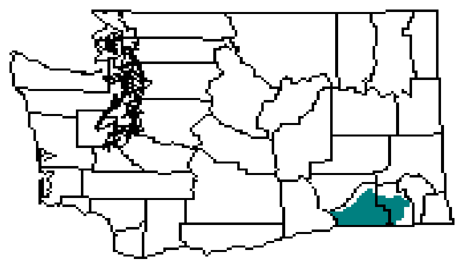
Assessment of Salmonids and Their Habitat Conditions in the Walla Walla River Basin within Washington:

2001 Annual Report



By

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Washington Department of FISH and WILDLIFE

For

U.S. Department of Energy
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John Whalen, Bill Neve, Joe Bumgarner, Mike Gembala, Mark Tuttle, and Chris Fulton reviewed this draft and provided comments for revisions. We appreciate their assistance in preparation of this report.

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Executive Summary

This study began in 1998 to assess salmonid distribution, relative abundance, genetics, and the condition of salmonid habitats in the Walla Walla River basin.

Stream flows have shown a general trend that begins with a sharp decline in discharge in late June, followed by low summer flows and then an increase in discharge in fall and winter. The Walla Walla River saw continuous overland flow from Nursery Bridge in Oregon to the Washington/Oregon stateline, for the first time in decades, due to a 2000 settlement agreement with USFWS and the irrigation districts in Oregon. Manual stream flows at Pepper bridge showed an increase in 2001 of 300-400% from July-September, over the previous 3 years. The Washington Department of Fish and Wildlife (WDFW) also cooperated with the National Marine Fisheries Service (NMFS), Deparment of Ecology (DOE), the City of Walla Walla, the Walla Walla Flood Control District, the Corps of Engineers, the U.S. Fish and Wildlife Service (USFWS), and others on a test to increase and evaluate flows through the Mill Ck flood control channel. The purpose of the test was to try and eliminate a take of listed steelhead by diverting 3-12 cfs into the flood control channel.

Stream temperatures in the Walla Walla basin were similar to those in 2000. Upper montane tributaries held max summer temperatures below 65EF, while sites in mid and lower Touchet and Walla Walla rivers frequently had daily maximum temperatures above 68EF (high enough to inhibit migration in adults and juveniles, and to sharply reduce survival of embryos and fry). These high temperatures are possibly the most critical physiological barrier to salmonids in the Walla Walla basin, but other factors (turbidity, cover, lack of pools, etc.) also play a part in fish survival, migration, and breeding success. The increased flows in the Walla Walla (due to the 2002 settlement) did not show consistent improvements in temperatures over the years, but decreases in maximum temperatures were seen at Mojonnier Rd. and Swegel Rd. The test flow in Mill Ck on the other hand produced substantial increases in water temperature (10-20EF) from the Yellowhawk diversion to Roosevelt St., reaching leathal maximum temperatures over 90EF.

Rainbow/steelhead (*Oncorhynchus mykiss*) trout represent the most common salmonid in the basin. Other salmonids including; bull trout (*Salvelinus confluentus*), chinook salmon (*Oncorhynchus tshawytscha*), mountain whitefish (*Prosopium williamsoni*), and brown trout (*Salmo trutta*) had low densities, and limited distribution throughout the basin. The 2000 settlement on the Walla Walla River seems to have had some positive effects on salmonid survival. Densities have shown increases from the Washington/Oregon stateline to Mojonnier Rd., but densities below this were inconsistent (Table 8). Fish densities in Mill Ck seem to have been negatively affected by the test flow. Some fish mortalities were likely caused by the high temperatures (85-91EF) created by the increased flow. Fish were found throughout Mill Ck in June, but after the test flow from mid June through early July few rainbow/steelhead existed from the Yellowhawk diversion to 9th Ave, and from Gose St. downstream.

Steelhead spawning surveys in Washington found 30 redds in the Walla Walla River and its tributaries, and 124 redds on the Touchet River and its tributaries. Bull trout spawning surveys in the upper Touchet River tributaries found a total of 148 redds (84 in the Wolf Fork, 16 in the Burnt Fork, and 48 in the North Fork Touchet and its tributaries). The largest number of returning adult spring chinook to the Touchet River (31 adults at the Dayton trap) in several decades prompted us to initiate spawning surveys on the upper mainstem Touchet River, the North Fork, and the Wolf Fork. A total of 32 spring chinook redds were identified with the majority (23 redds) being found on the Wolf Fork.

We recommend several changes in study emphasis for 2002, such as increasing sampling in Mill Creek.

Introduction

Concerns about the decline of native salmon and trout populations have increased among natural resource managers and the public in recent years. As a result, a multitude of initiatives have been implemented at the local, state, and federal government levels. These initiatives include management plans and actions intended to protect and restore salmonid fishes and their habitats.

In 1998 bull trout (*Salvelinus confluentus*) were listed under the Endangered Species Act (ESA), as “Threatened”, for the Walla Walla River and its tributaries. Steelhead (*Oncorhynchus mykiss*) were listed as “Threatened” in 1999 for the mid–Columbia River and its tributaries. These ESA listings emphasize the need for information about these threatened salmonid populations and their habitats.

The Washington Department of Fish and Wildlife (WDFW) is entrusted with “the preservation, protection, and perpetuation of fish and wildlife....[and to] maximize public recreational or commercial opportunities without impairing the supply of fish and wildlife (WAC 77.12.010).” In consideration of this mandate, the WDFW submitted a proposal in December 1997 to the Bonneville Power Administration (BPA) for a study to assess salmonid distribution, relative abundance, genetics, and the condition of salmonid habitats in the Walla Walla River basin.

The primary purposes of this project are to collect baseline biological and habitat data, to identify major data gaps, and to draw conclusions whenever possible. The study reported herein details the findings of the 2001 field season (March to November, 2001).

Background

The Walla Walla River and its major tributaries, including the Touchet River, comprise a watershed of 1,758 square miles (ACOE 1997) and 2,454 major stream miles (Knutson et al. 1992). The majority of the watershed (73%) lies within the State of Washington, with the remainder in Oregon (Figure 1). The Walla Walla River originates from a fine network of deeply incised streams on the western slopes of the Blue Mountains. The Touchet River originates from similar streams on the northwestern slopes of the Blue Mountains, and also from seasonal streams draining Palouse hillsides to the north. The Walla Walla River drains into the Columbia River near Wallula Gap, about 21 miles above McNary Dam and 6 miles above the Oregon border. The Touchet River drains into the Walla Walla River just west of the town of Touchet, WA.

Historic and contemporary land–use practices have had a profound impact on the salmonid species abundance and distribution in the watershed. Fish habitat in area streams has been severely degraded by urban and agricultural development, grazing, tilling, logging, recreational activities, and flood control. Agricultural diversions have severely impacted stream flows in the Walla Walla River since the 1880s (Nielson 1950). Nearly all (99%) of the surface water diversions within Washington are for the purpose of irrigation (Pacific Groundwater Group

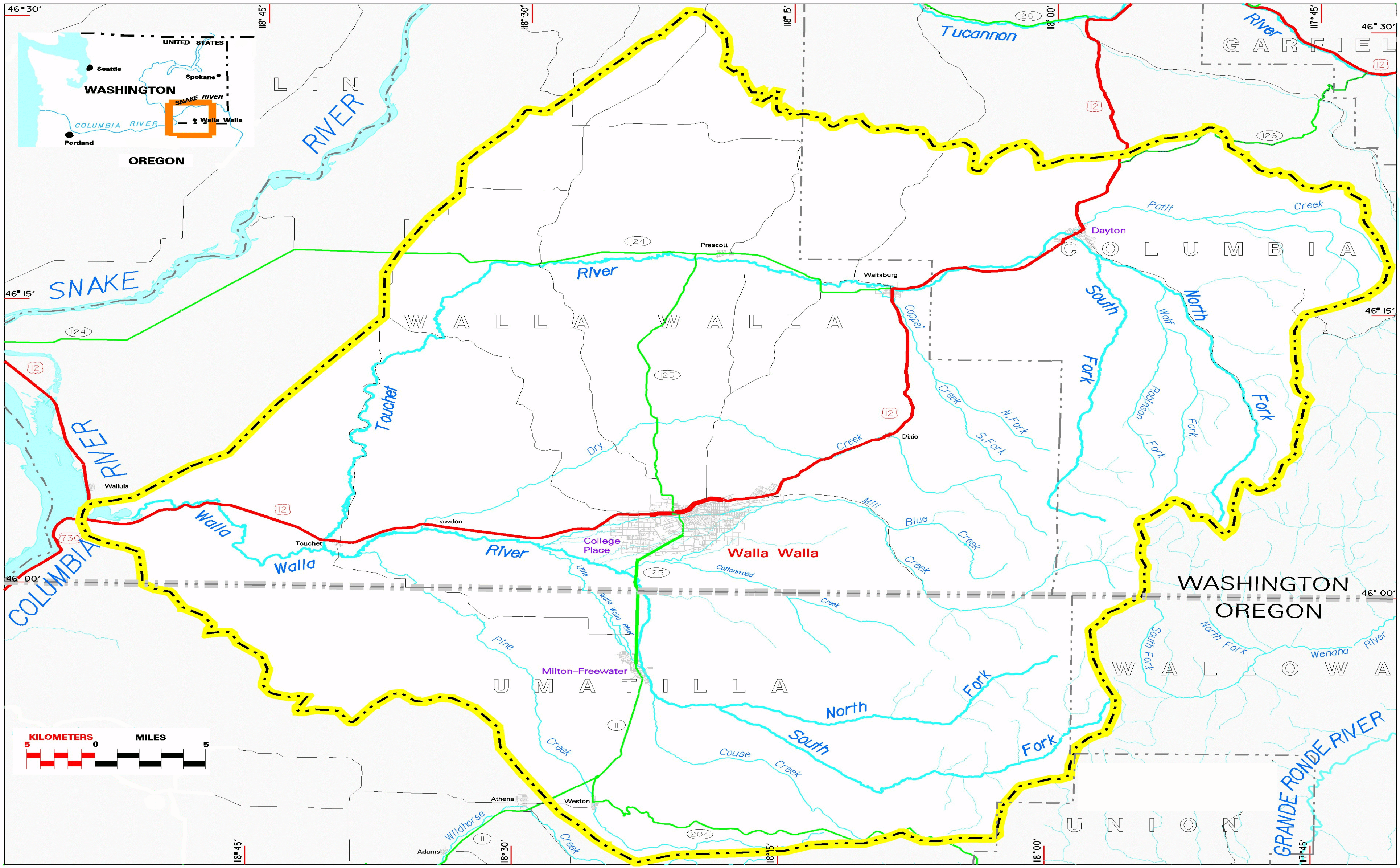


Figure 1. Walla Walla watershed (modified from map courtesy of USACE, Walla Walla District).

1995). The reduced stream flows created by irrigation withdrawals adversely impact salmonid survival within the basin. Additionally, many unscreened or partly screened diversions and fish passage barriers exist within the basin.

Out-of-basin impacts to local fish populations have been substantial. Salmon migrating to or from the ocean must pass through four dams and reservoirs in the Columbia River before reaching their destination. Juvenile and adult salmonid mortalities occur as they pass through each reservoir or dam. Other impacts include over-harvest, habitat destruction in the lower Columbia River and estuaries, predation, and industrial pollution.

Historically the basin probably produced substantial runs of both spring chinook (*Oncorhynchus tshawytscha*) and summer steelhead. The last substantial run of wild chinook took place in 1925; thereafter chinook populations continued a precipitous decline, and the species is considered extirpated in the basin (Nielson 1950, ACOE 1997). Anecdotal accounts and reports of historic fisheries in adjacent basins, indicate that chum (*Oncorhynchus keta*) and coho (*Oncorhynchus kisutch*) could have occurred in substantial numbers in the Walla Walla Basin (Pirtle 1957), but little written documentation exists. Endemic steelhead persist throughout much of the basin, but the population is considered depressed (WDF and WDW 1993). Historically as many as 300,000, and presently as many as 225,000, non-endemic hatchery steelhead (Lyons Ferry stock) were released annually in the middle Touchet and lower Walla Walla rivers under the Lower Snake River Compensation Program (LSRCP) to provide harvest mitigation for the four lower Snake River dams.

Not all native salmonids in the basin are anadromous. Mountain whitefish (*Prosopium williamsoni*), bull trout and rainbow/redband trout (*Onchorhynchus mykiss*) exist within the basin. However, only rainbow/redband trout retain a wide distribution. In the past, bull trout are thought to have been widely distributed in the basin. Currently, bull trout distribution is generally limited to montane upper tributaries of the Touchet River, Walla Walla River, and Mill Creek (Mongillo 1993). However, bull trout are known to migrate into the middle or lower reaches of these rivers during the winter months. Many factors have led to the decline of bull trout in southeast Washington. Damaged riparian vegetation, increased sedimentation, and decreased water flows have resulted in elevated water temperatures beyond the tolerance of this cold water species (Mongillo 1993). Introduced rainbow trout or brown trout (*Salmo trutta*) may have increased competition or predation for bull trout.

Several non-native fish species have been introduced to support recreational fishing, or they have strayed into the basin. The Washington Department of Game (now WDFW) began stocking brown trout in the Touchet River in July, 1965. Stocking of brown trout was discontinued in 1999 due to concerns about competition, hybridization, and predation with native bull trout, steelhead, or rainbow/redband trout. Common carp (*Cyprinus carpio*) were introduced as early as 1884 (Walla Walla Daily Journal 1884). Channel catfish (*Ictalurus punctatus*), smallmouth bass (*Micropterus dolomieu*), and bluegill (*Lepomis macrochirus*) are some of the warm water fish that now occur in the lower basin. Additionally, in 1999, three-spine stickleback (*Gasterosteus aculeatus*) were found in the Walla Walla River by WDFW personnel involved with this project.

Study Purpose and Objectives

The purpose of this study is to determine fish passage, rearing, and spawning conditions for steelhead and for potential reintroduction of chinook salmon, and to assess steelhead and bull trout distribution, densities, habitat, and genetic composition in the Walla Walla watershed.

Specific objectives and tasks were outlined in WDFW's proposal and statement of work to the Bonneville Power Administration (BPA Project # 199802000). Some tasks had to be scaled back or postponed. Multi–year study objectives include:

1. Assess baseline habitat conditions for salmonids in the Washington portion of the Walla Walla watershed;
2. Determine salmonid distribution and relative abundance in the Washington portion of the Walla Walla watershed; and
3. Identify genetic stocks of steelhead and bull trout in the Walla Walla watershed.

Specific objectives and tasks were outlined in the statement of work. Tasks included:

- Establish constant recording temperature and flow data loggers in the Walla Walla River basin, to identify available water, as well as temperature limitations for salmonid passage, spawning and rearing;
- Conduct biweekly manual stream flow and temperature measurements to calibrate the instream monitor data outputs, and to provide data for reaches that did not have instream discharge monitors in place;
- Monitor water quality by sampling dissolved oxygen, pH, turbidity, and conductivity (This task has been deferred);
- Conduct electrofishing to determine salmonid distribution, and abundance;
- Conduct snorkel surveys during the spring and summer to supplement electrofishing data and for seasonal density comparisons;
- Conduct general habitat surveys in portions of the stream with potential for salmonid use to quantify habitat conditions and identify limiting factors (This task has been deferred);
- Conduct steelhead and bull trout spawning surveys to determine spawning timing and distribution, and to establish an index of relative abundance; and
- Collect tissue samples from bull trout and steelhead for genetic analyses.

Methods

Study Area

The study area encompasses the greater Walla Walla River basin in Washington State (Figure 1). The Walla Walla River, the Touchet River, and Mill Creek are the major rivers within the basin. The primary study reaches in 2001 were the Walla Walla River in Washington, Mill Creek, and the Touchet River and their tributaries.

Stream Reaches

Representative stream reaches were identified based on general physical characteristics and readily identifiable landmarks. General physical characteristics included: slope, width, depth, and temperature; as well as, predominant adjacent land uses. Landmarks included towns, roads, and bridges.

Individual Site Selection

Most of the study streams are in private ownership, therefore it was necessary to obtain permission from landowners to access potential sites. Owners of property bordering the study streams were identified from county assessment records and contacted in person or by telephone. For convenience, public land was utilized whenever possible. Study sites were distributed to comprehensively cover the study area (Appendix A), and sites are listed and identified in order from upstream to downstream.

River miles were determined by measuring 1:24000 USGS topographic maps with a digital map wheel. River miles were determined by measuring the distance between the confluence of each stream and the study site. These locations should be considered approximate due to the limited precision of this method.

Electrofishing sites were selected randomly from access areas. Selections of top and bottom net locations were also randomized. Site lengths sometimes had to be modified to avoid unsuitable stream features, such as deep pools, rapids, multiple channels, and/or for safety concerns.

Snorkeling sites were designed to extend and compliment the area surveyed by electrofishing. Sites were located using the same randomization process used for establishing electrofishing sites.

Habitat Assessment

Stream Flows

Stream discharge was measured using two methods. Manual flow measurements were taken at selected sites according to standard techniques (Armour and Platts 1983) using a Swoffer model 2100 flow meter. Discharge was calculated in cubic feet per second (cfs) with Quattro Pro© spreadsheets. The second method involved the use of continuous flow data loggers (Unidata America, Model KB/DSP 128K). The monitors were placed at four sites on the Walla Walla River, two sites on Yellowhawk Creek, two sites on the lower Touchet River, and one site on lower Mill Creek (Appendix A, Figure 2). WDFW contracted with the Washington Department of Ecology (WDOE) to maintain the monitors and collect the data. Manual flow measurements were taken approximately every two weeks by WDFW near each of the flow monitors to correlate the discharge and stage readings recorded by the monitors. An index site was a location where discharge measurements were taken approximately every two weeks, compared to periodic flow sites where flow measurements were only taken occasionally (Appendix A, Figure 2).

Stream Temperatures

We used three methods to collect water temperatures. Manual water temperature (EF) was measured at each site using standard field thermometers. The second method involved the use of temperature data loggers (Onset Corporation, Optic StowAway, or TidbiT Temp Data Logger®), which were set to continuously measure temperatures in EF at 30 minute intervals. The monitors were placed at sites throughout the Walla Walla River basin (Appendix A, Figure 3). WDFW maintained the temperature monitors and downloaded the data using an Optic Stowaway Shuttle®. Temperature data was downloaded from the shuttle into Boxcar 4.0 software. Boxcar 4.0 was used to calculate daily minimum, maximum, and mean temperatures, which were exported to Quattro Pro spreadsheets. Data in Quattro Pro was used to make graphs showing minimum, maximum, and mean temperatures. The third method involved the use of continuous flow and temperature data loggers (Unidata America, Model KB/DSP 128K). The monitors collect both stream discharge (water stage (based on pressure)) and temperature data every 15 seconds and stores the data every four hours as averages for discharge and minimum, maximum, and mean temperatures. The monitors were used to collect temperatures as a substitute for the stowaway temperature loggers at their respective sites (Appendix A, Figure 3). The accuracy of field thermometers and data loggers was evaluated using a laboratory calibrated thermometer (Kessler Instruments).

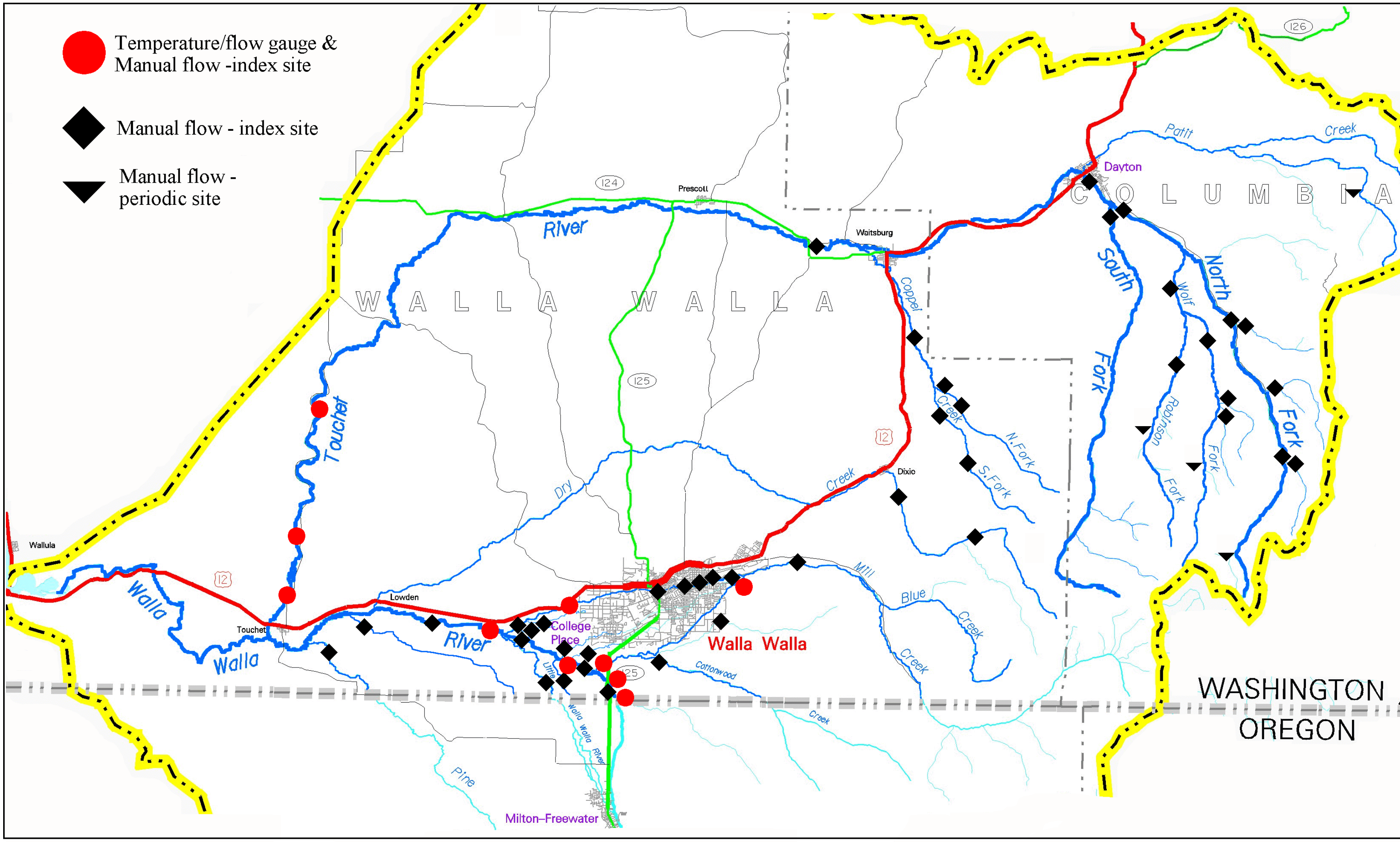


Figure 2. Relative locations of flow monitoring sites in the Walla Walla basin, 2001.

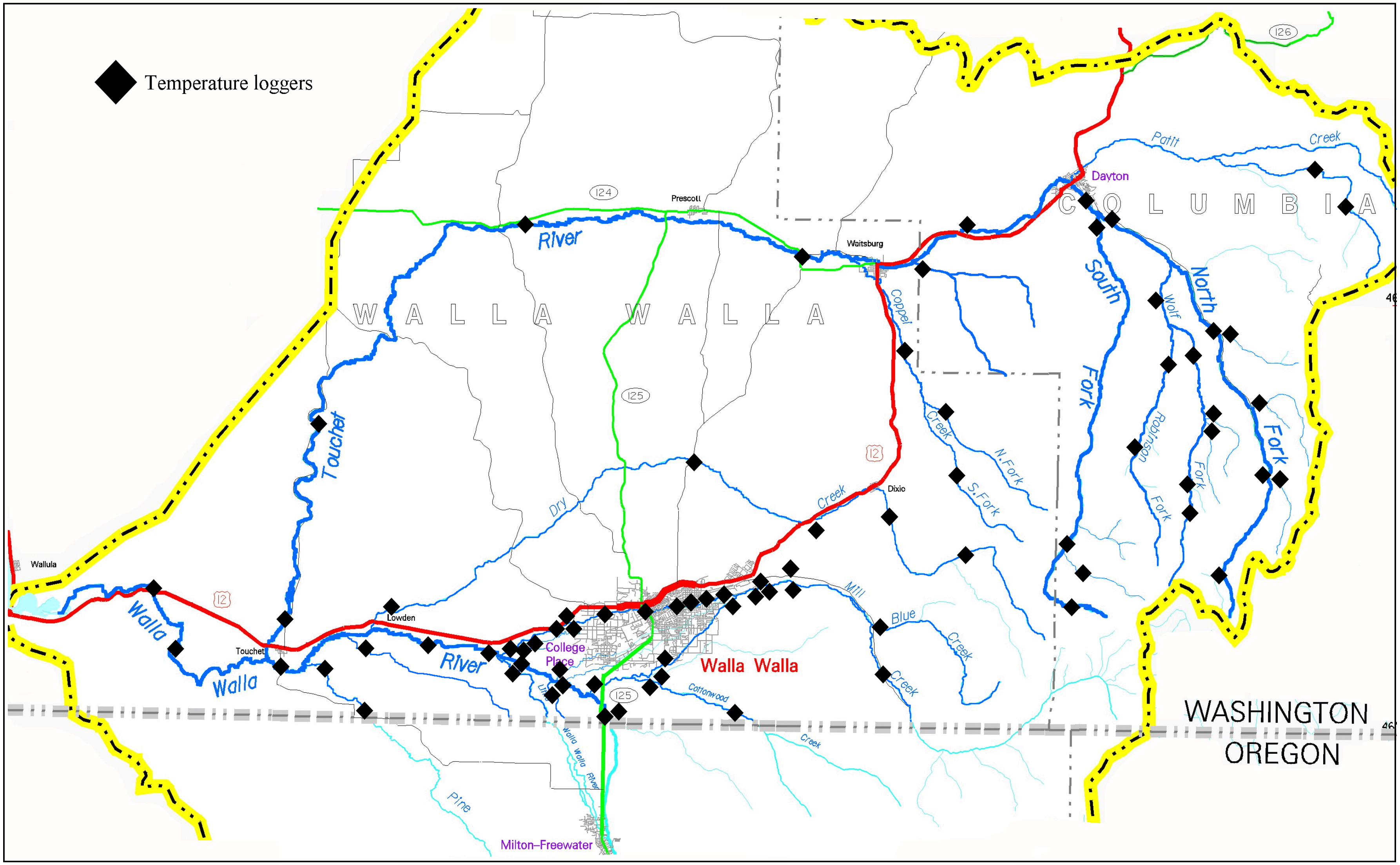


Figure 3. Relative locations of temperature logger sites in the Walla Walla basin, 2001.

Limiting Factor Identification

One of the study goals was to identify and document physical barriers to salmonid passage, spawning and rearing. Field personnel noted the presence of potential barriers and provided the information to local biologists to coordinate habitat rehabilitation efforts. The activity of two major irrigation diversion structures, Hofer Dam on the Touchet River, and Burlingame Diversion on the Walla Walla River, were also noted throughout the season.

Physiological barriers to salmonid passage and survival, in the form of excessive temperatures, inadequate flows, and degraded habitat were also identified by examining tables and graphs of data collected by instream monitors and manual sampling. Maximum temperatures, as well as the number of days with temperatures exceeding 75EF (lethal to salmonids if prolonged), and presence or absence of salmonid fishes at study sites, were factors taken into consideration.

Fish Stock Assessment

Distribution and Abundance

Electrofishing

A Smith-Root Model 11A or 12B electrofishing backpack unit was used to collect fish so we could calculate densities at various study sites in the Walla Walla basin (Figures 4 and 5). We used pulsed DC (direct current) between 300 and 600 volts. Sites were delimited by block nets spanning the channel, usually placed approximately 30 meters apart. Block nets prevented fish from entering or leaving the site, so that densities could be calculated (Platts et al. 1983). The operator usually began at the upstream net and worked downstream, covering the entire wetted width. In sites with heavy sedimentation the operator would begin at the bottom net and work upstream to maintain water clarity. One "pass" was completed when the net opposite the start was reached. All sites received at least two sequential passes. A 60% reduction was required between the first and second passes for each salmonid species and estimated age class. If the 60% reduction was not met, a third pass was conducted. Stunned fish were collected with dip nets and placed in buckets until they could be sampled for lengths and weights. Collected fish were anesthetized with FINQUEL® (MS-222 tricaine methane sulfonate). Once anesthetized the following information was collected; identification (genus or species), weight (g), and fork length (mm).

Fork lengths collected during quantitative electrofishing were used to create length frequency histograms. The histograms were used to determine age classes (Mendel et al. 1999). These age class delineations were checked against ages determined from reading fish scales that were collected from several of the stream reaches. Age class groupings were specific for each stream reach.

A removal–depletion software program developed by the U.S. Forest Service (Van Deventer and Platts, 1983) was used to calculate population densities (#/100 m^2) for each salmonid species, by age class. The average weight (grams) of each age class can be multiplied by its density to calculate biomass (g/100 m^2) per age class.

Area sampled was determined by multiplying site length by the average of four or more site width measurements. A brief description of the riparian, bank stability, substrate, pools/riffle ratio, and the presence of large organic debris (LOD) was recorded for each site.

Fish identification included genus and species for all *Salmonidae* (Salmonids) and *Cyprinidae* (minnows); and genus only for *Cottidae* (sculpins), *Catostomidae* (suckers), and *Petromyzontidae* (lamprey). Our sampling protocol was to collect and measure 10-20 of each non–salmonid species at each site. Non–salmonid species were assigned a relative abundance ranking value based on general observations made during electrofishing (Table 1).

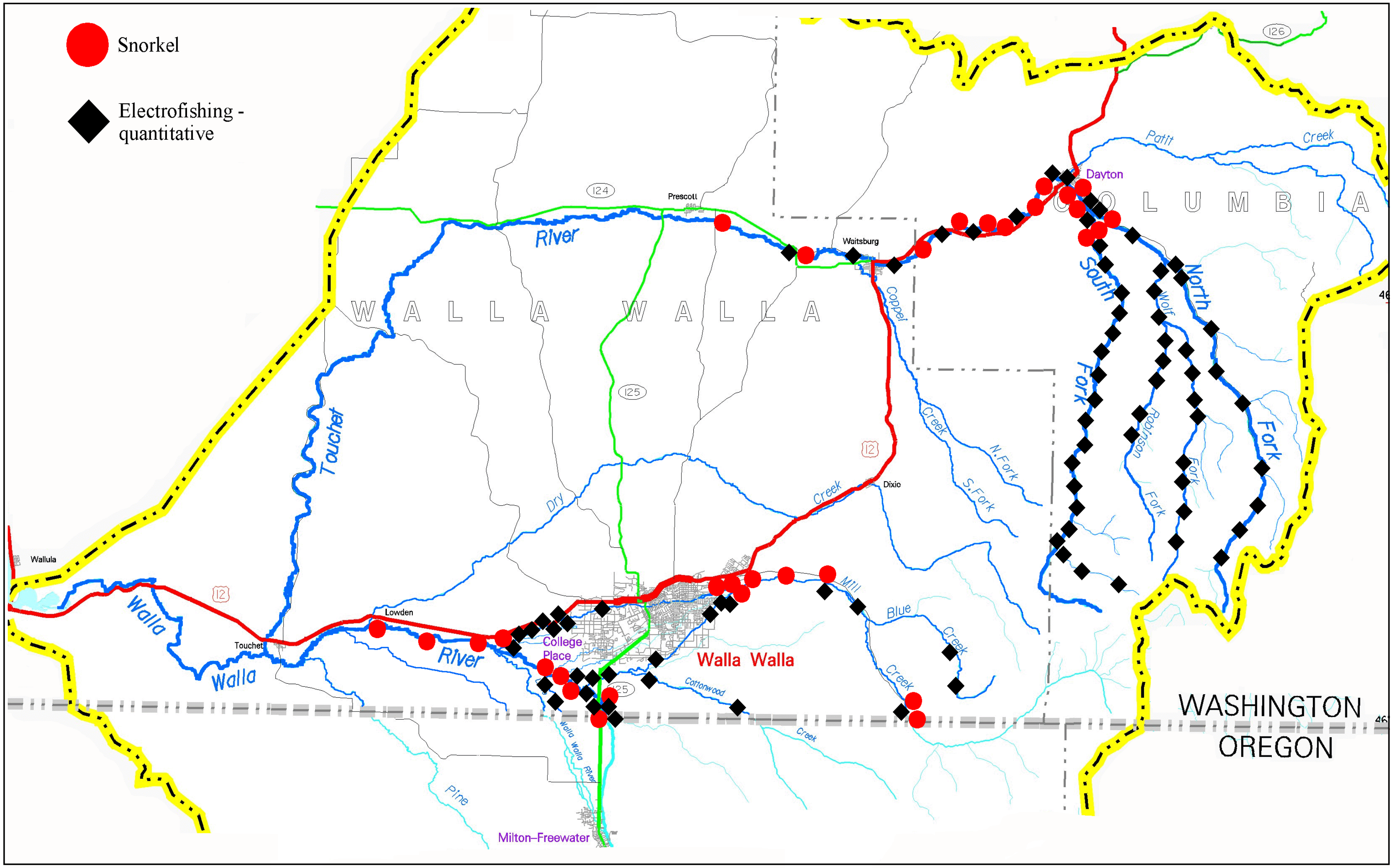


Figure 4. Relative locations of quantitative electrofishing and snorkeling sites in the Walla Walla basin, 2001.

Relative abundance for non–salmonid species were treated semi–quantitatively. For each species at each site, a relative abundance was determined. The relative abundance was assigned a corresponding ranking value (Table 1). Ranked values were averaged to determine a relative abundance for each species per designated reach. Relative abundance data were tabulated to provide qualitative comparisons between reaches and species.

Table 1. Categories of relative abundance (per site) for non–salmonids.

Category	Count (individuals seen)	Ranking Value
Absent	**0**	**0**
Rare	**1-3**	**1**
Uncommon	**4-10**	**2**
Common	**11-100**	**3**
Abundant	**100+**	**4**

We also conducted "qualitative" electrofishing surveys in several sites in the Walla Walla River and its tributaries, Mill Ck., and in the Touchet River and one of its tributaries (Appendix A, Figure 5). These surveys enabled us to cover large areas relatively quickly as they did not entail the use of block nets or repeat passes with the electrofisher. We electrofished while moving upstream and capturing fish to determine species presence, size of fish (age class), and their relative abundance. We also noted the presence or general abundance of non–salmonids. This method supplemented our intensive "quantitative" electrofishing surveys and our snorkel surveys to provide a more complete view of salmonid distribution and abundance.

Snorkeling

Snorkeling sites were generally between 90 and 120 meters in length. Snorkelers moved upstream, counting and identifying species, and estimating the age class of all salmonid fishes. Counts were recorded on PVC armbands. General abundance of non–salmonids were also noted. Snorkel surveys could be performed in deeper water, braided channels, and at other locations where electrofishing was not feasible or effective. Another advantage of snorkeling was that we were able to cover a large stream area in a short period of time and still provide density estimates. Snorkel surveys were conducted at selected sites both in the spring and summer for comparison of salmonid distribution and densities temporally and by geographic location (Appendix A, Figure 4).

Salmonids observed during snorkel surveys were classified by age class based on their estimated size. Snorkelers reported genus classifications for all non–salmonid fish. Age class and relative abundance of non–salmonids were estimated and recorded. Site length and width measurements were taken to calculate the area surveyed. Brief habitat descriptions of each site were recorded .

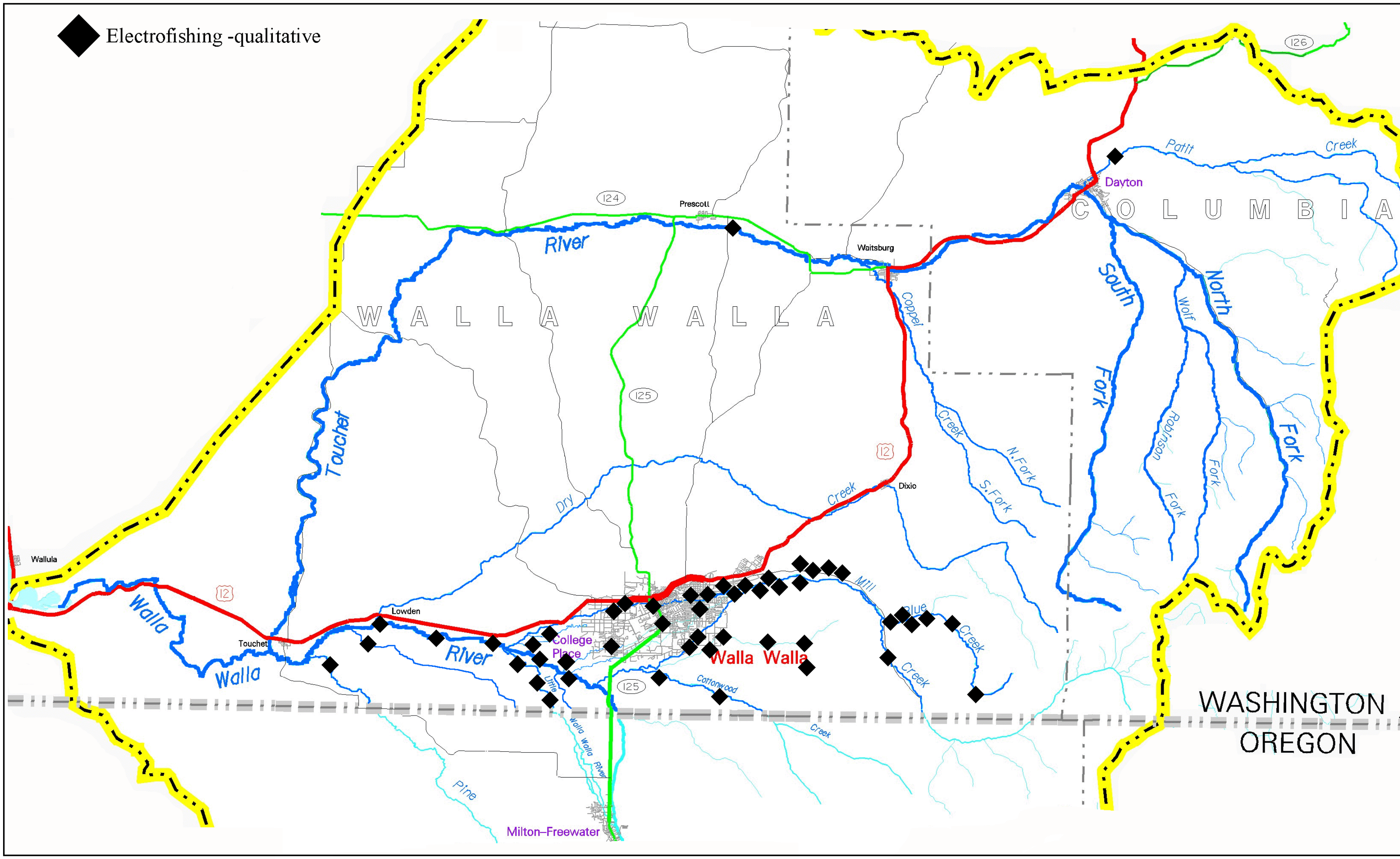


Figure 5. Relative locations of qualitative electrofishing sites in the Walla Walla basin, 2001.

Spawning Surveys

Spawning surveys were conducted in the same manner for both steelhead and bull trout. Surveyors generally walked downstream and visually identified spawning fish and/or redds (nests). Redds were usually readily identified, characterized by an area of clean gravel with a large depression and mound. Each redd observed was assigned a two–part identification (ID) code representing the survey number and the redd number. A flag was hung in adjacent vegetation, and marked with the ID code, the date, and the surveyor's initials, so the same redd would not be counted in subsequent surveys. Each redd was recorded in a notebook with the date, time, ID code, general description of the redd, size, score of its observability and its location. Counts were tallied for each designated stream reach.

Genetic Sampling

Sampling of salmonid tissues was undertaken by WDFW personnel for later genetic analyses. Fin clips or opercle punches were obtained from adult steelhead, bull trout, adult spring chinook, and adult coho. Tissue samples were placed in tubes of 95 % ethanol for preservation, labeled and retained or transported to the WDFW Genetics Stock Identification Lab in Olympia. Fin clips provide sufficient DNA material for genetic analysis, without killing the fish (Olsen et al. 1996). A non–lethal method of genetic sampling was preferred due to the current ESA listings for bull trout and wild steelhead in the Walla Walla River basin.

Results and Discussion

Habitat Assessment

Stream Flows

Stream flows in the Walla Walla River basin follow a fundamental pattern initiated by a rapid decline in discharge in late June, followed by low summer flows and increased discharge in the fall and winter. The reduced flows represent the end of the spring runoff, water diversions for agricultural irrigation, and the general lack of summer precipitation in the basin. The recharge in the fall is generated because of fall precipitation and after most water diversions are discontinued or reduced. However, sites in proximity to major irrigation facilities exhibited more erratic stream flow patterns (Appendix B). Irrigation withdrawals included pumps, "push–up"dams for gravity diversions and irrigation district dams and canals.

Stream flows at our continuous monitoring sites below major irrigation diversions at Peppers' Bridge and Mojonnier Rd were very erratic compared with the flows near the Oregon Stateline and Detour Rd.(Figs. 6-9). Yellowhawk Creek flows were also slightly erratic because of irrigation demands (Figs.10, 11). Lower Mill Creek flows remained low (≤ 5 cfs) and relatively consistent until October (Fig. 12). The Touchet River flows at Simms Rd were about 20 cfs and at Cummins Rd they were low (generally ≤ 5 cfs) and relatively constant throughout most of the summer (Figs. 13, 14).

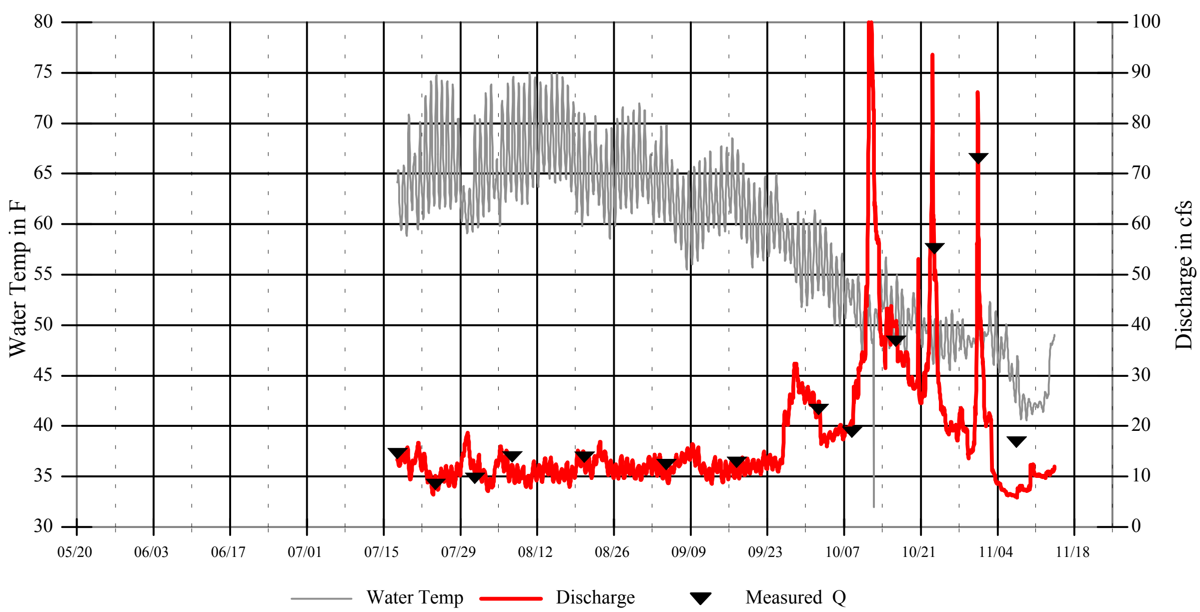


Figure 6. Walla Walla River stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, just below the Washington/Oregon stateline (WW-1), 2001. (Measured Q = manual stream discharge measurement)

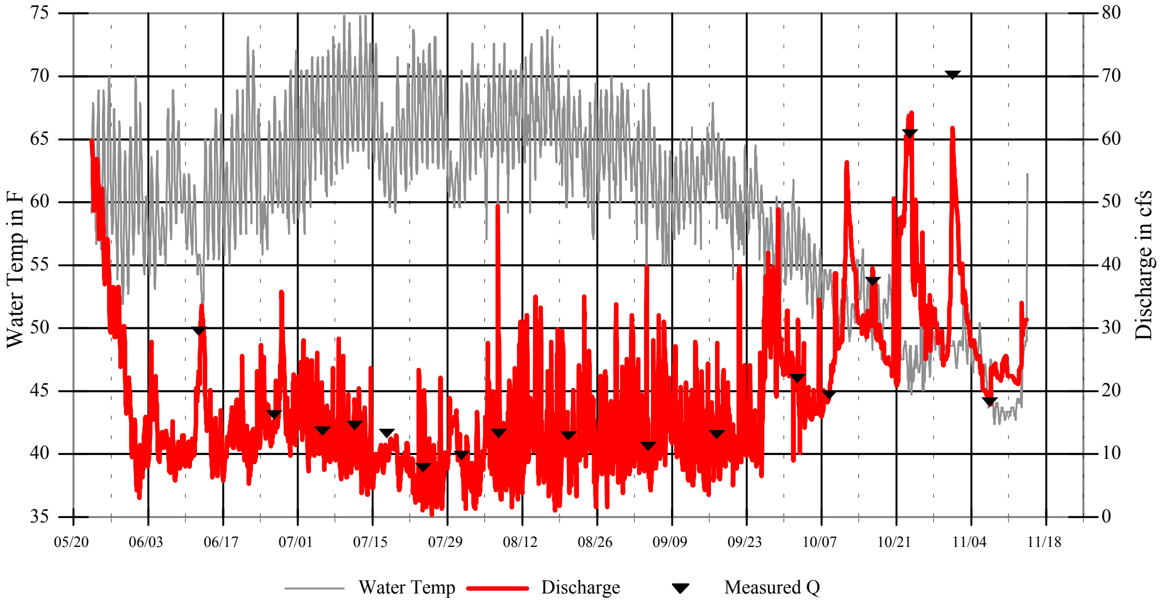


Figure 7. Walla Walla River stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, 0.7 mi below Pepper Rd. bridge (WW-4), 2001. (Measured Q = manual stream discharge measurement)

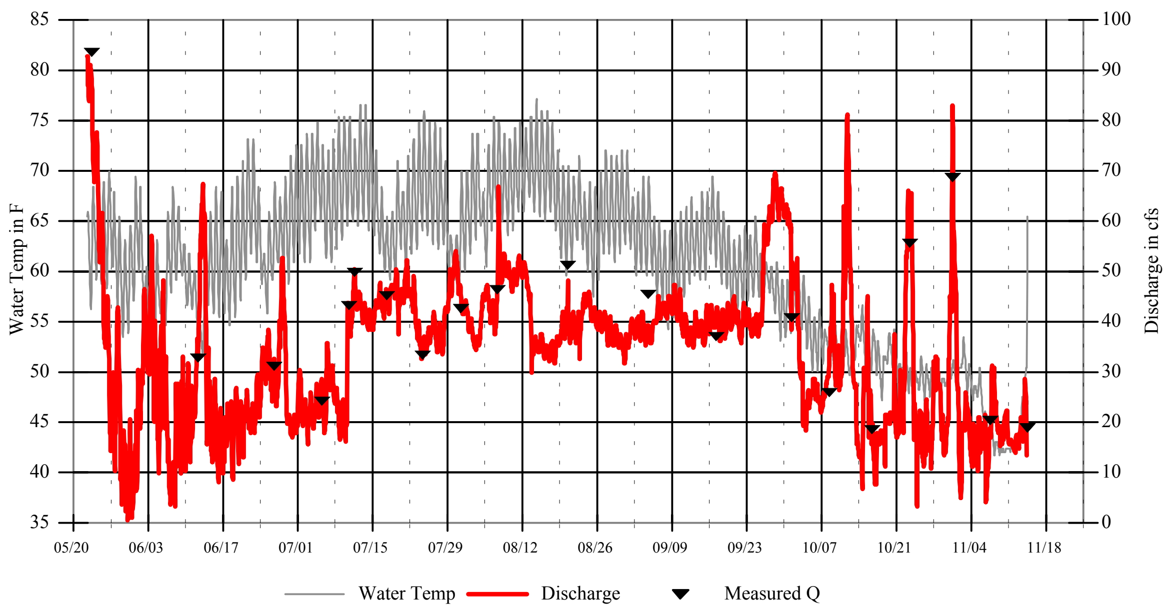


Figure 8. Walla Walla River stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, below Mojonnier Rd. and Burlingame Dam (WW-8), 2001. (Measured Q = manual stream discharge measurement)

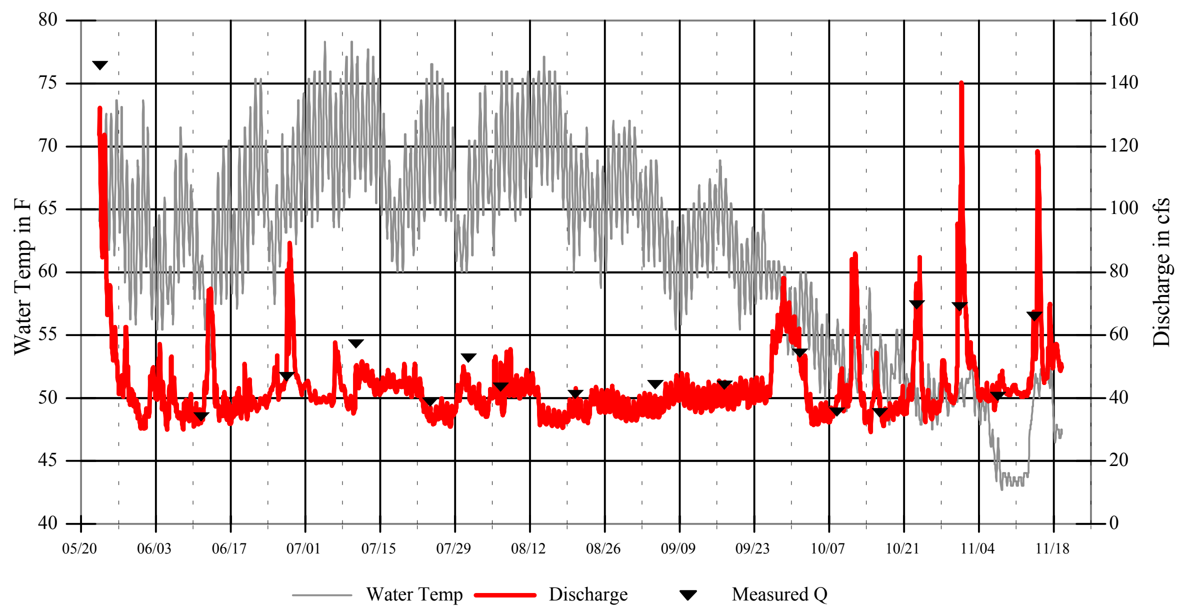


Figure 9. Walla Walla River stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, above Detour Rd. (WW-9), 2001. (Measured Q = manual stream discharge measurement)

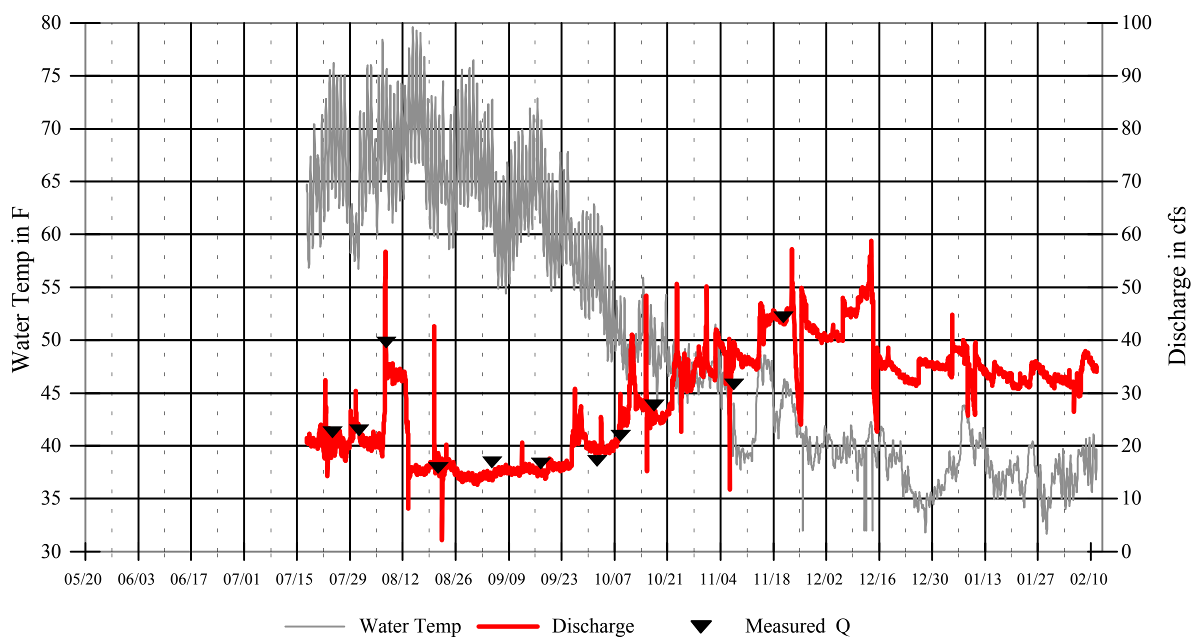


Figure 10. Yellowhawk Creek stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, below Yellowhawk diversion (YC-1), 2001 and into February 2002. (Measured Q = manual stream discharge measurement)

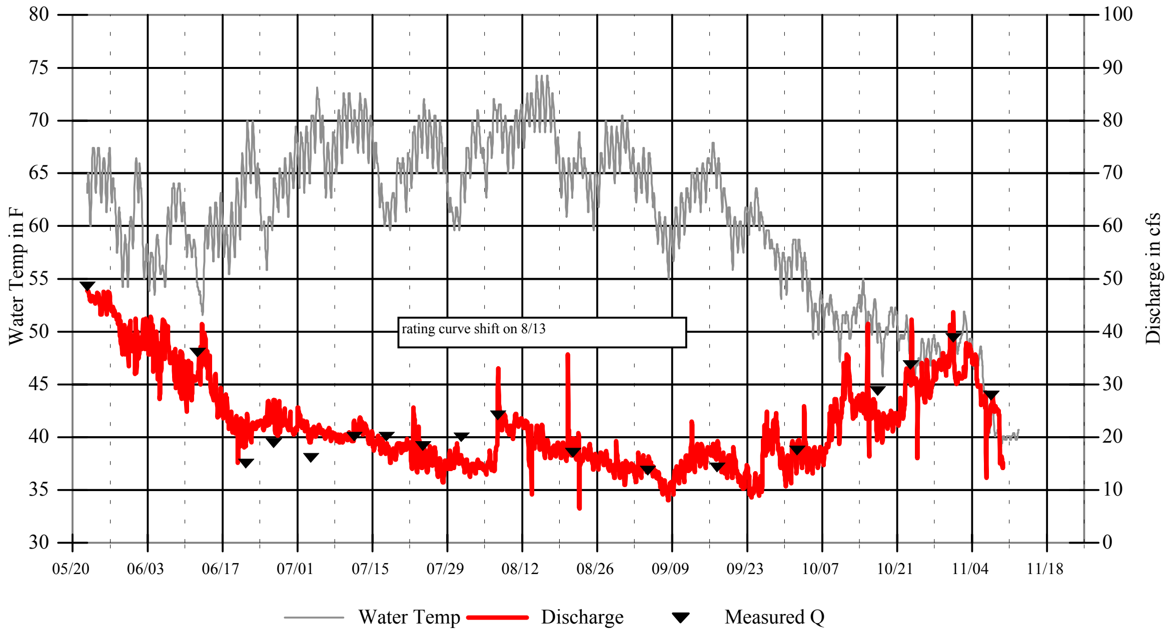


Figure 11. Yellowhawk Creek stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, near the confluence with the Walla Walla River (YC-7), 2001. (Measured Q = manual stream discharge measurement)

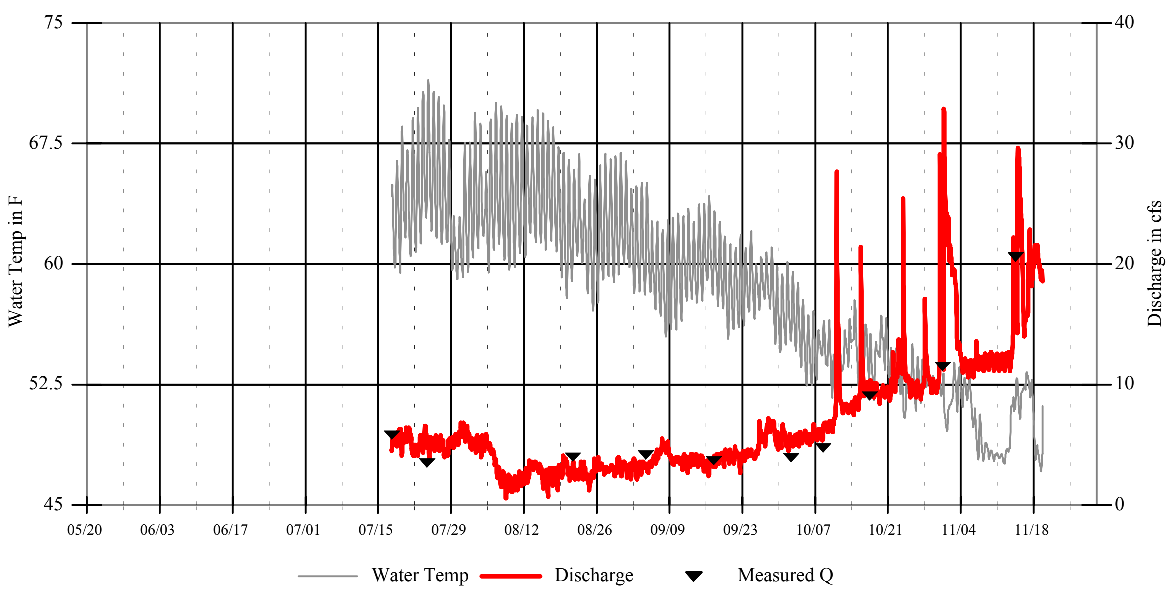


Figure 12. Mill Creek stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, below Wallula Rd. bridge (MC-32), 2001. (Measured Q = manual stream discharge measurement)

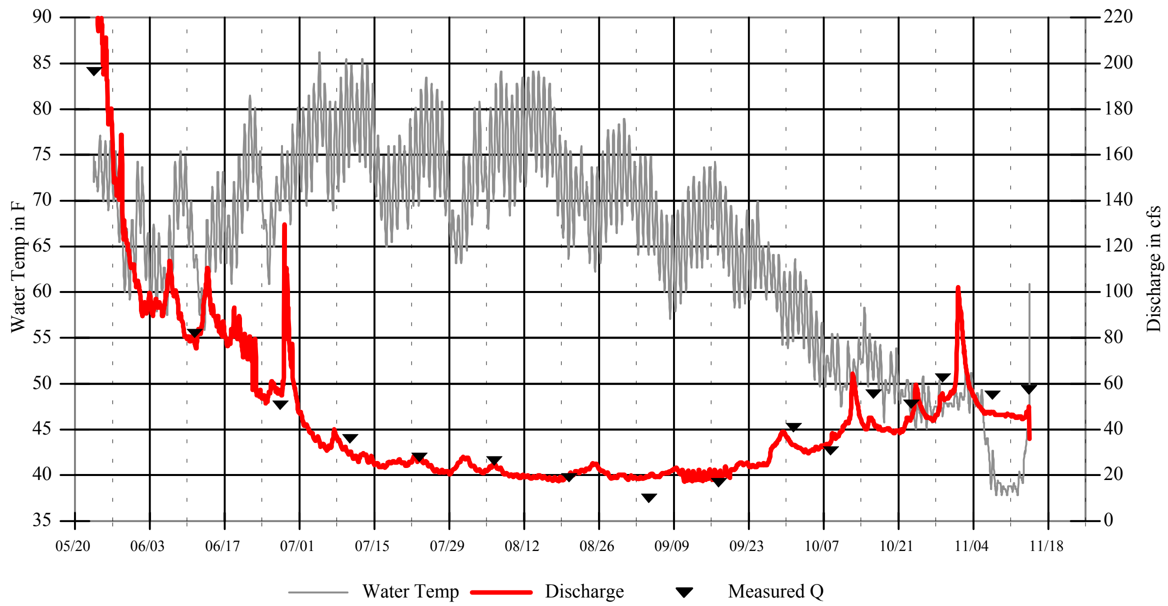


Figure 13. Touchet River stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, below Simms Rd. bridge (TR-20), 2001. (Measured Q = manual stream discharge measurement)

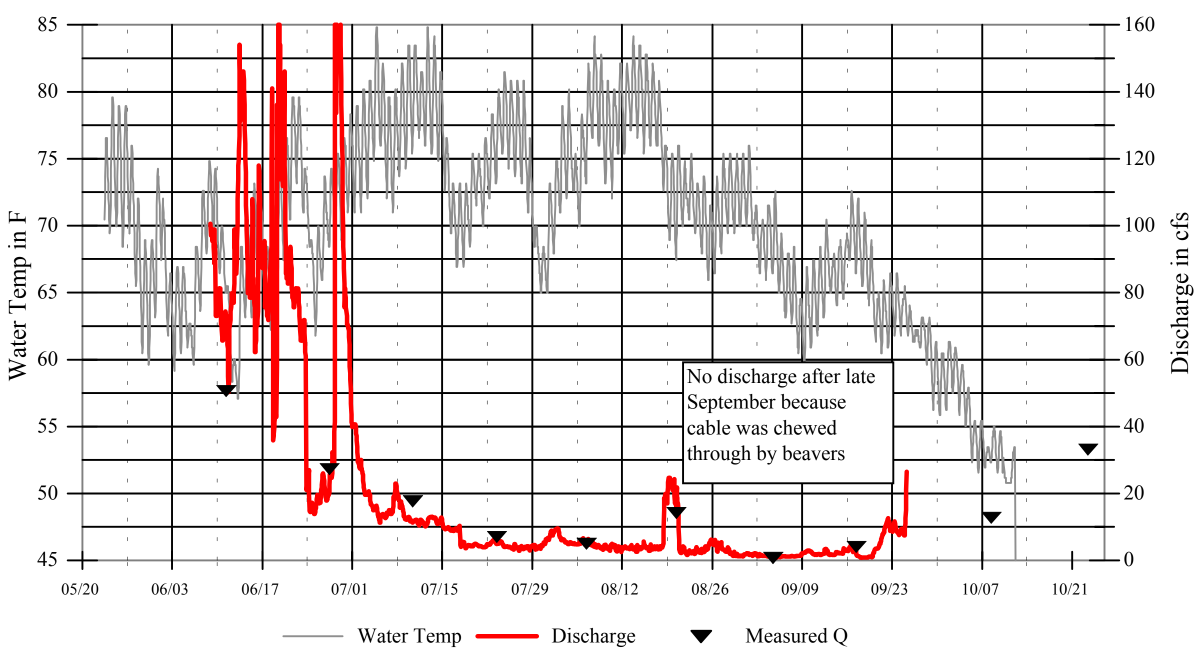


Figure 14. Touchet River stream discharge (CFS) and daily maximum water temperatures (EF) every four hours, above Cummins Rd. bridge (TR-22), 2001. (Measured Q = manual stream discharge measurement)

Walla Walla Settlement Agreement

In 2000, under a settlement agreement with the U.S. Fish and Wildlife Service (USFWS), irrigation districts in Oregon maintained a minimum instream flow of 13 cfs at Nursery Bridge in Milton Freewater, OR. In 2001 the minimum instream flow at Nursery Bridge was increased to 18 cfs. Nursery Bridge is approximately four miles upstream of the Washington state line. The additional water, in 2000, made an immediate impact in Oregon by considerably reducing the historic dewatered area from Nursery Bridge downstream to below Tumalum Bridge, near the stateline. With the additional water available in 2001 the Walla Walla River saw continuous overland flow from Nursery Bridge to the Washington/Oregon stateline for the first time in decades. Manual stream flow measurements taken at Pepper Rd. bridge (just below the Oregon State line) have shown little or no increase in stream flows until July-September 2001 when flows increased 300 - 400% over summer flows documented the previous three years. The mean manual flow measurements show that between mid-July and the first of October stream flows were; between 3.06 and 3.26 cfs in 1998, from 2.7 to 3.7 cfs in 1999, 3.8 to 5.0 cfs in 2000, and 12 to13.6 cfs in 2001 (Appendix F, Table 2). Also, under the auspices of the settlement agreement, Gardena Farms Irrigation District(ID), in Washington, maintained at least a 10 cfs streamflow past Burlingame Dam (Mojonnier) during the spring, early summer, and fall irrigation season. In 2001 the Gardena Farms ID maintained an instream flow of 14 cfs. Flows have shown a general increase from 1999 to 2001 at continuous flow monitoring sites near Mojonnier and Detour roads (Table 3), especially in July and August. Manual flow measurements show consistent increases in August and September (Table 2).

Table 2. Mean streamflows in cfs (standard deviation, number of samples) taken manually in the Walla Walla River, 1998-2001.

	Pepper Rd.	Above Hwy. 125	Mojonnier Rd.	Swegel Rd.	Detour Rd.	McDonald Rd.[c]
1998[a]						
July	3.16[b]		32.77 (3.285,2)	23.53 (14.303,3)		4.51 (0.415,2)
August	3.26 (0.165,2)		25.46 (0.315,2)	24.44 (2.780,2)		3.98 (3.980,2)
September	3.06 (0.265,2)		31.66 (3.355,2)	31.42 (5.865,2)		13.64 (3.670,2)
October	3.04 (0.180)		7.78 (5.945,2)	14.38 (6.055,2)		

[a] No data collected in June in 1998
[b] Only one sample during the month, so no mean or standard deviation could be calculated.
[c] Mean cfs (SD,N) was only collected at McKay Rd (0.6 miles above the mouth of Pine Ck). in 1998 and was; July--3.80 (N/A), August--0.00 (N/A), September–8.82 (6.395,2), October–4.20 (3.435,2).

Table 2 (Cont.) Mean streamflows in cfs (standard deviation, number of samples) taken manually in the Walla Walla River, 1998-2001.

	Pepper Rd.[c]	Above Hwy. 125	Mojonnier Rd.	Swegel Rd.	Detour Rd.	McDonald Rd.
1999						
June	44.2 (34.300,2)		128.53 (122.602,3)	126.73 (118.189,3)	180.40 (163.515,3)	
July	3.7 (1.400,2)		20.60 (5.100,2)	20.60 (3.100,2)	23.00 (3.800,2)	6.73[b]
August	3.1[b]		23.80 (1.200,2)	24.25 (0.650,2)	31.6 (1.000,2)	10.25 (1.150,2)
September	2.7 (0.000,2)		23.90 (2.200,2)	28.95 (2.350,2)	32.20 (3.200,2)	13.30 (1.200,2)
October	2.65 (0.050,2)		18.30 (9.659,3)	20.4[b]	31.8[b]	15.8[b]
2000						
June	42.4 (36.900,2)		57.55 (47.050,2)	42.9[b]	97.20 (74.500,2)	36.6[b]
July	3.8 (0.200,2)		29.30 (12.900,2)	22.2[b]	32.05 (6.450,2)	5.9[b]
August	4.1[b]		31.05 (1.150,2)	32.90 (3.800,2)	33.70 (4.400,2)	14.40 (3.400,2)
September	5.00 (0.539,4)		48.35 (0.650,2)	55.55 (0.750,2)	57.45 (2.450,2)	37.65 (3.350,2)
October	52.35 (28.650,2)		54.95 (38.450,2)	60.40 (36.700,2)	84.95 (43.250,2)	69.75 (42.450,2)
2001						
June	18.9 (6.253,3)	22.93 (6.650,2)	31.96 (0.735,2)	27.30 (0.655,2)	40.53 (6.425,2)	23.12 (4.495,2)
July	12.22 (2.303,5)	11.88 (2.590,5)	39.79 (8.501,6)	40.96 (5.553,3)	49.63 (7.910,3)	19.67 (2.165,2)
August	13.65 (1.140,2)	13.13 (0.210,2)	48.84 (2.420,2)	41.55 (0.970,2)	42.33 (1.220,2)	19.97 (3.740,2)
September	12.00 (0.870,2)	12.22 (0.930,2)	41.28 (4.200,2)	44.38 (1.425,2)	44.27 (0.020,2)	19.50 (1.765,2)
October	53.13 (21.872,4)	42.01 (20.404,5)	41.96 (18.481,5)	42.06 (9.682,3)	52.85 (15.140,5)	39.93 (11.585,3)

[a] No data collected in June in 1998
[b] Only one sample during the month, so no mean or standard deviation were calculated.
[c] Mean cfs (SD,N) was only collected at Stateline in 2001 and was; July–10.92 (2.637,3), August–13.90 (0.015,2), September–12.86 (0.070,2), October–41.46 (20.205,5).

Table 3. Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors at Mojonnier Rd. and Detour Rd. in the Walla Walla River, 1999-2001.

	1999		2000		2001	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Mojonnier Rd.						
June (20th-30th)	14.55	6.979	46.33	33.203	26.45	7.094
July	16.52	5.156	20.63	4.270	36.91	9.335
August	18.97	4.608	26.40	1.925	40.88	5.206
September	24.14	3.131	51.73	9.259	43.50	8.350
October	20.84	14.011	24.71[a]	14.075[a]	29.37	13.222
November (1st-14th)	11.23	5.038	58.44	42.236	18.93	4.513
Detour Rd.						
June (20th-30th)	35.49	13.353	69.05	41.052	45.70	10.362
July	24.73	3.447	30.77	3.028	41.72	4.159
August	26.18	5.855	31.12	1.575	38.12	3.601
September	29.14	2.762	53.57[a]	9.922	43.16	8.530
October	32.65	11.349	52.48[a]	21.484[a]	43.33	12.052
November (1st-14th)	26.93	6.417	96.89	57.287	46.82	9.649

[a] At least one measurement for the month was removed as an outlier.

Mill Creek Test

In 2001 WDFW cooperated with the National Marine Fisheries Service (NMFS), Department of Ecology (DOE), the City of Walla Walla, the Walla Walla Flood Control District, the Corps of Engineers, USFWS and others on a test to increase and evaluate flows through the Mill Creek Flood control channel. The purpose of the test was to determine the effects on salmonids of diverting 3-12 cfs into the Mill Creek flood control channel downstream of the Yellowhawk Creek Diversion. This was an attempt to avoid a take of listed steelhead by improving passage and rearing conditions for salmonids in the Mill Creek flood channel, and eliminate the potential need for a fish salvage operation.

The test began on the 15th of June by increasing stream flows in Mill Creek from 2 cfs to10 cfs below the Yellowhawk Creek Diversion until July 12. This test began after the channel had been dewatered, or nearly so, for several weeks. The City returned 5 cfs to the channel from their hydropower pipeline (cold water from the City's intake dam) and DOE added 3-5 cfs from Yellowhawk Creek Diversion to bring the Mill Creek flows to 10-12 cfs. From July 12-20 flows were reduced to 6 cfs (3 cfs from each agency) and during July 20-27 the total was reduced to 3 cfs. After July 27 only 1-2 cfs were allowed downstream of Yellowhawk Creek by DOE with the intent of triggering fish to move upstream with decreasing flows or to maintain fish life fromYellowhawk Creek to Tausick Way, and to eliminate warm water from entering the top of the concrete channel and adversely affecting rearing salmonids in the concrete channel. During the test the Flood Control District used volunteers to sandbag across the tops of several weirs to create low flow notches and concentrate water flow in an attempt to improve passage at the weirs upstream and downstream of Tausick Way.

WDFW monitored the effects of the additional water by taking stream flows weekly and collecting temperature measurements every half-hour at several sites from Five Mile Rd. (upstream of the flood control channel) down to Swegle Br., near the mouth of Mill Creek (Table 4). WDFW also conducted periodic sampling for salmonids throughout the flood channel to determine their distribution and abundance.

Table 4. Mill Creek temperature and streamflow data for the water enhancement test of the flood control channel in 2001 (locations listed from upstream to downstream).

	June 15-July 4		July 5-11		July 12-17		July18-24		July 25-Aug 14	
Location	cfs	max temps	cfs	max temps	cfs	max temps	cfs	max temps	cfs	max temps
Above the Diversion										
5 Mile Bridge	33-40	60-75	32	71-76	31	59-75	33	66-73	32-44	59-74
above City return pipe	—	72-76	—	71-78	—	65-77	—	67-75	—	61-75
in City return pipe	—	56	—	55-57	—	52-56	—	52-55	—	55-70
below City return	—	61-62	—	59-62	—	57-65	—	59-68	—	54-75
At the Diversion										
Yellowhawk Diver.	12-17	61-75	20	69-76	21	61-77	23	68-76	23-40	63-79
Low. Yellowhawk	15-19	61-73	20	69-73	20	62-73	18	64-71	20-24	62-75
Garrison Cr at diver	2-3	—	3	—	3	—	4	—	6	—
Flow gauge below diver.	—	—	15	—	6-8	—	—	—	—	—
Tausick Way	—	63-78	—	73-78	—	73-78	—	69-80	—	62-83
Concrete Channel										
Roosevelt St.	10-16	87-89	13	82-88	3	67-88	1	75-88	NM	69-91
Wildwood Park	11	—	9	76-85	3	68-84	2	72-82	2	66-84
Clinton St.	12-15	—	10	—	4	—	2	—	NM	—
9th Ave	16-21	—	15	76-81	8	66-79	4	69-76	2-5	63-77
Below Concrete channel										
Gose St	—	66-81	—	75-78*	—	66-80	—	71-76	—	66-75
Wallula Rd	—	—	—	—	6	—	4	—	7	—
Swegle	12-15	65-77	9	73-78	5	69-78	3	68-76	2-3	68-77

* malfunction so only first and last day of period recorded

Stream Temperatures

Despite low stream flows and very little precipitation, water temperatures in 2001 were similar to water temperatures in 2000 throughout the Walla Walla basin (Appendix C). Sites where maximum water temperatures were less than or equal to 65EF during summer months were generally located in tributaries associated with the Blue mountains; Bluewood Culvert (NFT-1), Spangler Ck (SC-6), NF Touchet (NFT-5), Lewis Ck (LC-1), Wolf Fork (WF-2, 3, 8),Whitney Ck (WH-1), Coates Creek (C-1), Upper Robinson Fork (RF-1), Green Fork (GF-1), and Burnt Fork (BF-3). Maximum daily temperatures at some instream monitoring sites routinely exceeded temperatures that can be lethal for salmonids (75-84EF, Bjornn and Reiser 1991). This generally occurred during mid–summer, when the photo–period is long and evening cooling is brief. Sites with maximum water temperatures greater than 75EF included the Washington state portion of the Walla Walla River (WW-3, 10, 11, 12, 14, 15), Yellowhawk Creek (YC-1), Birch Creek (BRC-1), Caldwell Creek (CD-1), Garrison Creek (GC-6), Blue Creek (BC-8), most of Mill Creek (MC-11, 19, 20, 21, 24, 26, 33) Dry Creek (DC-1, 2, 3), Mud Creek (MDC-1), Pine Creek (PC-1), West Little Walla Walla (WLW-3), the Touchet River below Dayton (TR-12, 17, 19, 20, 22), Lower Robinson Fork (RF-5), Lower South Fork Touchet (SFT-17), South Patit Creek (SFP-1, 2), and the mainstem of Coppei Creek (CO-1). Sites in the mid and lower Touchet and Walla Walla rivers frequently had daily maximum temperatures that were high enough (above 68EF) to inhibit migration of adults and young, and to sharply reduce survival of embryos and fry (Bjornn and Reiser 1991, Figures 6-9). However, at night, temperatures would usually decrease to within reasonable physiological limits for steelhead/rainbow trout (<65-70EF).

Walla Walla Settlement Agreement

Increases in streamflow did not consistently improve water temperatures during summer months from 1998 through 2001 (Table 5). We documented little or no change in temperatures at Pepper Br. even though stream flows increased several fold in 2001 compared to previous years. We documented some decreases in mean and maximum temperatures in August and September at Mojonnier Rd. from 1998-2001. Maximum July temperatures decreased each year at Swegle Rd and we observed no consistent change at Detour Rd.

Table 5. Average and mean maximum temperatures (EF and standard deviation) from temperature monitors at Pepper Rd., Mojonnier Rd., Swegle Rd., and Detour Rd. in the Walla Walla River, 1998-2001 (listed from upstream to downstream).

	1998[a]		1999		2000		2001	
	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)
Pepper Rd.								
April							46.38 (2.957)	50.26 (3.929)
May					54.40 (3.425)	57.56 (4.264)	53.72 (4.877)	59.32 (6.177)
June			59.19 (3.861)	65.04 (5.361)	58.71 (4.539)	64.22 (5.636)	60.62 (2.773)	66.15 (4.209)
July			66.68 (2.592)	73.92 (3.276)	67.14 (1.960)	73.16 (2.191)	66.25 (2.047)	71.99 (3.466)
August			68.03 (2.280)	73.40 (3.042)	66.68 (2.273)	71.88 (2.576)	66.76 (1.659)	72.07 (2.213)
September			60.68 (1.999)	64.84 (2.564)	60.36 (2.604)	63.74 (2.923)	61.37 (2.329)	65.12 (2.754)
October			53.21 (2.560)	55.64 (2.810)	51.20 (2.496)	53.64 (2.755)	51.53 (2.592)	53.79 (3.193)
Mojonnier Rd.								
April							47.34 (3.079)	50.71 (3.875)
May					55.91 (3.019)	59.34 (3.631)	54.63 (4.440)	59.03 (4.955)
June			62.81 (2.304)	68.64 (2.666)	59.46 (4.156)	64.22 (4.759)	60.03 (3.184)	63.71 (4.382)
July	71.97 (2.056)	78.23 (2.669)	66.82 (3.177)	74.78 (3.445)	66.76 (2.500)	72.35 (3.086)	66.70 (2.591)	71.83 (3.660)
August	69.72 (0.646)	75.17 (2.589)	68.28 (2.947)	74.77 (3.313)	65.52 (2.951)	70.97 (3.132)	67.16 (2.259)	71.66 (2.170)
September	64.63 (6.673)	71.21 (3.004)	59.28 (2.698)	64.61 (2.951)	58.19 (3.330)	61.21 (3.647)	60.72 (2.411)	64.56 (2.956)
October	49.61 (2.681)	51.48 (2.987)	51.52 (2.730)	54.48 (2.983)	51.87 (2.249)	53.76 (2.422)	51.98 (2.021)	53.73 (2.580)

[a] Temps were not collected at Pepper Rd. or Detour Rd. due to lack of time and resources available in the first year (1998) of the project. The 1998 data were collected on continuous temp and flow monitors that took readings every 15 seconds and stored the data every four hours as averages.

Table 5 (Cont.) Average and mean maximum temperatures (EF and standard deviation) from temperature monitors at Pepper Rd., Mojonnier Rd., Swegle Rd., and Detour Rd. in the Walla Walla River, 1998-2001 (listed from upstream to downstream).

	1998		1999		2000		2001	
	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)
Swegle Rd.								
April			50.32 (1.757)	53.91 (2.753)			47.80 (3.364)	51.40 (4.204)
May			52.54 (2.683)	55.99 (2.880)	57.74 (3.885)	61.060 (4.218)	54.57 (4.022)	58.79 (4.114)
June	69.22 (2.199)	75.46 (4.256)	62.38 (4.929)	67.95 (5.792)	61.31 (5.058)	66.12 (5.831)	61.80 (4.547)	66.33 (5.501)
July	73.41 (2.032)	79.61 (2.289)	68.83 (2.865)	75.13 (3.132)	69.18 (2.227)	74.45 (2.252)	68.22 (2.796)	72.73 (3.543)
August	71.09 (2.990)	76.23 (3.351)	69.70 (3.282)	74.68 (3.675)	67.59 (3.077)	71.44 (3.434)	68.23 (2.352)	72.68 (2.699)
September	64.23 (3.978)	68.20 (4.469)	59.90 (2.739)	64.00 (3.170)	59.36 (3.578)	62.23 (3.818)	60.51 (2.408)	64.36 (2.814)
October	52.97 (3.580)	55.98 (3.789)	51.41 (2.868)	54.19 (2.793)	51.83 (2.758)	53.94 (2.900)	50.62 (2.503)	53.64 (2.823)
Detour Rd.								
April							48.18 (3.503)	51.62 (4.283)
May					59.03 (3.414)	62.56 (3.619)	57.19 (5.919)	62.53 (7.637)
June			66.12 (2.327)	71.53 (2.920)	62.38 (4.910)	66.97 (5.875)	63.70 (3.295)	68.79 (4.409)
July			69.22 (2.783)	75.73 (2.803)	69.76 (2.148)	75.60 (2.270)	68.84 (2.925)	73.89 (3.836)
August			70.18 (3.047)	75.36 (3.424)	68.13 (3.142)	72.57 (3.442)	68.61 (2.335)	73.12 (2.760)
September			60.27 (2.632)	64.18 (3.036)	59.89 (3.595)	62.79 (3.801)	61.81 (2.600)	64.86 (2.865)
October			51.71 (2.814)	54.32 (2.743)	52.91 (2.448)	54.79 (2.612)	52.45 (2.296)	54.48 (2.851)

[a] Temps were not collected at Pepper Rd. or Detour Rd. due to lack of time and resources available in the first year (1998) of the project. The 1998 data were collected on continuous temp and flow monitors that took readings every 15 seconds and stored the data every four hours as averages.

Mill Creek Test

The Mill Creek test produced substantial increases in water temperatures from Yellowhawk Creek to Roosevelt Street at the top of the concrete channel by early July (Table 4). Water temperature increased over this area by up to10-20EF because of the wide shallow channel, particularly near Wilbur Street. Lethal maximum water temperatures of over 90EF at the top of the concrete channel overwhelmed the cool spring waters entering the concrete channel near Wildwood Park and substantially reduced the suitability of water in the concrete channel to sustain steelhead juveniles. Maximum water temperatures decreased between Wildwood Park to 9th Avenue during the test because of spring flows and pipe discharges entering the concrete channel (Table 4). The test was modified after the first couple of weeks to eliminate the flow of hot water into the concrete channel to protect salmonids rearing there.

Limiting Factor Identification

A number of barriers or impediments to salmonid passage and rearing have been identified by this project since 1998. A portion of those barriers were physical (e.g., structures or dewatered streambeds) that physically blocked salmonid movement. Physiological barriers and impediments to salmonid passage and rearing were extensive in terms of stream miles affected. The primary physiological factor affecting fish in the Walla Walla River basin was water temperature. Temperature possibly represents the most critical physiological barrier to salmonids, particularly for passage or rearing. Seasonal temperature related barriers for salmonids generally occur in lower areas of the Touchet River, Mill Creek, and the Walla Walla Rivers and their tributaries. Stream reaches with mean water temperatures exceeding 75 EF during the summer are associated with low densities of salmonids (Mendel et. al.,1999). Most of the salmonids in these marginal thermal areas are age 0+ rainbow/steelhead trout. We have documented temperatures of 70°F or higher in many lower mainstem reaches and in some tributaries in mid to late May and June and again in early September. These temperatures likely adversely affect migrating juvenile salmonids and adult steelhead in spring, and adult steelhead returning in September.

One barrier found on Russell Creek in 2000, and observed again in 2001, was a Civilian Conservation Corp diversion structure that was built in the 1930's or 40's. The stream bed had eroded and incised the stream channel over the years forming an impassible barrier about 15-20 ft tall. During qualitative electrofishing efforts we found 86 Age 0+ rainbow/steelhead just below the barrier, and at least three different age classes of rainbow/steelhead at another site below the dam (Appendix D). No fish of any kind were found at the only site sampled above the barrier.

Turbidity, sedimentation, lack of pools and cover, and other habitat factors, may also present challenges to migrating, breeding and rearing salmonids. Extensive and intensive surveys of habitat conditions to identify limiting factors were deferred because of lack of adequate staff time.

Fish Stock Assessment

Distribution and Abundance

Densities of five salmonid species were calculated from electrofishing and snorkel surveys (Tables 6, 7, 8 and 9). Adult rainbow trout ($200 mm or 8 in) densities represent wild or unknown origin trout unless noted. Identified salmonid species included: mountain whitefish, brown trout, bull trout, chinook salmon and rainbow/steelhead trout.

Rainbow/steelhead trout represent the most common salmonid found in the Walla Walla Basin. Age 0+ rainbow/steelhead densities are typically higher than for older age classes for most sites. Age 1+ rainbow/steelhead trout predominated in the following sites; North Fork Touchet (NFT-3, 4, 7), Wolf Fork (WF-1, 3, 4, 6), Robinson Fork (RF-3), Burnt Fork (BF-1), South Fork Touchet (SFT-3, 4, 5, 6, 7, 8, 9), Yellowhawk Creek (YC-1), Mill Creek (MC-2), and Blue Creek (BLC-2). Large or "legal sized"($8 in.) rainbow trout were found in very low densities throughout the basin. The numbers of age 0+ steelhead found in the mainstem Walla Walla River suggests that spawning is commonly occurring within the Washington portion of the river.

Other salmonid species had a limited distribution (Tables 6,7, and 9, Appendix D). Bull trout distribution was greatest in the North Fork, Wolf Fork, and Burnt Fork of the Touchet River. Low densities of bull trout were also found in the South Fork Touchet and in Mill Ck. Age 1+/sub adult bull trout were observed in the South Fork Touchet River around the mouth of the Griffin Fork. Mountain whitefish were uncommon, and they were found in low densities at only a few sites in the Walla Walla River (WW-4), Mill Creek (MC-3, 7), North Fork Touchet (NFT-9, 11, 12, 13), Wolf Fork (WF-12) and the Touchet River (TR-1, 2, 5, 6, 7, 8, 12, 16). Brown trout were found in low densities (but included some very large individuals) in the North Fork Touchet (NFT-8, 9, 10, 11, 12, 13), Wolf Fork (WF-12, 13), South Fork Touchet (SFT-17), and the Touchet River (TR-1, 2, 5, 6, 7, 8, 9, 12, 13, 15) around Dayton. Juvenile brown trout production appeared to be limited in 2001, and appears to have decreased slightly from 2000. Juvenile chinook were found in low densities at several sites in the North Fork Touchet (NFT-11, 12), Touchet River (TR-1, 2, 7, 14), and Walla Walla River (WW-1, 3, 4, 12, 13). Higher densities of juvenile chinook were seen in several sites in upper Mill Creek (MC-1, 2, 3, 6, 7, 8). The higher densities in Mill Creek, and the densities in the Walla Walla River are associated with the outplanting of adult spring chinook in late summer of 2000. These fish were released by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and allowed to spawn freely in the upper portion of Mill Creek, and the Walla Walla River.

Electrofishing

Densities of rainbow/steelhead trout ranged from 0 to 221.1 fish per 100 m^2 at sampled sites (Tables 6 and 7). Sub–yearling (age 0+) trout were the most abundant age class at sites in the mainstem and lower reaches with densities generally between 1.5 and 19.5 fish per 100 m^2. Cottonwood Creek contained extremely high densities (up to 221.1 fish per 100 m^2) of age 0+ fish that were concentrated in isolated pools or watered areas while most of the stream within Washington was dry during the summer. Yearling (age 1+) rainbow/steelhead were most abundant in tributaries and upper mainstem reaches, with densities usually between 1.3 and 41.9 fish per 100 m^2 (Tables 6 and 7). Adult ($200 mm or 8 in) rainbow/steelhead were found in lower densities ranging from 0 to 3.6 fish per 100 m^2. Densities of bull trout ranged from 0 to 23.4 fish per 100 m^2 with yearlings (age 1+) being in the highest densities. The highest densities of bull trout were found in the upper reaches of the North Fork Touchet, Wolf Fork, and Burnt Fork. Mountain whitefish were found in all age classes (0+, 1+, and $8 in) in the basin, but densities were low ranging from 0 to 0.8 fish per 100 m^2. Low densities of brown trout were found in the Touchet River and some of its major tributaries around Dayton. Brown trout were found in all age classes (0+, 1+, and $8 in), with densities from 0 to 0.9 fish per 100 m^2. Densities of sub-yearling chinook ranged from 0 to 7.9 fish per 100 m^2 with the highest densities occuring in Mill Creek. Juvenile chinook were also found in sites on the North Fork Touchet, Touchet River, and Walla Walla River (Tables 6 and 7).

Table 6. Densities of salmonids from electrofishing sites in the Touchet River and some of its tributaries, summer 2001. Sites are listed in order from upstream to downstream.

Stream Reach	Date	Site Length	Mean Width	Area	Density (#/100 m²) Rainbow/steelhead Age/size					Age/size		
Site Name	(mm/dd)	(m)	(m)	(m²)	0+	1+	$200 mm	Total	Other Species[a]	0+	1+	$200 mm
N. Fork Touchet												
NFT2	08/07	35.0	4.2	147.0	0.0	0.0	0.0	0.0	BT	0.7	23.4	0.0
NFT3	08/07	37.0	6.1	225.7	0.0	1.3	0.0	1.3	BT	7.1	18.6	0.0
NFT4	08/07	30.0	3.9	117.0	0.0	7.7	0.0	7.7	BT	1.7	0.9	0.0
NFT5	08/07	33.0	4.7	155.1	25.0	6.4	0.6	32.0				
NFT6[c]	08/21	50.0	6.4	320.0	26.0	13.2	0.3	39.5				
NFT7[c]	08/20	50.0	6.3	315.0	14.7	22.3	1.0	38.0				
NFT8[c]	08/20	50.0	9.0	450.0	18.1	12.2	1.1	31.4	BT	0.0	0.0	1.1
									BRT	0.2	0.0	0.0
NFT9[c]	08/20	50.0	5.5	275.0	22.4	10.1	0.7	33.2	BRT	0.0	0.0	0.4
									MTW	0.0	0.0	0.7
NFT10[c]	08/20	50.0	7.1	355.0	35.3	19.2	2.3	56.8	BRT	0.3	0.7	0.0
NFT11[c]	08/21	50.0	12.0	600.0	26.6	17.2[b]	1.7	45.5	CH	1.5[b]	0.0	0.0
									BRT	0.3[b]	0.7	0.0
									MTW	0.2	0.3	0.2
NFT13[c]	08/21	50.0	10.8	540.0	21.1[b]	3.7[b]	0.7	25.5	BRT	0.2	0.2	0.0
									MTW	0.2	0.2	0.0
Wolf Fork												
WF1	08/08	35.0	2.5	87.5	4.7	10.5	0.0	15.2	BT	2.3	18.6	1.2
WF2	08/08	30.0	3.6	108.0	10.1	5.5	0.0	15.6	BT	9.2	4.6	0.0
WF3	08/08	30.0	4.8	144.0	2.1	6.2	1.4	9.7	BT	2.8	10.3	0.7
WF4[c]	08/14	50.0	5.4	270.0	6.3	10.8	0.7	17.8	BT	6.0	2.6	0.4
WF5[c]	08/08	50.0	6.3	315.0	13.0	9.2[b]	0.0	22.2	BT	0.0	0.0	0.3
WF6[c]	08/02	50.0	6.2	310.0	6.4	9.6	1.0	17.0	BT	0.0	0.0	0.6
WF7[c]	08/01	50.0	7.5	375.0	20.9	12.3	0.5	33.7				
WF9[c]	08/01	50.0	8.8	440.0	26.2	11.9[b]	0.0	38.1	BT	0.0	0.5	0.0
WF10[c]	08/01	50.0	9.0	450.0	16.0[b]	7.6[b]	0.0	23.6	BT	0.0	0.2	0.2
WF12[c]	08/01	54.0	8.4	453.6	18.7	9.7[b]	0.0	28.4	BRT	0.2	0.2	0.0
									MTW	0.2	0.0	0.0
WF13[c]	08/02	50.0	10.9	545.0	20.7	6.0	0.0	26.7	BT	0.0	0.2	0.0
									BRT	0.9	0.0	0.0
Robinson Fork												
RF2[c]	08/14	60.0	4.3	258.0	25.6	12.0	0.0	37.6				
RF3[c]	08/14	50.0	3.5	175.0	20.0	34.3	0.6	54.9				
RF4[c]	08/14	50.0	3.9	195.0	21.5	12.3	0.0	33.8				
RF5[c]	08/14	50.0	3.7	185.0	44.9	7.6	0.0	52.5				
RF6[c]	08/14	50.0	3.9	195.0	7.2	1.5[b]	0.0	8.7				

[a] BT= Bull Trout; BRT= Brown Trout; CH=Chinook; MTW= Mountain White Fish
[b] Calculated using the sum of the passes, due to poor reduction between successive passes
[c] Electrofished by Snake River Lab personnel.

Table 6 (Cont.) Densities of salmonids from electrofishing sites in the Touchet River and some of its tributaries, summer 2001. Sites are listed in order from upstream to downstream.

Stream Reach	Date	Site Length	Mean Width	Area	Densities (#/100 m^2) Rainbow/steelhead Age/size					Age/size		
Site Name	(mm/dd)	(m)	(m)	(m^2)	0+	1+	$200 mm	Total	Other Species[a]	0+	1+	$200 mm
Burnt Fork												
BF1	08/09	30.0	3.4	103.2	0.0	9.7	1.0	10.7	BT	0.0	3.9[b]	2.9
BF2	08/09	30.0	4.4	132.0	18.0	15.8	0.0	33.8	BT	0.0	0.8	0.0
BF4	08/09	30.0	4.4	132.0	32.0	6.9	0.0	38.9				
South Fork Touchet												
SFT1	08/09	31.0	4.8	148.8	11.3	6.7[b]	0.7	18.7				
SFT2	08/09	30.0	4.8	144.0	34.0	7.6	0.7	42.3				
SFT3	08/09	39.0	5.0	195.0	8.9	41.9	2.6	53.4	BT	0.0	0.5	0.0
SFT4[c]	08/09	50.0	5.3	265.0	13.9	25.8	2.3	42.0				
SFT5[c]	08/09	50.0	4.7	235.0	6.4	11.0	0.0	17.4				
SFT6[c]	07/31	50.0	3.1	155.0	13.0[b]	24.7[b]	1.3	39.0				
SFT7[c]	07/31	50.0	5.1	255.0	10.2[b]	33.1[b]	2.0[b]	45.3				
SFT8[c]	07/31	50.0	5.4	270.0	11.9[b]	22.8	0.8	35.5				
SFT9[c]	07/31	50.0	8.2	410.0	4.9	12.2	0.7	17.8				
SFT10[c]	07/31	50.0	6.6	330.0	10.7	9.2[b]	0.0	19.9				
SFT11[c]	07/30	50.0	6.3	315.0	22.8	8.9	0.0	31.7				
SFT12[c]	07/30	50.0	7.7	385.0	13.5	2.6	0.0	16.1				
SFT13[c]	07/30	50.0	7.2	360.0	19.9[b]	4.6	0.0	24.5				
SFT14[c]	07/30	50.0	7.7	385.0	9.6[b]	7.3[b]	0.0	16.9				
SFT15[c]	07/30	50.0	6.5	325.0	10.3[b]	0.3	0.0	10.6				
SFT18[c]	07/23	50.0	5.1	255.0	30.0[b]	3.6	0.0	33.6				
Touchet River												
TR1[c]	07/18	50.0	11.8	590.0	12.9	1.4[b]	0.9[b]	15.2	CH	0.2	0.0	0.0
									MTW	0.4	0.0	0.0
									BRT	0.2	0.0	0.0
TR5[c]	07/12	50.0	11.3	565.0	24.1[b]	2.4[b]	0.0	26.5	WF	0.2	0.6	0.0
									BRT	0.4	0.0	0.0
TR6[c]	07/12	50.0	10.0	500.0	29.3	0.6	1.0[b]	30.9	MTW	0.4	0.2	0.2
									BRT	0.8	0.0	0.0
TR8[c]	07/11	50.0	12.4	620.0	22.5[b]	0.2	0.0	22.7	MTW	0.8	0.0	0.0
									BRT	0.8	0.0	0.0
TR11[c]	07/11	50.0	11.1	555.0	6.8[b]	0.2	0.2	7.2				
TR13[c]	07/10	50.0	10.0	500.0	15.2[b]	0.0	0.0	15.2	BRT	0.2	0.0	0.0
TR15[c]	07/18	50.0	11.6	580.0	2.9[b]	0.0	0.0	2.9	BRT	0.5	0.0	0.0
TR16[c]	07/10	50.0	12.8	640.0	22.2[b]	0.0	0.2	22.4	MTW	0.3	0.0	0.0
TR17	08/28	30.0	8.6	258.0	2.3	0.0	0.0	2.3				

[a] BT = Bull Trout; BRT = Brown Trout; CH = Chinook; MTW = Mountain White Fish
[b] Calculated using the sum of the passes due to poor reduction between successive passes.
[c] Electrofished by Snake River Lab personnel

Table 7. Densities of salmonids from electrofishing sites in the Walla Walla River and some of its tributaries, summer 2001. Sites are listed in order from upstream to downstream.

Stream Reach	Date	Site Length	Mean Width	Area	Densities (#/100 m²) Rainbow/steelhead Age/size					Age/size		
Site Name	(mm/dd)	(m)	(m)	(m²)	0+	1+	$200 mm	Total	Other Species[a]	0+	1+	$200 mm
Walla Walla River												
WW1	08/01	30.0	8.2	246.0	11.0[b]	4.5	0.4	15.9	CH	2.4[b]	0.0	0.0
WW3	08/01	30.0	8.1	243.0	10.7[b]	3.3	1.7	15.7	CH	1.7	0.0	0.0
WW4	08/13	30.0	10.3	309.0	4.9	0.3	0.0	5.2	CH	0.7	0.0	0.0
									MTW	0.3	0.0	0.0
WW5	08/13	30.0	8.0	240.0	2.1	0.4	0.0	2.5				
WW6	08/13	33.0	9.3	306.9	6.5	0.3	0.0	6.8				
Yellowhawk Creek												
YC1	08/23	30.0	6.5	195.0	0.0	0.5	0.0	0.5				
YC2	08/29	30.0	3.8	114.0	2.6	2.6	0.0	5.2				
YC5	08/29	30.0	4.1	123.0	6.5[b]	4.1	0.0	10.6				
YC7	08/29	30.0	5.3	159.0	1.9	0.0	0.0	1.9				
Cottonwood Creek												
CWC2	07/24	30.0	1.9	57.0	221.1	0.0	0.0	221.1				
CWC4	07/19	30.0	4.1	123.0	149.8	0.0	0.0	149.8				
East Little Walla Walla												
ELW1	07/25	30.0	3.6	108.0	16.6	0.9	1.8	19.3				
ELW3	07/25	30.0	3.5	105.0	2.8	1.9	0.0	4.7				
Mill Creek												
MC2	08/02	30.0	8.1	243.0	13.2	18.2	2.1	33.5	BT	0.0	0.0	0.4
									CH	7.9	0.0	0.0
MC6	08/02	30.0	8.0	240.0	18.4	14.2	0.0	32.6	CH	2.9[b]	0.0	0.0
MC7	08/14	30.0	8.3	249.0	14.1[b]	8.0	3.6	25.7	MTW	0.4	0.0	0.0
MC27	07/26	30.0	8.1	243.0	8.6	0.0	0.4	9.0				
MC28	07/30	35.0	4.1	143.5	0.0	0.7	0.7	1.4				
MC31	07/30	30.0	6.8	204.0	1.5	0.0	2.5	4.0				
MC32	07/26	40.0	5.7	228.0	16.1	0.0	0.0	16.1				
MC33	07/30	30.0	5.3	159.0	19.5	0.0	0.0	19.5				
MC34	07/26	35.0	6.5	227.5	13.7	0.0	0.0	13.7				
Blue Creek												
BLC2	08/16	31.0	2.0	62.0	3.3[b]	42.8	1.7	47.8				
BLC3	08/16	30.0	1.6	48.0	25.3[b]	14.8	0.0	40.1				

[a] BT= Bull Trout; BRT= Brown Trout; CH=Chinook; MTW= Mountain White Fish
[b] Calculated using the sum of the passes, due to poor reduction between successive passes.

Walla Walla Settlement Agreement

Increased flows and/or decreased temperatures may have resulted in increased rainbow/steelhead densities between Stateline and Mojonnier (Burlingame), but densities downstream were inconsistent (Table 8).

Table 8. Comparison of summer rainbow/steelhead densities (fish/100 m^2) in the Walla Walla River between the Stateline and Lowden from 1998 through 2001.

Year/ Reach	Mean Density	Standard Deviation	# of sites	Densities per Site (fish/100 m^2)	Other Salmonids Present
1998					
Stateline to just below Burlingame	0.3333	0.3215	3	0.7,0.1,0.2	none
down to McDonald Rd.	0.4	N/A	1	0.4	none
1999					
Stateline to just below Burlingame	3.6714	5.1068	7	1.8,1.4,2.8,0.5,15. 1.0,0.3	chinook & whitefish
down to McDonald Rd.	3.4500	2.3193	6	6.5,1.6,5.5,1.7,4.4, 1.0	none
down to Lowden Gardena Rd.	0	N/A	1	0[b]	none
2000					
Stateline to just below Burlingame	4.0000	7.2596	4	2.4,4.5,14.5,17.1	whitefish
down to McDonald Rd.	1.5	2.213	2	3.0,0,+1 qual[a]	none
down to Lowden Gardena Rd.	0	N/A	1	0[b]	none
2001					
Stateline to just below Burlingame	7.633	6.4488	9	15.9,15.7,5.2,2.5,6. 8,15.5,6.1,0.9,0.1	chinook & whitefish
down to McDonald Rd.	0.4667	0.6429	3	1.2,0,0.2,+3 qual[a]	none
down to Lowden Gardena Rd.	0.0	0.0	2	0,0	none

[a] Plus qualitative sites with rainbow/steelhead.
[b] High densities (31.4 to 101 fish/100 m^2) existed in June and the first couple days of July for mainly Age 0+ rainbow/steelhead.

Mill Creek Test

Salmonids were found throughout Mill Creek in June (see snorkeling and electrofishing summaries in Tables 7,9, and Appendix D), but after June few or no rainbow/steelhead were found between the Yellowhawk Diversion and the upper part of the concrete channel. Rainbow steelhead continued to exist in low to moderate numbers or densities from Wildwood Park (near the upper part of the concrete channel) downstream to the lower concrete channel at 9th Ave during the spring, summer and fall. Although, hot water (85-91^0 F) from the test flows in June and early July may have caused mortality of some salmonids in the concrete channel. Below 9th Ave., where the stream exits the concrete channel and flows through the wide flood channel that contains weirs, no salmonids were captured or observed through the summer. Some other species (e.g. suckers (*Catostomus spp.*), northern pikeminnows (*Ptychocheilus oregonensis*), etc.) were observed with sores or lesions. We have observed fish in this reach of Mill Creek with lesions for the last couple of years. We do not know the source of the lesions but we suspect water quality problems as the cause. Below the flood channel (below Gose St.) rainbow/steelhead reared at low densities throughout the summer.

A sample was taken on the 15th of August between Bennington Diversion Dam and Tausick Way to try and determine if rainbow/steelhead were surviving in this reach by choosing cooler portions of the stream channel. We electrofished the area to find salmonids and we took instantaneous water temperature readings with a pocket thermometer in areas with and without salmonids present. Basically, we found that rainbow/steelhead were found in segments of the stream with water temperatures from 1-5 degrees (F) cooler than the nearby areas of the stream. Various parts of the stream without fish present ranged from 70-75^0 F**.** The coolest location during this sampling effort that contained salmonids was 67^0 F, while the warmest was 73^0 F.

Snorkeling

The first round of snorkeling was conducted from June 5th to July 18th, starting in Mill Creek, then the Walla Walla River, and ending with the Touchet River and its tributaries. Rainbow/steelhead trout were found at all but one of the 25 sites surveyed, and ranged in density from 0 to 22.8 fish per 100 m^2. Sub-yearling (age 0+) rainbows were the most abundant ranging from 0 to 21.5 fish per 100 m^2, adult ($200mm or 8 in) rainbows were the next most abundant ranging from 0 to 5.5 fish per 100 m^2, and yearling (age 1+) rainbows were the least abundant ranging from 0 to 2.9 fish per 100 m^2. Juvenile chinook were only found at two sites with a maximum density of 0.9 fish per 100 m^2, with both sites on the Walla Walla River. Brown trout and mountain whitefish were both found only in the Touchet river and its tributaries, with maximum densities of 1.1 for brown trout and 0.5 for mountain whitefish. Two adult steelhead were also seen, one on the North Fork Touchet (NFT-12), and the other in the Touchet River (TR-7) (Table 9).

A second round of snorkeling was conducted from August 20th to the 27th in the exact same locations as the first round. This time rainbow/steelhead were found in all but four sites of the 19 sites surveyed, and ranged in density from 0 to 32.7 fish per 100 m^2. Again sub-yearling (age 0+) rainbows were the most common ranging from 0 to 16.3 fish per 100 m^2, yearling (age 1+) rainbows were the next most common ranging from 0 to 11.6 fish per 100 m^2, and adults ($200 mm or 8 in) rainbows were the least common ranging from 0 to 4.8 fish per 100 m^2. During our second snorkel surveys no juvenile chinook were found in the Walla Walla River, but we did find them in the Touchet River and it tributaries with a maximum density of 2.8 fish per 100 m^2. Brown trout and mountain whitefish were again seen in the Touchet River and its tributaries, with maximum densities of 1.4 fish per 100 m^2, and 0.4 fish per 100 m^2 respectively (Table 9).

Snorkeling was also conducted on upper Mill Creek (MC-1, 3, 7, 8) in early to mid August, to see if the release of water from the City's intake would have any effect on fish. The City of Walla Walla sent a pulse of cold water(< 60^0F) down from the City's intake on the 5th and 6th of August. Snorkeling occured at all four sites on August 2nd before the pulse was sent down from the intake. Two of the four sites (MC-1,8) were surveyed during the pulse on August 6th before the water became too turbid to make accurate counts. On August 13th, after the pulse, we went back and surveyed three of the sites again (MC-3,7,8). All sites showed a decrease in total density of rainbows, but the biggest effect was seen in the upper most site (MC-1) where total desities of rainbows dropped from 22.0 fish per 100 m^2 on August 2nd to 8.9 fish per 100 m^2 on August 6th and age 0+ chinook densities decreased from 7.2 fish per 100 m^2 on August 2nd to 5.0 fish per 100 m^2 on August 6th.

Table 9. Densities of salmonids from snorkel surveys in the Touchet and Walla Walla rivers, and in Mill Ck, summer 2001. Sites are listed in order from upstream to downstream.

					Density (#/100 m²)							
					Rainbow/steelhead							
Stream Reach	Date	Site Length	Mean Width	Area	Age/size					Age/size		
Site Name	(mm/dd)	(m)	(m)	(m²)	0+	1+	$200 mm	Total	Other Species[a]	0+	1+	$200 mm
N. Fork Touchet												
NFT12	07/18	100	12.3	1230	14.0	2.9	5.3	22.2	BRT	0.3	0.0	0.2
									MTW	0.0	0.0	0.5
									WSH	0.0	0.0	0.1
	08/28	100	10.0	1000	16.3	11.6	4.8	32.7	BRT	1.4	0.0	0.1
									MTW	0.1	0.0	0.1
									CH	2.8	0.0	0.0
SF Touchet												
SFT16	07/11	130	6.6	858	4.9	1.6	2.7	9.2				
SFT17	07/02	60	6.3	378	10.3	3.7	2.9	16.9	BRT	0.1	0.0	0.0
Touchet River												
TR1	07/18	80	10.3	824	14.6	2.9	4.9	22.4	BRT	0.0	0.0	0.2
	08/22	80	9.7	776	12.6	2.6	4.5	19.7	BRT	0.1	0.0	0.1
									CH	0.4	0.0	0.0
									MTW	0.4	0.3	0.1
TR2	07/18	85	12.2	1037	6.4	1.2	3.9	11.5	BRT	0.0	0.0	0.1
	08/22	85	11.0	935	5.9	2.2	3.3	11.4	BRT	0.2	0.0	0.1
									CH	0.2	0.0	0.0
									MTW	0.1	0.0	0.0
TR6	07/16	100	12.4	1240	8.4	2.5	1.5	12.4	BRT	1.1	0.0	0.1
									MTW	0.0	0.2	0.1
	08/27	100	11.1	1110	7.1	1.2	1.5	9.8	BRT	0.0	0.1	0.1
									MTW	0.1	0.2	0.2
TR7	07/11	130	11.9	1547	17.8	3.4	1.6	22.8	BRT	0.2	0.5	0.1
									MTW	0.0	0.1	0.1
									SHH	0.0	0.0	0.1
	08/27	130	10.9	1417	14.8	1.8	2.5	19.1	BRT	0.1	0.0	0.0
									MTW	0.1	0.1	0.0
									CH	0.2	0.0	0.0
TR9	07/02	80	11.8	994	12.3	4.2	0.3	16.8	BRT	0.0	0.1	0.0
TR10	07/18	100	10.9	1090	11.0	2.7	1.3	15.0				
	08/27	100	9.0	900	9.1	1.4	1.0	11.5				
TR12	06/26	120	11.8	1416	18.8	1.3	0.5	20.6	BRT	0.1	0.0	0.0
	08/27	120	10.9	1308	7.0	0.3	0.2	7.5	MTW	0.2	0.0	0.1
TR14	06/26	104	12.2	1269	9.7	0.6	0.0	10.3				
	08/23	104	9.0	936	7.6	0.1	0.2	7.9	CH	0.1	0.0	0.0

[a] BT= Bull Trout; BRT= Brown Trout; CH=Chinook; WSH= Wild Adult Steelhead; SHH=Hatchery Adult Steelhead; MTW= Mountain White Fish.

Table 9 (Cont.) Densities of salmonids from snorkel surveys in the Touchet and Walla Walla rivers, and in Mill Ck, summer 2001. Sites are listed in order from upstream to downstream.

Stream Reach	Date	Site Length	Mean Width	Area	Densities (#/100 m²)							
					Rainbow/steelhead							
					Age/size					Age/size		
Site Name	(mm/dd)	(m)	(m)	(m²)	0+	1+	$200 mm	Total	Other Species[a]	0+	1+	$200 mm
Touchet River (cont)												
TR17	07/16	100	13.5	1335	0.1	0.1	0.0	0.2				
	08/23	100	12.6	1260	0.0	0.0	0.0	0.0				
TR18	07/16	100	11.6	1160	0.0	0.0	0.0	0.0				
	08/23	100	10.9	1090	0.0	0.0	0.0	0.0				
Walla Walla River												
WW2	06/19	100	11.0	1100	20.5	2.4	1.9	24.8				
	08/21	100	9.9	990	12.3	1.9	1.3	15.5				
WW4	06/21	100	7.0	700	3.4	0.6	0.0	4.0				
	08/21	100	5.5	550	4.4	1.1	0.6	6.1				
WW6	06/20	118	8.9	1050	4.0	0.0	0.0	4.0				
	08/21	118	8.5	1003	0.7	0.1	0.1	0.9				
WW7	06/20	160	9.4	1568	0.7	0.0	0.0	0.7				
	08/21	160	8.8	1408	0.1	0.0	0.0	0.1				
WW8	06/20	97	13.1	1271	3.9	0.2	0.0	4.1				
	08/20	97	10.6	1028	1.1	0.1	0.0	1.2				
WW11	06/21	180	13.9	2502	1.2	0.0	0.0	1.2				
	08/20	180	13.1	2358	0.2	0.0	0.0	0.2				
WW12	06/06	100	8.7	870	4.0	0.5	0.5	5.0	CH	0.1	0.0	0.0
	06/21	76	10.6	806	1.0	0.0	0.0	1.0				
WW13	06/06	85	8.4	714	0.6	0.1	0.4	1.1	CH	0.9	0.0	0.0
	08/20	85	7.4	629	0.0	0.0	0.0	0.0				
Mill Creek												
MC1	08/02	66	12.4	818	12.0	7.1	2.9	22.0	CH	7.2	0.0	0.0
									BT	0.0	0.0	0.1
	08/06	66	13.1	865	4.7	2.2	2.0	8.9	CH	5.0	0.0	0.0
									BT	0.0	0.0	0.1
MC3	08/02	75	9.4	705	9.4	4.1	2.4	15.9	CH	13.0	0.0	0.0
									BT	0.0	0.0	0.1
									MTW	0.0	0.0	0.1
	08/13	75	9.5	713	10.0	2.7	1.7	14.4	CH	11.0	0.0	0.0
									BT	0.0	0.0	0.1
									MTW	0.0	0.0	0.4
MC7	08/02	64	7.1	454	25.0	6.4	4.2	35.6	CH	4.2	0.0	0.0
	08/13	64	7.1	454	15.4	5.3	5.5	26.2	CH	3.7	0.0	0.0

[a] BT = Bull Trout; BRT = Brown Trout; CH=Chinook; WSH=Wild Adult Steelhead; SHH=Hatchery Adult Steelhead MTW = Mountain White Fish

Table 9 (Cont.) Densities of salmonids from snorkel surveys in the Touchet and Walla Walla rivers, and in Mill Ck, summer 2001. Sites are listed in order from upstream to downstream.

					Densities (#/100 m^2)							
					Rainbow/steelhead							
Stream Reach	Date	Site Length	Mean Width	Area	Age/size					Age/size		
Site Name	(mm/dd)	(m)	(m)	(m^2)	0+	1+	$8 in	Total	Other Species[a]	0+	1+	$200 mm
Mill Ck (cont)												
MC8	08/02	54	9.4	508	12.4	2.6	2.6	17.6	CH	3.0	0.0	0.0
	08/06	54	9.4	508	11.0	1.4	2.0	14.4	CH	3.1	0.0	0.0
	08/13	54	9.4	508	11.6	2.0	1.8	15.4	CH	3.7	0.0	0.0
MC15	06/05	36	16.0	576	1.6	1.2	1.2	4.0				
MC16	06/05	36	16.0	576	0.3	0.5	0.7	1.5				
MC17	06/06	36	16.0	576	0.7	0.7	0.2	1.6				
MC33	06/05	60	5.2	312	21.5	0.6	0.3	22.4				
	08/20	60	3.5	210	0.0	0.0	0.0	0.0				

[a] BT = Bull Trout; BRT = Brown Trout; CH=Chinook; WSH=Wild Adult Steelhead; SHH=Hatchery Adult Steelhead MTW = Mountain White Fish.

Non–Salmonid Species Abundance and Distribution

Speckled dace (*Rhinichthys osculus*) and sculpins (*Cottus spp.*) were the most common non–salmonids found at most of our sampling sites (Appendix E). Speckled dace generally did not exist at upper sites where water temperatures were relatively cool. Longnose dace (*Rhinichthys cataractae*) was observed during electrofishing in upper Mill Creek, Titus Creek, and Yellowhawk Creek. Sculpin are found throughout the basin except in the lower sections of the mainstem Walla Walla and Touchet rivers and in cold headwater sites. Northern pikeminnow and chiselmouth (*Acrocheilus alutaceus*) are distributed in lower sections of tributaries and mainstem rivers. Tailed frogs/tadpoles (*Ascaphus truei*) were found only in upper sites in cold, clean water. During our efforts we have generally found bull trout where tailed frogs were present, but we have also found tailed frogs in headwater areas where bull trout are not present.

Spawning Surveys

Steelhead

Steelhead spawning surveys were conducted on several streams in the Walla Walla basin in 2001 between April and late May (Table 10). Surveys on the Walla Walla River were conducted from the stateline downstream 12.6 miles. In this section 6 redds were found in the upper 7.2 miles, and none were found in the lower 5.4 miles. Over 4 miles of Cottonwood Creek were surveyed and only one redd and one dead fish were observed. The East Little Walla Walla was surveyed for 1.1 miles and one redd was found. The West Little Walla Walla was also surveyed for 1.1 miles with nothing found. Upper Mill Creek from the stateline down to Bennington Lake diversion was sampled multiple times and we observed 21 redds in 10.1 miles, averaging 2.1 redds/mile. The lower 3.7 miles of Mill Creek were surveyed one time and 1 redd was observed. The lowest 4.2 miles of Blue Creek were also sampled but no redds or fish were found. The Touchet River was surveyed from the confluence of the North and South Forks to the Highway 12 bridge in Waitsburg (10.7 miles). This section had 7 redds, 1 live fish, and 6 dead fish. Five DNA samples were collected on the Touchet River during spawning walks. Four of the samples were from dead wild females ranging in length from 610 mm to 725 mm, the other sample was from a live hatchery female (622 mm) that was captured during the walk (Table 10). Surveys in the North Fork, Wolf Fork, Robinson Fork, and South Fork Touchet Rivers were conducted by WDFW personnel from the Snake River Lab, Dayton. They found 29 redds (3.4 redds/mile in the North Fork Touchet, 41 redds (4.8 redds/mile) in the Wolf Fork, 7 redds (1.9 redds/mile) in the Robinson Fork, and 40 redds (3.1 redds/mile) in the South Fork Touchet River (Table 10).

Table 10. Steelhead spawning survey summary for the Walla Walla and Touchet rivers and some of their tributaries in Washington State, 2001.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
Walla Walla River							
05/24	1	(A) River mile 40.0 to river mile 36.6	3.4	4	1.2	0	0
05/24	1	(B) River mile 36.6 to river mile 32.8	3.8	2	0.5	0	0
05/24	1	(C) River mile 32.8 to river mile 29.3	3.5	0	0	0	0
05/24	1	(D) River mile 29.3 to river mile 27.4	1.9	0	0	0	0
		Total	**12.6**	**6**	**0.5**	**0**	**0**
Cottonwood Creek							
05/18	1	(E) River mile 5.5 to river mile 4.5	1.0	0	0	0	0
05/18	1	(F) River mile 4.5 to river mile 2.8	1.7	0	0	0	1
05/18	1	(G) River mile 2.8 to river mile 1.0	1.8	1	0.6	0	0
		Total	**4.5**	**1**	**0.2**	**0**	**1**
East Little Walla Walla							
04/26	1	(H) River mile 1.7 to river mile 0.6	1.1	1	0	0	0
		Total	**1.1**	**1**	**0.9**	**0**	**0**
West Little Walla Walla							
04/26	1	(I) River mile 4.1 to river mile 3.0	1.1	0	0	0	0
		Total	**1.1**	**0**	**0**	**0**	**0**
Mill Creek							
03/23	1	(J) River mile 21.7 to river mile 19.1	2.6	0	0	0	0
03/22	1	(K) River mile 19.1 to river mile 16.8	2.3	0	0	0	0
03/22	1	(L) River mile 16.8 to river mile 14.7	2.1	2	1.0	2	0
04/25	1	(M) River mile 14.7 to river mile 12.8	1.9	2	1.1	0	0
04/25	1	(N) River mile 12.8 to river mile 11.6	1.2	1	0.8	0	0
05/23	1	(O) River mile 3.7 to river mile 2.7	1.0	0	0	0	0
05/23	1	(P) River mile 2.7 to river mile 1.7	1.0	0	0	0	0
05/23	1	(Q) River mile 1.7 to river mile 0.0	1.7	1	0.6	0	0
04/16	2	(J) River mile 21.7 to river mile 19.1	2.6	0	0	0	0
04/16	2	(K) River mile 19.1 to river mile 16.8	2.3	0	0	0	0
04/25	2	(L) River mile 16.8 to river mile 14.7	2.1	7	3.3	0	0
05/23	2	(M) River mile 14.7 to river mile 12.8	1.9	1	0.5	0	0
05/23	2	(N) River mile 12.8 to river mile 11.6	1.2	1	0.8	0	0
05/07	3	(J) River mile 21.7 to river mile 19.1	2.6	4	1.5	0	0
05/07	3	(K) River mile 19.1 to river mile 16.8	2.3	3	1.3	0	0
05/07	3	(L) River mile 16.8 to river mile 14.7	2.1	0	0	0	0
		Total	**13.8**	**22**	**1.6**	**2**	**0**

[a] A: Stateline to Beet Rd., B: Beet Rd. to Detour Rd., C: Detour Rd. to McDonald Rd., D: McDonald Rd. to Lowden Gardena Rd., E: RM 5.5 to Hood Rd., F: Hood Rd. to Powerline Rd., G: Powerline Rd. to Braden Rd., H: RM 1.7 to RM 0.6, I: RM 4.1 to Frog Hollow Rd., J: Stateline to Wickersham Brg., K: Wickersham Brg. To Blue Ck., L: Blue Ck. to Seven Mile Rd., M: Seven Mile Rd. to Five Mile Rd., N: Five Mile Rd. to Bennington Lake Diversion, O: Campbell Rd. to Wallula Rd., P: Wallula Rd. to Last Chance Rd., Q: Last Chance Rd. to Mouth of Mill Ck.

Table 10 (Cont.) Steelhead spawning survey summary for the Walla Walla and Touchet rivers and some of their tributaries in Washington State, 2001.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
Blue Ck							
05/09	1	(R) River mile 4.2 to river mile 2.6	1.6	0	0	0	0
05/09	1	(S) River mile 2.6 to river mile 0.0	2.6	0	0	0	0
		Total	**4.2**	**0**	**0**	**0**	**0**
North Fork Touchet[b]							
05/24	1	(T) River mile 11.0 to river mile 9.2	1.8	7	3.9	0	0
04/09	1	(U) River mile 9.2 to river mile 4.6	4.6	3	0.7	0	0
05/24	1	(V) River mile 2.1 to river mile 0.0	2.1	1	0.5	0	0
04/16	2	(U) River mile 9.2 to river mile 4.6	4.6	5	1.1	0	0
04/24	3	(U) River mile 9.2 to river mile 4.6	4.6	6	1.3	0	0
05/17	4	(U) River mile 9.2 to river mile 4.6	4.6	7	1.5	0	0
		Total	**8.5**	**29**	**3.4**	**0**	**0**
Wolf Fork Touchet[b]							
05/10	1	(W) River mile 10.9 to river mile 7.8	3.1	12	3.9	0	0
03/26	1	(X) River mile 7.8 to river mile 2.3	5.5	1	0.2	0	0
04/05	2	(X) River mile 7.8 to river mile 2.3	5.5	3	0.5	0	0
04/11	3	(X) River mile 7.8 to river mile 2.3	5.5	6	1.1	0	0
04/17	4	(X) River mile 7.8 to river mile 2.3	5.5	8	1.5	0	0
04/24	5	(X) River mile 7.8 to river mile 2.3	5.5	7	1.3	0	0
05/08	6	(X) River mile 7.8 to river mile 2.3	5.5	4	0.7	0	0
		Total	**8.6**	**41**	**4.8**	**0**	**0**
Robinson Fork Touchet[b]							
03/30	1	(Y) River mile 3.7 to river mile 0.0	3.7	0	0	0	0
04/16	2	(Y) River mile 3.7 to river mile 0.0	3.7	0	0	0	0
04/27	3	(Y) River mile 3.7 to river mile 0.0	3.7	0	0	0	0
05/25	4	(Y) River mile 3.7 to river mile 0.0	3.7	7	1.9	0	0
		Total	**3.7**	**7**	**1.9**	**0**	**0**
South Fork Touchet[b]							
05/23	1	(Z) River mile 15.3 to river mile 8.1	7.2	19	2.6	0	0
03/14	1	(AA) River mile 8.1 to river mile 2.4	5.7	0	0	0	0
03/28	2	(AA) River mile 8.1 to river mile 2.4	5.7	1	0.2	0	0
04/06	3	(AA) River mile 8.1 to river mile 2.4	5.7	2	0.4	0	0
04/16	4	(AA) River mile 8.1 to river mile 2.4	5.7	13	2.3	0	0
04/25	5	(AA) River mile 8.1 to river mile 2.4	5.7	5	0.9	0	0
05/07	6	(AA) River mile 8.1 to river mile 2.4	5.7	0	0	0	0
		Total	**12.9**	**40**	**3.1**	**0**	**0**

[a] R: RM 4.2 to Sawmill, S: Sawmill to Mouth of Blue Ck., T: Mile Post 13 Br. to Mile Post 11 Br., U: Mile Post 11 Br. to Wolf Fork Rd., V: Marll Rd. to Confluence of North and South Forks of the Touchet River, W: RM 10.9 to Mouth of Coates Ck, X: Mouth of Coates Ck to Mile Post 2, Y: RM 3.7 to Mouth of Robinson Fork, Z: Mouth of Burnt Fork to Camp Nancy Lee, AA: Camp Nancy Lee to Second Brg.,

[b] Surveys done by personnel from the Snake River Lab.

Table 10 (Cont.) Steelhead spawning survey summary for the Walla Walla and Touchet rivers and some of their tributaries in Washington State, 2001.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed	
						Live	Dead
Touchet River							
05/14	1	(AB) River mile 55.0 to river mile	2.8	1	0.4	1	2
05/14	1	(AC) River mile 52.2 to river mile	2.6	2	0.8	0	0
05/11	1	(AD) River mile 49.6 to river mile	1.6	2	1.3	0	0
05/10	1	(AE) River mile 48.0 to river mile	1.8	2	1.1	0	3
05/10	1	(AF) River mile 46.2 to river mile	1.9	0	0	0	1
		Total	**10.7**	**7**	**0.7**	**1**	**6**

[a] AB: Confluence of North and South Forks of the Touchet River to Sewer Plant, AC: Sewer Plant to Rose Gulch, AD: Rose Gulch to Lewis and Clark State Park, AE: Lewis and Clark State Park to Hogeye Hollow Rd., AF: Hogeye Hollow Rd. to SR 12 Br. in Waitsburg.

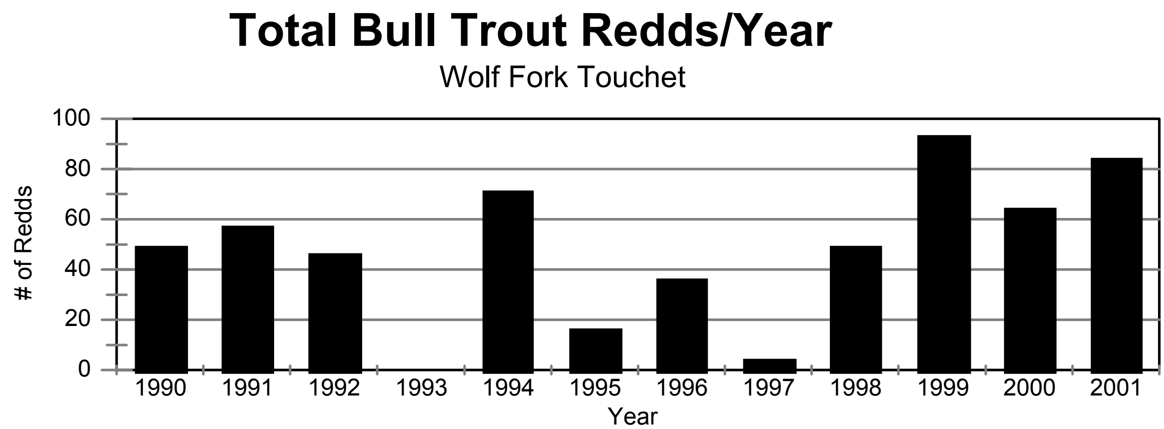
Bull Trout

Bull trout spawning surveys were conducted in the upper Wolf Fork Touchet again in 2001 (Table 11). Water temperatures in the Wolf Fork during bull trout spawning season were generally in the low to mid 40's (EF). A total of 84 redds were observed between river mile 6.9 and river mile 13.5. This is the second highest redd count recorded from 1990 through 2001 (Figure 15).

Table 11. Bull trout spawning survey summary for the Wolf Fork of the Touchet River, 2001.

Date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
09/06	1	(A) River mile 13.5 to river mile 12.0	1.5	5	3.3	0	0
09/06	1	(B) River mile 12.0 to river mile 10.7	1.3	11	8.5	3	0
09/06	1	(C) River mile 10.7 to river mile 9.8	0.9	21	23.3	6	0
09/06	1	(D) River mile 9.8 to river mile 8.7	1.1	5	4.5	2	0
09/20	1	(E) River mile 8.7 to river mile 7.5	1.2	2	1.7	0	0
09/20	1	(F) River mile 7.5 to river mile 6.9	0.6	0	0	0	0
09/20	2	(A) River mile 13.5 to river mile 12.0	1.5	3	2.0	0	0
09/20	2	(B) River mile 12.0 to river mile 10.7	1.3	5	3.8	0	0
09/20	2	(C) River mile 10.7 to river mile 9.8	0.9	11	12.2	2	0
09/20	2	(D) River mile 9.8 to river mile 8.7	1.1	3	2.7	1	0
10/03	2	(E) River mile 8.7 to river mile 7.5	1.2	0	0	0	0
10/03	2	(F) River mile 7.5 to river mile 6.9	0.6	1	1.7	0	0
10/03	3	(A) River mile 13.5 to river mile 12.0	1.5	5	3.3	2	0
10/03	3	(B) River mile 12.0 to river mile 10.7	1.3	2	1.5	0	0
10/03	3	(C) River mile 10.7 to river mile 9.8	0.9	4	4.4	0	0
10/03	3	(D) River mile 9.8 to river mile 8.7	1.1	2	1.8	0	0
10/15	3	(E) River mile 8.7 to river mile 7.5	1.2	0	0	0	0
10/15	4	(A) River mile 13.5 to river mile 12.0	1.5	2	1.3	0	0
10/15	4	(B) River mile 12.0 to river mile 10.7	1.3	1	0.8	0	0
10/15	4	(C) River mile 10.7 to river mile 9.8	0.9	0	0	0	0
10/15	4	(D) River mile 9.8 to river mile 8.7	1.1	1	0.9	0	0
		Total	**6.6**	**84**	**12.7**	**16**	**0**

[a] A: RM 13.5 (2nd meadow) to Forest Service Line, B: Forest Service Line to Mouth of Tate Ck., C: Mouth of Tate Ck. to RM 9.8 (stream ford), D: RM 9.8 (stream ford) to Old Cabin, E: Old Cabin to Mouth of Whitney Ck., F: Mouth of Whitney Ck. to First Br. Below Yellow Gate



<table>
<tr><th rowspan="3">Year</th><th colspan="6">Reach Surveyed [a]</th><th rowspan="3">Total Redds</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr>
<tr><th>River Mile 12.8 - 11.3</th><th>River Mile 11.3 - 10.3</th><th>River Mile 10.3 - 9.6</th><th>River Mile 9.6 - 8.7</th><th>River Mile 8.7 - 7.3</th><th>River Mile 7.3 - 6.8</th></tr>
<tr><td>1990</td><td></td><td>18</td><td>31</td><td></td><td></td><td></td><td>49</td></tr>
<tr><td>1991</td><td></td><td>20</td><td>37</td><td></td><td></td><td></td><td>57</td></tr>
<tr><td>1992</td><td></td><td colspan="2">46</td><td></td><td></td><td></td><td>46</td></tr>
<tr><td>1993[b]</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td></tr>
<tr><td>1994</td><td></td><td colspan="3">71</td><td></td><td></td><td>71</td></tr>
<tr><td>1995</td><td></td><td colspan="3">16</td><td></td><td></td><td>16</td></tr>
<tr><td>1996</td><td></td><td colspan="3">36</td><td></td><td></td><td>36</td></tr>
<tr><td>1997[c]</td><td></td><td></td><td></td><td colspan="3">4</td><td>4</td></tr>
<tr><td>1998</td><td>11</td><td>7</td><td>18</td><td>12</td><td>0</td><td></td><td>48</td></tr>
<tr><td>1999</td><td>32</td><td>14</td><td>34</td><td>11</td><td>2</td><td></td><td>93</td></tr>
<tr><td>2000</td><td>3</td><td>17</td><td>33</td><td>7</td><td>4</td><td></td><td>64</td></tr>
<tr><td>2001</td><td>15</td><td>19</td><td>36</td><td>11</td><td>2</td><td>1</td><td>84</td></tr>
</table>

[a] A: RM 12.8 (2nd meadow) to Forest Service Line, B: Forest Service Line to Mouth of Tate Ck., C: Mouth of Tate Ck. to RM 9.6 (stream ford), D: RM 9.6 (stream ford) to Old Cabin, E: Old Cabin to Mouth of Whitney Ck., F: Mouth of Whitney Ck. to First Br. Below Yellow Gate

[b.] No survey.

[c.] One survey done late in October and too far down stream.

Figure 15. Bull trout spawning survey summary for the Wolf Fork of the Touchet River, 1990-2001.

In 2001, we also surveyed the upper South Fork Touchet and two of its tributaries for bull trout. Since bull trout were found in the Burnt Fork in 2000, and multiple age classes were found by electrofishing in 2001, we expanded the spawning survey area to include a small portion of the upper South Fork Touchet (1.2 miles) between the confluence of the Burnt Fork and Green Fork, and the Griffen Fork, and the lowest 1.3 miles of the Griffen Fork. No redds were found in these new sections. The Burnt Fork was surveyed from river mile 3.5 down to the mouth. A total of 16 redds were found in this area giving an average of 4.6 redds/mile (Table 12). This was four times the number of redds seen in 2000 (Figure 16).

Table 12. Bull trout spawning survey summary for the South Fork of the Touchet River and tributaries,

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
SF Touchet							
09/12	1	(A) River mile 15.4 to river mile 14.8	0.6	0	0	0	0
09/26	1	(B) River mile 14.8 to river mile 14.2	0.6	0	0	0	0
09/26	2	(A) River mile 15.4 to river mile 14.8	0.6	0	0	0	0
10/09	2	(B) River mile 14.8 to river mile 14.2	0.6	0	0	0	0
		Total	**1.2**	**0**	**0**	**0**	**0**
Burnt Fork							
09/12	1	(C) River mile 3.5 to river mile 1.4	2.1	9	4.3	10	0
09/12	1	(D) River mile 1.4 to river mile 0.0	1.4	0	0	0	0
09/26	2	(C) River mile 3.5 to river mile 1.4	2.1	3	1.4	1	0
09/26	2	(D) River mile 1.4 to river mile 0.0	1.4	1	0.7	0	0
10/09	3	(C) River mile 3.5 to river mile 1.4	2.1	0	0	0	0
10/09	3	(D) River mile 1.4 to river mile 0.0	1.4	0	0	0	0
10/22	4	(C) River mile 3.5 to river mile 1.4	2.1	1	0.5	0	0
10/22	4	(D) River mile 1.4 to river mile 0.0	1.4	2	1.4	0	0
		Total	**3.5**	**16**	**4.6**	**11**	**0**
Griffin Fork							
09/26	1	(E) River mile 0.5 to river mile 0.0	0.5	0	0	0	0
10/09	1	(F) River mile 1.3 to river mile 0.0	1.3	0	0	0	0
		Total	**1.3**	**0**	**0**	**0**	**0**

[a] A: Confluence of Burnt Fk.and Green Fk. to RM 14.8 (stream ford), B: RM 14.8 (stream ford) to Mouth of Griffen Fk., C: Just above Forks to RM 1.4, D: RM 1.4 to Mouth of Burnt Fk., E: RM 0.5 to Mouth of Griffen Fk., F: RM 1.3 to Mouth of Griffen Fk.

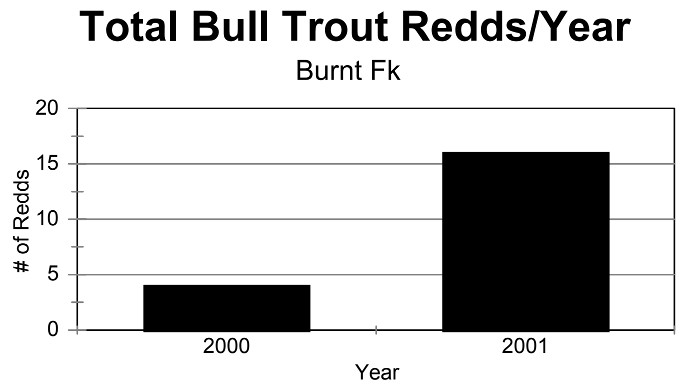


Figure 16. Bull trout redd counts for the Burnt Fork, 2000-2001

In 2001, WDFW assumed the lead for bull trout spawning walks from the US Forest Service on the North Fork Touchet. The Forest Service had conducted bull trout spawning surveys from 1994-1999, and then in conjunction with WDFW in 2000, during which time redd numbers have steadily increased (Figure 17). In 2001, 50 bull trout and 46 redds were observed between Bluewood Creek and Spangler Creek on the North Fork Touchet (Table 13).

Table 13. Bull trout spawning survey summary for the North Fork of the Touchet River and some of its tributaries, 2001.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
NF Touchet							
09/05	1	(A) River mile 19.1 to river mile 16.6	2.5	21	8.4	29	0
09/05	1	(B) River mile 16.6 to river mile 14.0	2.6	1	0.4	2	0
09/19	2	(A) River mile 19.1 to river mile 16.6	2.5	13	5.2	15	0
09/19	2	(B) River mile 16.6 to river mile 14.0	2.6	1	0.4	0	0
10/02	3	(A) River mile 19.1 to river mile 16.6	2.5	5	2.0	3	0
10/02	3	(B) River mile 16.6 to river mile 14.0	2.6	3	1.2	1	0
10/17	4	(A) River mile 19.1 to river mile 16.6	2.5	2	0.8	0	0
10/17	4	(B) River mile 16.6 to river mile 14.0	2.6	0	0	0	0
		Total	**5.1**	**46**	**9.0**	**50**	**0**
Spangler Ck							
09/24	1	(C) River mile 3.5 to river mile 0.0	3.5	2	0.6	0	0
		Total	**3.5**	**2**	**0.6**	**0**	**0**

[a] A: Bluewood Culvert to 2.5 Miles Below Bluewood Culvert, B: 2.5 Miles Below Bluewood Culvert to Stream Ford Below Mouth of Spangler Ck., C: Headwaters of Spangler Ck. to Mouth of Spangler Ck.

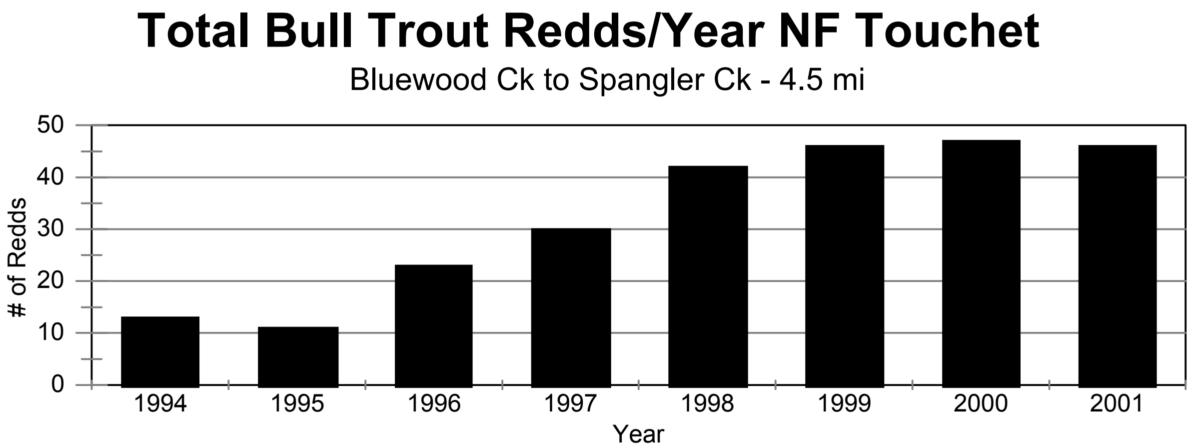


Figure 17. Bull trout redd counts for the North Fork Touchet, 1994-2001

Spring Chinook

During the spring of 2001, 31 adult spring chinook were collected at the trap on the Touchet River. Most of the fish were passed upstream, while a small portion of fish with coded wire tags were sacrificed in an attempt to try and determine the origin of these fish (Coded wire tags from sacrificed fish indicate they were Tucannon River stock). With the largest number of returning adult chinook in the Touchet River in several decades we initiated spawning surveys on the upper mainstem Touchet River, the North Fork Touchet, and the Wolf Fork (Table 14). The South Fork of the Touchet was not surveyed due to very low flows and the poor likelihood that chinook adults would be present there. These spawning surveys were conducted by personnel from both our fish management office and the Snake River Lab in Dayton.

Redds in the Touchet River were only found in the area from the confluence (river mile 55.0) of the North and South Fork Touchet down 2.8 miles, even though surveys were conducted down to river mile 44.3. In the upper section 6 redds were found for an average of 2.1 redds per mile (Table 14).

The North Fork Touchet was walked from the confluence with the South Fork Touchet up to river mile 3, and from river mile 4.3 to river mile 9.9. The bottom section had 2 redds and the upper section had 1 redd, with an overall average of 0.3 redds per mile (Table 14).

The Wolf Fork was the most productive area, averaging 2.3 redds per mile. In total, 9.8 miles were surveyed and 23 redds were found. Five dead fish were sampled in this area and several other live fish were seen. The highest areas of productivity were from river mile 0.0 to 1.8 with 7 redds, and from river mile 6.9 to river mile 8.7 with 9 redds (Table 14).

Table 14. Spring Chinook spawning survey summary for the Touchet River and some of its tributaries, 2001.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
NF Touchet							
09/21[b]	1	(A) River mile 9.9 to river mile 4.3	5.6	1	0.2	0	0
09/20[b]	1	(B) River mile 3.0 to river mile 0.0	3.1	2	0.6	1	1
		Total	**8.7**	**3**	**0.3**	**1**	**1**
Wolf Fork							
09/20	1	(C) River mile 9.8 to river mile 8.7	1.1	2	1.8	1	0
09/20	1	(D) River mile 8.7 to river mile 7.5	1.2	6	5.0	0	0
09/20	1	(E) River mile 7.5 to river mile 6.9	0.6	3	5.0	1	1
09/19	1	(F) River mile 6.9 to river mile 5.7	1.2	2	1.7	1	2
09/19	1	(G) River mile 5.7 to river mile 4.5	1.2	1	0.8	1	0
09/19	1	(H) River mile 4.5 to river mile 2.9	1.6	1	0.6	0	1
09/19	1	(I) River mile 2.9 to river mile 1.8	1.1	0	0	3	0
09/19	1	(J) River mile 1.8 to river mile 0.0	1.8	7	3.9	7	1
09/28	2	(K) River mile 2.3 to river mile 1.5	0.8	1	1.2	0	2
		Total	**9.8**	**23**	**2.3**	**14**	**7**
Touchet River							
09/20[b]	1	(L) River mile 55.0 to river mile 52.2	2.8	6	2.1	1	3
09/25	1	(M) River mile 52.2 to river mile 49.6	2.6	0	0	0	0
09/25	1	(N) River mile 49.6 to river mile 48.0	1.6	0	0	0	0
09/25	1	(O) River mile 48.0 to river mile 46.2	1.8	0	0	0	0
09/25	1	(P) River mile 46.2 to river mile 44.3	1.9	0	0	0	0
		Total	**10.7**	**6**	**0.6**	**1**	**3**

[a] A: Mile Post 11 to Wolf Fork Rd., B: Warrens Orchard to Confluence of the North and South Forks of the Touchet River, C: RM 9.8 (stream ford) to Old Cabin, D: Old Cabin to Mouth of Whitney Ck., E: Mouth of Whitney Ck. to First Br. Below Yellow Gate, F: First Brg. Below Yellow Gate to RM 5.7, G: RM 5.7 to Second Br. on Wolf Fk Rd., H: Second Br. on Wolf Fk Rd.to Mountain Home Park, I: Mountain Home Park to Holmberg Rd., J: Holmberg Rd. to Mouth of Wolf Fk., K: 0.5 miles above Holmberg Rd. to 0.3 miles below Holmberg Rd., L: Confluence of the North and South Forks of the Touchet River to Sewer Plant, M: Sewer Plant to Rose Gulch, N: Rose Gulch to Lewis and Clark State Park, O: Lewis and Clark State Park to Hogeye Rd., P: Hogeye Rd. to Hwy 12 Br. in Waitsburg.

[b] Survey sections walked by Snake River Lab personnel.

Genetic Sampling

Fin clips were collected from a total of 191 fish in the Walla Walla basin during the 2001 field season. One hundred seventy-eight of these samples from various species were taken at the Touchet River trap in Dayton (most taken by Snake River Lab (SRL) staff), and the other 20 were collected by Fish Management staff. The Touchet River trap is only partially effective as some fish can jump the dam. Of the 20 samples collected by Fish Management staff, 8 were from bull trout, 6 were from steelhead, 5 were from spring chinook, and 1 was from an adult coho (from the lower Touchet River).

SRL staff sampled 193 steelhead at the Touchet River trap, and collected 148 DNA samples from steelhead. Specific details for steelhead sampled at the trap will appear in the Snake River Lab's 2001 annual report. Samples collected from steelhead by Fish Management staff were collected from fish that were found during spawning walks. One of the fish was found on Cottonwood Creek, and the other 5 were found in the Touchet River. All of the fish except one in the Touchet River were dead when sampled.

SRL and Fish Management personnel sampled 43 bull trout at the Dayton trap (Appendix G), of which SRL collected one DNA sample and Fish Management personnel collected 7 DNA samples. The other bull trout sampled by Fish Management was during a bull trout spawning survey on the North Fork Touchet. This fish appeared to be dying and was laying along the bank.

SRL personnel sampled 35 spring chinook at the Dayton trap (Appendix G), and took DNA samples from 19 of them. Fish Management also sampled 5 spring chinook on the Wolf Fork during chinook spawning surveys. The Snake River Lab conducted spring chinook spawning surveys on the North Fork Touchet and the upper Touchet River, and 4 DNA samples were collected.

Four mountain whitefish and 14 brown trout were also trapped, but DNA samples were only collected from 3 whitefish (Appendix G).

All the genetic samples are currently being held at either the SRL or Fish Management offices in Dayton. They are being prepared for shipment to the WDFW Genetics Stock Identification Lab for DNA analysis.

Conclusions and Recommendations

Mainstem Walla Walla Settlement Agreement

Additional analyses that include local air temperatures, precipitation, snow pack, and irrigation use by other parties should be conducted to determine the full effects of increased bypass flows from the settlement agreement on stream flows, water temperatures, salmonid abundance and distribution in the Washington portion of the Walla Walla Basin, upstream of the confluence with the Touchet River. Preliminary summaries indicate that stream flows in 2001 in particular were increased and mean maximum summer temperatures at Mojonnier and Swegle roads generally decreased from 1998-2001. Juvenile rainbow/steelhead mean densities increased by approximately 20 times from 1998-2001 from Pepper Rd. down to Mojonnier, but densities downstream were inconsistent. We are still uncertain how much of these changes can be attributed strictly to the increased settlement flows as opposed to differences in weather, snow pack levels and other variables among years.

Mill Creek Water Enhancement Experiment

One reason for this test was an attempt to increase fish survival with the increase in the amount of water in the channel. Another reason was to test whether water temperatures would be suitable for fish throughout the flood control channel. We found that the increase in flow probably caused fish mortalities in the concrete channel, because the water temperatures were increased to lethal levels for salmonids (≥75-84EF, Bjornn and Reiser 1991, Appendix C). The increase in temperature was caused by continuous overland flow through the wide part of the flood channel, where it had gone dry in the past (near Wilbur Street). This hotter water then mixed with groundwater that was recharging the concrete channel at Wildwood Park causing increased temperatures throughout the concrete channel. Salmonids became rare between Tausick Way and the top of the concrete channel during summer and fall. The fish that remained between the Yellowhawk Creek Diversion and Tausick Way tended to be found in slightly cooler water than the ambient stream temperatures present during August.

Unfortunately, this study was not planned prior to implementation so the Mill Creek channel was dewatered temporarily before the study began, and no pretreatment data were available. This was an ad hoc test with substantial monitoring to try and evaluate the potential benefits of adding water to the Mill Creek channel during the summer. The test showed that the channel must be narrowed to minimize thermal increases before water reaches the concrete channel. Otherwise, lethal water temperatures likely kill salmonids downstream of Tausick Way and through some of the concrete channel.

Lower River Passage Conditions

We examined stream temperature and discharge data that we have collected in the lower Walla Walla and Touchet rivers from 1998 through 2001 to evaluate juvenile and adult salmonid passage conditions in the spring and fall each year. Data on temperatures and flows is limited in

May because stream flows can increase rapidly and cause damage or loss of monitors during spring.

Reduced flows downstream of major irrigation diversions have been observed during the field seasons (Appendix B). Specific observations included: (1) sharp flow reductions below Burlingame Diversion (Mojonnier) in mid to late June and again in mid–October through mid-November (as recorded by manual and instream flow monitors); (2) a steep decline in flows on the Touchet River below Hofer Diversion from late June through early November (as recorded by manual and instream flow monitors); and (3) a severe flow reduction in Mill Ck below Yellowhawk diversion in May or June and after the test flow was completed through late October-early November, including a completely dewatered area from Wilbur Street to Wildwood Park.

Returning adult steelhead are blocked by low stream flows in the lower Walla Walla and Touchet rivers in the fall of each year. Although stream temperatures decrease in September and October to levels that are generally suitable for salmonid migration in these lower river reaches, low flows often preclude adult steelhead or salmon from accessing the basin upstream to the mouth of the Touchet River, or further upstream. Tagged hatchery steelhead destined for the Walla Walla or Touchet River often bypass the Walla Walla basin in the fall and enter the Snake River where they are recovered at Lyons Ferry Hatchery or at Lower Granite Dam (Bumgarner et al. 2002). Many of these fish are later recovered in the Walla Walla River basin after being released from Lyons Ferry Hatchery and after the rivers have reduced temperatures and increased flows. Low flows in the lower Walla Walla and Touchet rivers are apparently increasing wandering and possibly straying by hatchery fish released as smolts within the basin. Similar effects are likely occurring for unmarked wild steelhead returning to the Walla Walla basin.

Spring Chinook and Coho Status

Chinook and coho salmon have rarely been observed in the Walla Walla basin from the mid 1950s until about 1998 or 1999. The CTUIR began experimental reintroduction in upper Mill Creek and the upper Walla Walla River in 2000 by outplanting adult spring chinook from Ringold Hatchery into the basin in August. These outplants continued in 2001, but a relatively large number (several dozen) of unmarked spring chinook were counted at traps in the Walla Walla River at Milton-Freewater and in the Touchet River near Dayton during spring and early summer 2001. These fish entered the basin volitionally. WDFW conducted spring chinook spawning surveys in the Touchet River in the fall of 2001 to document spawning locations and numbers of redds. The CTUIR also conducted spawning surveys in the upper Mill Creek and the upper Walla Walla River to document spring chinook redds and adults that had been outplanted, or had voluntarily entered Mill Creek and the Walla Walla River. We do not know the source of the unmarked spring chinook in the Touchet and Walla Walla rivers. We suspect that most of them are likely unmarked stray hatchery fish from the Umatilla River, or elsewhere. WDFW has documented a few marked hatchery fish in the Touchet River from the Tucannon Hatchery. All Tucannon Hatchery spring chinook are marked, but not all Umatilla Hatchery spring chinook returning in 2001 were marked.

WDFW has had reports from anglers and landowners of spawning fall chinook in the lower Walla Walla River (below the Touchet River) since about 1991. Several carcasses have also been documented or recovered. In 2001, WDFW found one spawning pair in lower Mill Creek.

Very rarely over the past two or three years we have observed juvenile or adult coho in the lower Walla Walla River (below the State line). In 2001, two anglers reported catching two adult coho in the lower Walla Walla River and one adult coho carcass was recovered by WDFW in the lower Touchet near Hofer Dam. We suspect that most, or all, of these fall chinook and coho are stray hatchery fish from the Umatilla River, or elsewhere.

Barriers Identified or Documented by WDFW

Over the course of this project we have identified numerous barriers in the Walla Walla Basin. Some of these barriers have been removed or passage has been improved, while other physical and/or physiological barriers remain. Listed below are barriers that we have identified since 1998, and their current status:

1. Walla Walla River below Nursery Bridge in Milton-Freewater - dewatered in the past, but continuous flows throughout the year in 2001 for the first time in many years (from Settlement Agreement actions).

2. Walla Walla River below McDonald Rd - was stagnant or isolated pools during summer in 1998 - has limited water, but flowing in 1999, 2000 and 2001. Water levels appear to be improving some.

3. Cottonwood Ck. -low flows and high temps in the Washington portion, with areas that go completely dry from early summer through fall.

4. Mill Ck. - nearly or completely dry from Yellowhawk Diversion to the concrete channel, and stagnant or nearly so from 9th Ave downstream to the mouth - unchanged except during part of the test in 2001. Spring fed flows occur in the concrete channel and maintain tolerable temperatures.

5. Lewis Ck - dam and unscreened diversion near the mouth discovered by WDFW in 1999. Only one size class of bull trout (subadults) present in 1999. The diversion has been screened and the barrier modified to provide passage. Multiple age and size classes of bull trout have been found upstream since 2000.

6. Whiskey Ck. - Barrier dam was identified in 1999 by WDFW. The barrier was made passable in 2001 with a series of weirs and a notch in the dam.

7. Mud Ck. - tributary to Dry Creek - near Dixie, WA. - a culvert appears to be a complete barrier - no change.

8. Pattit Ck. Below Broughton Bridge - old concrete Dam was a partial barrier, especially during low flows. The dam was removed and weirs were installed in 2001.

9. Bluewood box culvert - low flows and few fish above this point in the NF Touchet River. - no change.

10. Russell Ck. Dam - a high Civilian Conservation Corps dam was identified by WDFW in Russell Creek in 2000. No fish have been documented upstream of this dam. - no change.

11. Dry Ck. - Sapolil Rd area - box culvert identified by DOE - no change. Also has low flows and high temps in lower portions.

12. Blue Ck. - debris jam - likely barrier identified by WDFW. - no change, but likely to wash out soon.

13. Touchet River - Hofer Dam - poor adult passage at the dam and very limited water below the dam in summer and fall. The splash dam on top of the concrete dam is often not removed until winter, if at all, and the ladder is often not adjusted in the fall or early winter for adequate passage. Screens are not adequate at this site. Design options have been completed, or nearly so, but there is a lack of funds at this point to complete the needed modifications. Also low flow passage problems exist at the concrete siphon a short distance below Hofer Dam.

14. Bennington Diversion Dam - this Corps of Engineers Dam has an adult fish ladder that does not meet current WDFW or NMFS criteria and the diversion into Bennington Lake was unscreened until 2000 when temporary screens were installed for that spring. WDFW initiated screening discussions with the COE and built and provided drum screens for the COE to install at the diversion in 2001. Downstream and upstream passage for adults and juveniles at this dam are not within criteria or guidelines for adequate salmonid passage. WDFW has tried for several years to get ladder redesign and improvements completed, as well as construction and operation of an adult fish trap in this ladder - unchanged at this time.

15. Garden City/Old Lowden on the Lower Walla Walla River- screens were being designed and were installed during summer and fall 2002, under BPA funding.

16. Huntsville diversion screens upstream of Waitsburg- new screens are being designed and will be installed with BPA funding. Hundreds of other small pumps and diversions are now being identified and screened under the WDFW Cooperative Compliance Review Program with State and federal monies.

17. Dayton Dam - This dam is used as a water intake by WDFW for the steelhead acclimation pond. It was identified as a passage problem in 2000 and it does not meet current passage requirements for adults or juveniles. - unchanged in 2001.

Bull Trout

WDFW has identified several habitat and potential fish stock problems that affect bull trout in the Washington portion of the Walla Walla Basin. Most, or all, of these problems have now been identified in the draft Umatilla/Walla Walla Bull Trout Recovery Plan (U.S. Fish and Wildlife Service, 2002). Some of the problems that we have identified from our Walla Walla Assessment study include the following:

a) Tate Creek has a blocked culvert and it now runs down the upper Wolf Fork Road for about a half mile where it reenters the stream and adds sediment to the Wolf Fork.

b) There are five or more stream fords on upper Wolf Fork that attract bull trout for spawning. These fords are used in the fall by vehicles and spawning fish may be disturbed or redds may be destroyed when the fords are accessed.

c) The box culvert at the entrance to Ski Bluewood does not appear to allow adequate passage. Few bull trout are found upstream of it and they are plentiful immediately downstream. Additionally, there is an orange algal, bacterial or chemical coating on the bottom of the small drainage from the Bluewood parking lot and into parts of the North Fork Touchet River. No fish of any kind were found in this small tributary during qualitative electrofishing in 2000.

d) A road culvert is apparently a barrier on a tributary to Spangler Creek. Cursory electrofishing upstream of the barrier in 2000 produced no fish upstream, but several bull trout and steelhead juveniles were found immediately downstream.

e) A few subadult bull trout were found in Lewis Creek in 1999, but other age classes could not be found. Some landowners told us that bull trout adults were common before the 1996 flood. A barrier and an unscreened diversion were built in 1996 and identified by WDFW in 1999 near the mouth of this stream. The barrier and diversion have been modified and in 2002 WDFW intends to sample this stream again to determine if the bull trout population is being reestablished in Lewis Creek.

f) We sampled upper SF Touchet River and Burnt Fork in 1999. We found little evidence of bull trout. We resampled the Burnt Fork in 2000 and found multiple age classes present. We began conducting bull trout spawning surveys in 2000 and found 4 redds. We expanded our efforts in the Burnt fork in 2001 and documented 16 redds. We have conducted spawning surveys in the upper SF Touchet, but have not found any evidence of spawning by bull trout. Bull trout apparently do not spawn, or generally rear, in the SF Touchet River because of high temperatures. The Burnt Fork population appears to be very isolated and quite small, therefore it is very vulnerable to extirpation.

g) WDFW has documented that bull trout spawn in 6 miles of the Wolf Fork, 4.5 miles of the NF Touchet River, and just over 3 miles of the Burnt Fork of the South Fork Touchet River. We currently do not know if these spawning groups are reproductively isolated from one another. These small spawning aggregations are very vulnerable to poaching, disturbance, or habitat loss.

Recommendations for Emphasis of Assessment Activities for 2002.

a) Continue to monitor the mainstem Walla Walla River from the Stateline downstream to McDonald Br to document changes in stream temperatures, flows, and salmonid densities and distribution with the addition of water under the Settlement Agreement.

b) Increase monitoring of the Mill Creek flood channel, and others parts of Mill Creek and Yellowhawk Creek, to document seasonal changes in temperatures, flows, and fish distribution and abundance. This information is needed to guide management and restoration actions in the Mill Creek system (includes Garrison and Yellowhawk creeks).

c) Reevaluate the distribution and abundance of juvenile salmonids in Whiskey Creek now that passage has been restored in lower Whiskey Creek.

d) Increase monitoring in the Little Walla Walla River system to document flows, temperatures, and seasonal fish use. This system is screened at the top in Oregon, but it is unscreened at the lower ends and there is access from the mainstem Walla Walla River in Washington. Salmonids are known to use parts of this system. This information is necessary to guide decisions and actions for managing this modified stream system.

e) Increase the assessment of Titus Creek flows, temperatures and fish use. This information is needed to help determine management actions to screen fish from irrigation diversions in Titus Creek.

f) Reevaluate use of Lewis Creek by bull trout. Conduct redd surveys if multiple age classes are found during electrofishing.

g) Select or develop a habitat survey protocol and begin conducting habitat inventory and assessment surveys. Detailed habitat assessment and inventory data are lacking in nearly all portions of the Walla Walla Basin within Washington. This lack of information limits watershed planning and restoration actions.

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Appendix A. Study Sites, 2001

Appendix A. Table 1. Touchet River and tributary study sites, 2001.

Reach	Site #	RM[a]	Location	Sample Type[b]	Comments
NF Touchet River	NFT-1	19.1	T7N,R40E,Sect 18,NW¼,NE¼	T,F	Bluewood culvert
	NFT-2	18.5	T7N,R40E,Sect 7,NE¼,SE¼	EQ	Snow Park
	NFT-3	17.0	T7N,R40E,Sect 5,SW¼,NE¼	EQ	1.4 mi below snow park
	NFT-4	15.3	T8N,R40E,Sect 33,NE¼,NE¼	EQ	3 mi below snow park
	NFT-5	14.0	T8N,R40E,Sect 21,SE¼,SE¼	EQ,T,F[c]	0.2 mi. below Spangler mouth
	NFT-6	11.0	T8N,R40E,Sect 9,NW¼,NW¼	EQ[d]	MP #13 Bridge
	NFT-7	9.2	T9N,R40E,Sect 31,SE¼,SE¼	EQ[d]	MP #11 Bridge
	NFT-8	7.6	T9N,R40E,Sect 30,SW¼,NE¼	EQ[d],T,F[c]	Jim Ck Mouth
	NFT-9	5.7	T9N,R39E,Sect 13,NW¼,SE¼	EQ[d]	MP #7
	NFT-10	4.2	T9N,R39E,Sect 11,NW¼,SE¼	EQ[d]	Wolf Fork Rd. Bridge
	NFT-11	2.1	T9N,R39E,Sect 3,SE¼,NW¼	EQ[d]	Vernon Ln. Bridge
	NFT-12	1.4	T9N,R39E,Sect 4,NW¼,NE¼	T,F[c],S	Above Baileysburg
	NFT-13	0.1	T10N,R39E,Sect 32,NW¼,SE¼	EQ[d]	Just above confluence
Spangler Ck	SC-1	0.2	T8N,R40E,Sect 27,NW¼,NW¼	T,F[c]	0.2 mi above Spangler mouth
Lewis Ck	LC-1	0.1	T8N,R40E,Sect 9,NW¼,NW¼	T,F[c]	At NF Touchet Rd. Bridge
Jim Ck	JC-1	0.3	T9N,R40E,Sect 30,SE¼,NE¼	T,F[c]	Below culvert
Wolf Fork	WF-1	12.0	T7N,R39E,Sect 1,NW¼,NW¼	EQ	Forest Service Boundary
	WF-2	10.7	T8N,R39E,Sect 25,NW¼,SE¼	EQ,T	Tate Ck mouth
	WF-3	10.4	T8N,R39E,Sect 25,SE¼,NE¼	EQ,T,F	Below Green Fly Canyon
	WF-4	9.9	T8N,R39E,Sect 24,SW¼,SE¼	EQ[d]	RM 9.9
	WF-5	7.3	T8N,R40E,Sect 7,NW¼,SW¼	EQ[d]	Coates Ck mouth
	WF-6	6.8	T8N,R40E,Sect 7,NW¼,NW¼	EQ[d]	Below Coates Ck
	WF-7	5.5	T9N,R39E, Sect 36,NW¼,SE¼	EQ[d]	Just above 3rd Bridge
	WF-8	4.5	T9N,R39E,Sect 36,NW¼,NW¼	T,F[c]	2nd Bridge
	WF-9	4.2	T9N,R39E,Sect 25,SW¼,SE¼	EQ[d]	RM 4.2
	WF-10	2.7	T9N,R39E,Sect 23,SW¼,SE¼	EQ[d]	Robinson Fork mouth
	WF-11	1.7	T9N,R39E,Sect 23,NW¼,NW¼	T,F[c]	Holmberg Rd. bridge
	WF-12	1.3	T9N,R39E,Sect 14,NW¼,SW¼	EQ[d]	RM 1.3
	WF-13	0.1	T9N,R39E,Sect 11,SW¼,NE¼	EQ[d]	Just above confluence
Whitney Ck	WH-1	0.3	T8N,R40E,Sect 7,SE¼,SW¼	T,F[c]	0.2 mi above Wolf Fk Rd.
Coates Ck	C-1	0.1	T8N,R40E,Sect 7,NE¼,SW¼	T,F[c]	Just above Wolf Fk Rd.
Robinson	RF-1	5.7	T8N,R39E,Sect 22,NW¼,NW¼	T,F	5.2 mi above BLC Gate
	RF-2	4.1	T8N,R39E,Sect 15,NE¼,NE¼	EQ[d]	3.2 mi above BLC Gate
	RF-3	3.5	T8N,R39E,Sect 11,NW¼,NW¼	EQ[d]	RM 3.5
	RF-4	2.2	T8N,R39E,Sect 2,NW¼,NE¼	EQ[d]	1st bridge above gate
	RF-5	1.5	T9N,R39E,Sect 35,NE¼,SW¼	EQ[d],T,F[c]	2nd bridge up Robinson Fk Rd
	RF-6	0.6	T9N,R39E,Sect 26,NW¼,SE¼	EQ[d]	1st bridge up Robinson Fk Rd.
Green Fork	GF-1	2.1	T7N,R38E,Sect 13,SW¼,SE¼	T	RM 2.1
Burnt Fork	BF-1	3.3	T7N,R39E,Sect 16,NE¼,SE¼	EQ	RM 3.3
	BF-2	1.5	T7N,R39E,Sect 17,NE¼,NW¼	EQ	Canyon Crossing
	BF-3	1.3	T7N,R39E,Sect 8,SW¼,SW¼	T	RM 1.3
	BF-4	0.8	T7N,R39E,Sect 7,NW¼,SE¼	EQ	RM 0.8

[a] River Mile.
[b] EQ-Quantitative electrofishing (density estimates); EL-Qualitative electrofishing; T-Temperature; F-Flow; G-Flow Guage; S-Snorkel
[c] Index discharge sites
[d] Sites electrofished by Snake River Lab personnel.

Appendix A. Table 1. Touchet River and tributary study sites, 2001 (continued).

Reach	Site #	RM[a]	Location	Sample Type[b]	Comments
SF Touchet River	SFT-1	15.2	T7N,R39E,Sect 6,SE¼,SW¼	EQ,T	Below Burnt Fork
	SFT-2	14.7	T7N,R39E,Sect 6,SE¼,NE¼	EQ	RM 14.7
	SFT-3	13.5	T8N,R39E,Sect 32,SW¼,NW¼	EQ	Below Griffen Fk
	SFT-4	12.5	T8N,R39E,Sect 30,SE¼,NE¼	EQ[d]	RM 12.5
	SFT-5	11.5	T8N,R39E,Sect 19,NE¼,SE¼	EQ[d]	RM 11.5
	SFT-6	10.5	T8N,R39E,Sect 17,Se¼,SW¼	EQ[d]	RM 10.5
	SFT-7	9.4	T9N,R39E,Sect 8,SE¼,NW¼	EQ[d]	Just below MP #9
	SFT-8	8.4	T8N,R39E,Sect 5,NW¼,SE¼	EQ[d]	Camp Nancy Lee Bridge
	SFT-9	7.5	T9N,R39E,Sect 32,SE¼,SE¼	EQ[d]	Just below MP #7
	SFT-10	6.5	T9N,R39E,Sect 33,NW¼,NW¼	EQ[d]	RM 6.5
	SFT-11	5.5	T9N,R39E,Sect 28,SW¼,NE¼	EQ[d]	RM 5.5
	SFT-12	4.5	T9N,R39E,Sect 21,Se¼,NE¼	EQ[d]	RM 4.5
	SFT-13	3.5	T9N,R39E,Sect 16,NW¼,SE¼	EQ[d]	MP #3
	SFT-14	2.4	T9N,R39E,Sect 9,NW¼,SW¼	EQ[d]	Pettyjohn Rd. bridge
	SFT-15	1.4	T9N,R39E,Sect 5,SW¼,SE¼	EQ[d]	MP #1
	SFT-16	0.8	T9N,R39E,Sect 5,SW¼,NE¼	S	0.3 mi above Gephart Rd.
	SFT-17	0.5	T9N,R39E,Sect 5,NW¼,NE¼	T,F[c],S	Gephart Rd.
	SFT-18	0.1	T10N,R39E,Sect 32,NW¼,SE¼	EQ[d]	Just above confluence
Touchet	TR-1	56.1	T10N,R39E,Sect 32,NE¼,SW¼	EQ[d],S	0.1 mi below confluence
	TR-2	54.0	T10N,R39E,Sect 30,SE¼,SE¼	S	Above intake
	TR-3	53.8	T10N,R39E,Sect 30,SE¼,SE¼	T,S	Below Snake River Lab trap
	TR-4	53.5	T10N,R39E,Sect 30,NW¼,SE¼	F[c]	Flagpole
	TR-5	53.3	T10N,R39E,Sect 30,SE¼,NW¼	EQ[d]	Highway 12 bridge in Dayton
	TR-6	52.2	T10N,R38E,Sect 25,NE¼,SW¼	EQ[d],S	Sewer plant
	TR-7	51.3	T10N,R38E,Sect 35,NE¼,SE¼	S	Poor Farm Rd.
	TR-8	50.7	T10N,R38E,Sect 35,NE¼,SW¼	EQ[d]	RM 50.7
	TR-9	50.3	T10N,R38E,Sect 35,SW¼,SW¼	S	Behind Longs Elevator
	TR-10	49.5	T9N,R38E,Sect 3,NE¼,NE¼	S	Rose Gulch Rd.
	TR-11	49.2	T9N,R38E,Sect 4,SE¼,NE¼	EQ[d]	RM 49.2
	TR-12	48.4	T9N,R38E,Sect 4,SW¼,NW¼	T,S	Behind L&C State Park
	TR-13	47.3	T9N,R38E,Sect 6,NE¼,SE¼	EQ[d]	Across from airstrip
	TR-14	46.2	T9N,R38E,Sect 7,SW¼,NW¼	S	Above Lower Hogeye Rd.
	TR-15	45.3	T9N,R37E,Sect 12,SE¼,SW¼	EQ[d]	RM 45.3
	TR-16	43.8	T9N,R37E,Sect 10,NE¼,SE¼	EQ[d]	RM 43.8
	TR-17	40.5	T9N,R37E,Sect 8,SW¼,NW¼	EQ,T,F,S	Bolles Bridge
	TR-18	36.6	T9N,R36E,Sect 3,NW¼,NE¼	EL,S	Hart Rd.
	TR-19	27.4	T9N,R35E,Sect 5,SW¼,NW¼	T	Lamar Rd.
	TR-20	11.4	T8N,R33E,Sect 23,NE¼,SW¼	T,F[c],G	Below Simms Rd.
	TR-21	4.6	T7N,R33E,Sect 15,NE¼,NE¼	F,G	Above Hofer Dam
	TR-22	1.5	T7N,R33E,Sect 27,NW¼,SE¼	T,F[c],G	Cummins Rd.

[a] River Mile.
[b] EQ-Quantitative electrofishing (density estimates); EL-Qualitative electrofishing; T-Temperature; F-Flow; G-Flow Guage; S-Snorkel
[c] Index discharge sites
[d] Sites electrofished by Snake River Lab personnel.

Appendix A. Table 1. Touchet River and tributary study sites, 2001 (continued).

Reach	Site #	RM[a]	Location	Sample Type[b]	Comments
SF Patit Ck	SFP-1	7.1	T10N,R40E,Sect 25,SE¼,SE¼	T,F[c]	End of Road
	SFP-2	3.7	T10N,R40E,Sect 22,SW¼,SE¼	T	RM 3.7
Patit Ck	PC-1	2.3	T10N,R39E,Sect 17,SE¼,SE¼	EL	Just below Patit Rd.
Whiskey Ck	WC-1	0.0	T9N,R37E,Sect 12,NE¼,SE¼	T	Just above mouth
SF Coppei	SFC-1	3.2	T8N,R38E,Sect 20,SE¼,SE¼	T,F[c]	Canyon culvert
	SFC-2	0.8	T8N,R38E,Sect 18,NW¼,NE¼	F[c]	Walker Rd.
NF Coppei	NFC-1	0.8	T8N,R38E,Sect 8,SW¼,NW¼	T,F[c]	Grain elevators
	NFC-2	0.1	T8N,R38E,Sect 7,NW¼,NW¼	F[c]	Forks Bridge
Coppei Ck	CO-1	4.6	T9N,R37E,Sect 25,SW¼,SE¼	T,F[c]	McCowan Rd.

[a] River Mile.
[b] EQ-Quantitative electrofishing (density estimates); EL-Qualitative electrofishing; T-Temperature; F-Flow; G-Flow Guage; S-Snorkel
[c] Index discharge sites
[d] Sites electrofished by Snake River Lab personnel.

Appendix A. Table 2. Walla Walla River and tributary study sites, 2001.

Reach	Site #	RM[a]	Location	Sample Type[b]	Comments
Birch Ck	BRC-1	0.1	T6N,R35E,Sect 13,NW¼,NE¼	T	Just above mouth
Walla River	WW-1	40.0	T6N,R35E,Sect 13,SW¼,NE¼	EQ,F[c],G	Stateline
	WW-2	39.9	T6N,R35E,Sect 13,SW¼,NE¼	S	Above Birch Ck mouth
	WW-3	39.6	T6N,R35E,Sect 13,NE¼,NW¼	EQ,T,F[c]	Pepper Rd bridge
	WW-4	38.9	T6N,R35E,Sect 12,NW¼,SW¼	EQ,F[c],G,S	0.7 mi below Pepper Rd.
	WW-5	38.2	T6N,R35E,Sect 38,SE¼,NE¼	EQ	Above Yellowhawk mouth
	WW-6	37.1	T6N,R35E,Sect 3,SW¼,SE¼	EQ,F[c],S	0.5 mi above Burlingame
	WW-7	36.7	T6N,R35E,Sect 39,SW¼,NE¼	S	Burlingame Diversion
	WW-8	36.5	T6N,R35E,Sect 39,NE¼,NW¼	EL,T,F[c],G,S	Below Mojonnier Rd.
	WW-9	35.1	T6N,R35E,Sect 5,NE¼,NE¼	EL	Below Last Chance Rd.
	WW-10	34.0	T7N,R35E,Sect 38,SE¼,SW¼	T,F[c]	Below Swegle Rd.
	WW-11	33.3	T7N,R35E,Sect 31,SW¼,NW¼	EL,T,F[c],G,S	0.4 miles Above Detour Rd.
	WW-12	29.4	T7N,R34E,Sect 34,NW¼,NW¼	EL,T,F[c],S	Above McDonald Rd
	WW-13	27.4	T7N,R34E,Sect 29,SE¼,SW¼	EL,S	Lowden Gardena Rd.
	WW-14	22.8	T6N,R33E,Sect 3,SE¼,NW¼	T	Touchet Gardena Rd.
	WW-15	15.6	T7N,R32E,Sect 35,SE¼,SE¼	T	Byerly Rd. bridge
	WW-16	12.1	T7N,R32E,Sect 22,NE¼,SE¼	T	Nine Mile Rd.
Yellowhaw	YC-1	8.0	T7N,R36E,Sect 23,NE¼,NW¼	EQ,T,F[c],G	Diversion
	YC-2	6.8	T7N,R36E,Sect 27,NW¼,NE¼	EQ	Carl St.
	YC-3	5.4	T7N,R36E,Sect 33,NE¼,NW¼	EL	Fern Ave.
	YC-4	5.2	T7N,R36E,Sect 33,SW¼,NW¼	EL	0.2 mi below Fern Ave.
	YC-5	4.1	T7N,R36E,Sect 37,SE¼,NW¼	EQ	3rd and Yellowhawk St.
	YC-6	1.2	T6N,R35E,Sect 1,SW¼,SW¼	EQ	Above Pepper bridge
	YC-7	0.1	T6N,R35E,Sect 38,NE¼,NE¼	EQ,T,F[c],G	Above Mouth
Caldwell Ck	CD-1	0.2	T7N,R36E,Sect 37,SE¼,NW¼	T	3rd Ave.
Russell Ck	RC-1	6.3	T7N,R37E,Sect 31,SW¼,NE¼	EL	0.3 mi below Foster Rd.
	RC-2	5.0	T7N,R36E,Sect 36,SE¼,NW¼	EL	CCC dam
	RC-3	3.0	T7N,R36E,Sect 34,NE¼,NW¼	F[c]	Above Depping Rd
	RC-4	3.0	T7N,R36E,Sect 34,NE¼,NW¼	EL	Below Depping Rd
	RC-5	2.4	T7N,R36E,Sect 34,NW¼,SW¼	EL	S. Wilbur Ave.
	RC-6	0.2	T7N,R36E,Sect 37,SW¼,SW¼	T	Plaza Way
Reeser Ck	REC-1	4.7	T6N,R37E,Sect 7,SE¼,NW¼	EL	Foster Rd
Cottonwood	CWC-1	5.3	T6N,R36E,Sect 11,SE¼,SE¼	EL	1.0 mi above Hood Rd.
	CWC-2	4.5	T6N,R36E,Sect 10,NE¼,SE¼	EQ,T	Hood Rd. bridge
	CWC-3	1.0	T6N,R36E,Sect 6,NE¼,SE¼	EL	Above Braden Rd.
	CWC-4	0.9	T6N,R36E,Sect 6,NE¼,SE¼	EQ,T,F[c]	Below Braden Rd.
East Little Walla	ELW-1	1.5	T6N,R35E,Sect 11,SW¼	EQ,F[c]	At river fork
	ELW-2	0.6	T6N,R35E,Sect 10,SE¼,SE¼	T	Springdale Rd Bridge
	ELW-3	0.2	T6N,R35E,Sect 10,NW¼,NW¼	EQ	Upstream of mouth
Stone Ck	SC-1	6.4	T7N,R36E,Sect 29,SE¼,SE¼	EL	Howard St.
	SC-2	0.6	T6N,R35E,Sect 39,NE¼,NE¼	F[c]	Above Bussell Rd.

[a] River Mile.
[b] EQ-Quantitative electrofishing (density estimates); EL-Qualitative electrofishing; T-Temperature; F-Flow; G-Flow Guage; S-Snorkel
[c] Index discharge sites

Appendix A. Table 2. Walla Walla River and tributary study sites, 2001 (continued).

Reach	Site #	RM[a]	Location	Sample Type[b]	Comments
Garrison Ck	GC-1	9.1	T7N,R36E,Sect 23,NE¼,NW¼	EQ,F[c]	Below Mill Ck Diversion
	GC-2	7.2	T7N,R36E,Sect 21,SE¼,SE¼	EL	Bridge St. at Pioneer Jr. High
	GC-3	5.4	T7N,R36E,Sect 29,SW¼,NW¼	EL	Garrison School
	GC-4	4.4	T7N,R36E,Sect 31,NW¼,NW¼	EL	Fort Walla Walla
	GC-5	3.5	T7N,R35E,Sect 36,SW¼,NE¼	EL	Lyon's Park
	GC-6	0.3	T6N,R35E,Sect 3,SW¼,NW¼	T,F[c]	Mission Rd. culvert
	GC-7	0.1	T6N,R35E,Sect 4,SE¼,NE¼	EL	Culvert to mouth
Bryant Ck	BC-1	1.2	T7N,R36E,Sect 29,NW¼,SW¼	EL	Jefferson Park
Mill Ck	MC-1	21.7	T6N,R38E,Sect 18,SW¼,NW¼	S	Stateline
	MC-2	20.4	T6N,R37E,Sect 12, NW¼,NE¼	EQ	1.3 mi Below stateline
	MC-3	20.2	T7N,R37E,Sect 2,SE¼,NE¼	S	1.5 mi Below stateline
	MC-4	19.1	T6N,R37E,Sect 2,NW¼,NE¼	T	Wickersham bridge
	MC-5	18.0	T7N,R37E,Sect 35,SW¼,NW¼	EL	1.0 mi Below Wickersham Brg.
	MC-6	16.4	T7N,R37E,Sect 22,SE¼,SE¼	EQ	Below Blue Creek
	MC-7	14.7	T7N,R37E,Sect 16,SE¼,SW¼	EQ,S	Below 7mi bridge
	MC-8	12.9	T7N,R37E,Sect 18,NW¼,SE¼	S	Above 5mi bridge
	MC-9	12.8	T7N,R37E,Sect 18,NW¼,SE¼	EL,T,F[c]	Below 5mi bridge
	MC-10	11.5	T7N,R36E,Sect 13,SE¼,SW¼	EL	Below Bennington spillway
	MC-11	11.4	T7N,R36E,Sect 13SW¼	S	Rooks Park to Tausick Way
	MC-12	11.3	T7N,R36E,Sect 13,SE¼,SW¼	T	Above cold return
	MC-13	11.3	T7N,R36E,Sect 13,SW¼,SW¼	T	In cold return
	MC-14	11.2	T7N,R36E,Sect 13,SW¼,SW¼	EL,T	Below cold return
	MC-15	10.5	T7N,R36E,Sect 23,NW¼,NE¼	EL,S	Above diversion
	MC-16	10.4	T7N,R36E,Sect 23,NE¼,NW¼	EL,S	Below diversion
	MC-17	10.3	T7N,R36E,Sect 23,NW¼,NW¼	S	Titus Ck outlet
	MC-18	10.3-9.6	T7N,R36E,Sect 22NE¼	EL	Titus Ck to below Tausick Way
	MC-19	10.0	T7N,R36E,Sect 23,NW¼,NW¼	EL,T	Tausick Way bridge
	MC-20	8.6	T7N,R36E Sect21,NE¼,SE¼	EL	Below Wilbur St.
	MC-21	8.4	T7N,R36E,Sect 21,NW¼,SE¼	T,F	Roosevelt St.
	MC-22	8.2	T7N,T36E,Sect 21,SW¼,NW¼	T,F	Wildwood Park
	MC-23	8.2-7.9	T7N,R36E,Sect 21,NW ¼	EL	Wildwood Park to Clinton St.
	MC-24	7.9	T7N,R36E,Sect 21,NW¼,SW¼	T,F	Clinton St. Bridge
	MC-25	6.7	T7N,R36E,Sect 19,SE¼,SE¼	EL,T,F	9th Ave.
	MC-26	4.8	T7N,R35E,Sect 24,SW¼,SW¼	EL	Above Gose St. bridge
	MC-27	4.7	T7N,R35E,Sect 23,SE¼,SE¼	EQ,EL,T	Below Gose St. bridge
	MC-28	4.1	T7N,R35E,Sect 26,NW¼,NW¼	EQ	1.4 mi above Wallula
	MC-29	3.7	T7N,R35E,Sect 26,NE¼,SW¼	T	1.0 mi above Wallula
	MC-30	3.6	T7N,R35E,Sect 26,NE¼,SW¼	T	0.9 mi above Wallula
	MC-31	3.3	T7N,R35E,Sect 27,SE¼,NW¼	EQ	0.6 mi above Wallula
	MC-32	2.7	T7N,R35E,Sect 28,NE¼,SE¼	EQ,F[c],G	Wallula Rd.
	MC-33	1.5	T7N,R35E,Sect 32,NE¼,NW¼	EQ	0.2 mi below Last Chance Rd.
	MC-34	0.4	T7N,R35E,Sect 38,SE¼,NW¼	EQ,T,F[c],S	Swegle Rd.

[a] River Mile.
[b] EQ-Quantitative electrofishing (density estimates); EL-Qualitative electrofishing; T-Temperature; F-Flow; G-Flow Guage; S-Snorkel
[c] Index discharge sites

Appendix A. Table 2. Walla Walla River and tributary study sites, 2001 (continued).

Reach	Site #	RM[a]	Location	Sample Type[b]	Comments
Blue Ck	BLC-1	7.4	T6N,R38E,Sect 9,SW¼,NW¼	EL	RM 7.4
	BLC-2	6.7	T6N,R38E,Sect 4,SW¼,SW¼	EQ	RM 6.7
	BLC-3	4.7	T7N,R38E,Sect 32,NW¼,NE¼	EQ	RM 4.7
	BLC-4	3.2	T7N,R38E,Sect 30,SE¼,NE¼	EL	End of Road
	BLC-5	1.8	T7N,R37E,Sect 25,NW¼,NE¼	EL	RM 1.8
	BLC-6	1.1	T7N,R37E,Sect 25,SW¼,NW¼	EL	Below Klicker Mt. Rd. Bridge
	BLC-7	0.8	T7N,R37E,Sect 26,SE¼,NE¼	EL	Below Klicker Mt. Rd. Bridge
	BLC-8	0.2	T7N,R37E,Sect 26,SE¼,NW¼	T	Above Mill Ck Rd. bridge
	BLC-9	0.1	T7N,R37E,Sect 26,SE¼,NW¼	EL	Below Mill Ck Rd. bridge
Titus Ck	TC-1	4.3	T7N,R37E,Sect 16,NW¼,SW¼	EL	Below Seven mile Rd.
	TC-2	2.8	T7N,R37E,Sect 18,SE¼,NE¼	EL	0.1 mi above covered bridge
	TC-3	2.7	T7N,R37E,Sect 18,SW¼,NE¼	EL	Covered bridge
	TC-4	2.7	T7N,R37E,Sect 18,SW¼,NE¼	EL	Below covered bridge
	TC-5	2.6	T7N,R37E,Sect 18,NW¼,SE¼	T	Above 5mi Rd. culvert
Cold Ck	CC-1	0.6	T7N,R35E,Sect 32,NE¼,NE¼	EL,T,F[c]	Last Chance Rd.
Doan Ck	DNC-1	0.9	T7N,R35E,Sect 38,East edge	T,F[c]	Irrigation diversion
	DNC-2	0.8	T7N,R35E,Sect 38,East edge	EL	Below irrigation diversion
West Little Walla	WLW-1	4.5	T6N,R35E,Sect 9,NE¼,SW¼	EL,F[c]	0.5 mi up Valley Chapel Rd.
	WLW-2	3.4	T6N,R35E,Sect 5,SE¼,SE¼	EL	Below Frog Hollow Rd.
	WLW-3	0.8	T6N,R35E,Sect 37,North edge	EL,T	Above Swegle Rd.
NF Dry Ck	NFD-1	0.2	T7N,R38E,Sect 8,NW¼,SE¼	T,F[c]	0.25 mi up Scott Rd.
Dry Ck	DRC-1	27.3	T8N,R37E,Sect 35,NE¼,NW¼	T,F[c]	0.5 mi up Biscuit Ridge Rd.
	DRC-2	17.4	T7N,R36E,Sect 21,SW¼,NE¼	T	Lower Waitsburg Rd. Bridge
	DRC-3	3.4	T7N,R34E,Sect 22,SE¼,NE¼	T	Talbott Rd bridge
Spring Ck	SC-1	0.2	T7N,R37E,Sect 5,SW¼,NW¼	T	Highway 12 bridge
Mud Ck	MDC-1	0.5	T7N,R34E,Sect 31,NW¼,SW¼	EL,T,F[c]	Barney Rd.
Pine Ck	PC-1	4.8	T6N,R34E,Sect 17,SE¼,NW¼	T	Stateline Rd.
	PC-2	1.3	T6N,R33E,Sect 1,SW¼,NW¼	EL,T,F[c]	Sand Pit Rd.

[a] River Mile.
[b] EQ-Quantitative electrofishing (density estimates); EL-Qualitative electrofishing; T-Temperature; F-Flow; G-Flow Guage; S-Snorkel
[c] Index discharge sites

Appendix B. Discharge Data, 2001

Appendix B. Table 1. Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
NF Touchet R	NFT-1	8/6	**2.8**	45.0	09:57	Bluewood Culvert
Spangler Ck	SC-1	5/22	**8.5**	43.0	10:10	0.2 mi up Spangler Creek
		6/13	**4.0**	44.0	11:21	
		6/25	**2.4**	46.0	10:45	
		7/12	**1.8**	56.0	14:54	
		7/23	**1.7**	50.0	10:32	
		8/6	**1.5**	52.0	10:27	
		8/21	**1.5**	51.0	12:38	
		9/4	**1.0**	47.0	14:18	
		9/13	**1.0**	51.0	11:45	
		10/1	**1.2**	46.0	10:47	
		10/15	**2.1**	42.0	09:36	
		11/1	**2.6**	43.0	10:59	
NF Touchet R	NFT-5	5/22	**31.4**	46.0	10:30	Below mouth of Spangler Creek
		6/13	**13.3**	46.0	11:39	
		6/25	**10.6**	47.0	11:10	
		7/12	**5.1**	59.0	15:15	
		7/23	**6.0**	52.0	10:54	
		8/6	**4.7**	53.0	10:47	
		8/21	**4.8**	56.0	13:00	
		9/5	**3.8**	50.0	14:34	
		9/13	**4.0**	54.0	12:05	
		10/1	**4.4**	48.0	11:05	
		10/15	**6.2**	43.0	09:52	
		11/1	**7.5**	44.0	11:28	
Lewis Creek	LC-1	4/19	**14.5**	46.0	15:00	Above N. Fork Touchet Rd
		5/22	**8.2**	48.0	11:22	
		6/13	**5.2**	48.0	12:16	
		6/25	**5.3**	49.0	11:40	
		7/12	**4.1**	58.0	15:45	
		7/23	**4.2**	52.0	11:14	
		8/6	**3.9**	53.0	11:07	
		8/21	**4.2**	52.0	13:20	
		9/5	**4.4**	51.5	14:49	
		9/13	**4.0**	52.0	12:25	
		10/1	**4.4**	47.0	11:30	
		10/15	**4.8**	44.0	10:15	
		11/1	**5.1**	46.0	12:04	
Jim Creek	JC-1	5/22	**3.4**	53.0	11:43	Culvert at Jim Ck Rd
		6/13	**1.6**	53.0	12:41	
		6/25	**1.2**	56.0	12:05	
		7/12	**0.9**	66.0	16:10	
		7/23	**1.1**	60.0	11:35	
		8/6	**1.2**	60.0	11:36	
		8/21	**1.1**	60.0	13:30	
		9/5	**1.2**	54.5	15:11	
		9/13	**0.9**	57.0	12:48	
		10/1	**1.0**	51.0	11:52	
		10/15	**0.8**	45.0	10:33	
		11/1	**1.2**	47.0	12:20	

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
NF Touchet R	NFT-8	5/22	**57.6**	44.0	12:00	Below Jim Ck Mouth
		6/13	**28.2**	54.0	12:50	
		6/25	**27.5**	59.0	13:00	
		7/16	**23.4**	54.0	09:37	
		7/23	**19.4**	60.0	11:52	
		8/6	**19.9**	62.0	12:00	
		8/21	**18.3**	62.0	14:06	
		9/5	**18.8**	58.0	15:27	
		9/13	**17.2**	59.0	13:10	
		10/1	**19.0**	54.0	12:14	
		10/15	**22.8**	47.0	10:50	
		11/1	**25.0**	48.0	12:45	
Wolf Fork	WF-3	6/25	**17.3**	48.0	14:15	Below Green Fly Canyon
		7/23	**13.2**	50.0	14:25	
		8/23	**14.8**	45.0	11:00	
		10/15	**15.1**	45.0	13:02	
Whitney Creek	WH-1	5/22	**8.3**	51.0	13:29	0.2 mi up Whitney Creek
		6/12	**5.0**	47.0	10:45	
		6/25	**4.1**	52.0	14:40	
		7/16	**3.6**	52.0	10:25	
		7/23	**3.9**	53.0	13:08	
		8/6	**3.2**	56.0	13:20	
		8/23	**3.1**	53.0	09:40	
		9/5	**2.9**	51.0	13:15	
		9/13	**2.6**	53.0	13:53	
		10/1	**3.5**	52.0	12:57	
		10/15	**3.2**	46.0	12:31	
		11/1	**4.0**	46.0	13:30	
Coates Creek	C-1	5/22	**4.8**	52.0	13:49	Wolf Fork Rd
		6/12	**2.9**	46.0	11:10	
		6/25	**2.6**	52.0	15:00	
		7/16	**2.0**	52.0	10:04	
		7/23	**1.8**	54.0	13:25	
		8/6	**1.4**	56.0	13:38	
		8/23	**1.9**	53.0	09:23	
		9/5	**1.5**	51.0	13:30	
		9/13	**1.3**	54.0	14:20	
		10/1	**1.3**	51.0	13:19	
		10/15	**1.8**	45.0	11:22	
		11/1	**1.9**	46.0	13:54	
Wolf Fork	WF-8	5/22	**56.1**	56.0	14:10	2nd Bridge
		6/12	**34.4**	49.0	11:40	
		6/27	**44.2**	51.0	13:47	
		7/16	**24.3**	52.0	11:10	
		7/23	**23.1**	60.0	13:49	
		8/6	**24.4**	62.0	14:04	
		8/21	**23.3**	58.0	14:43	
		9/5	**23.1**	54.0	13:49	
		9/13	**23.0**	55.0	14:48	
		10/1	**26.9**	52.0	13:46	

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Wolf Fork	WF-8	10/15	**24.7**	46.0	11:43	2nd Bridge
(Cont.)		11/8	**22.9**	43.0	11:52	
Robinson Fork	RF-1	5/21	**10.79**	49.0	14:20	6.0 mi above Broughton Land Co. Gate
Robinson Fork	RF-5	5/21	**15.8**	58.0	15:10	Broughton Land Co. Gate
		6/12	**4.1**	53.0	12:04	
		7/16	**0.9**	62.0	11:39	
		7/23	**0.8**	76.0	14:15	
		8/6	**0.7**	78.0	14:31	
		8/21	**0.5**	72.0	15:12	
		9/5	**NM**[a]	N/A	N/A	Not measurable from 9/5 to 10/15
		11/8	**0.8**	43.0	12:10	
Wolf Fork	WF-11	5/22	**68.9**	58.0	15:00	Holmberg Rd Bridge
		6/12	**35.6**	50.0	12:25	
		6/27	**43.8**	55.5	14:26	
		7/16	**22.2**	59.0	12:16	
		7/23	**20.2**	64.0	14:35	
		8/6	**18.9**	65.0	15:30	
		8/21	**20.6**	61.0	15:35	
		9/5	**18.7**	55.0	14:20	
		9/13	**17.6**	58.0	15:30	
		10/1	**19.2**	54.0	14:20	
		10/15	**21.0**	47.0	12:19	
		11/8	**22.4**	43.0	12:29	
NF Touchet R	NFT-12	5/31	**79.0**	53.0	09:08	Above Baileysburg
		6/13	**64.7**	61.0	13:20	
		6/27	**84.6**	60.5	15:00	
		7/10	**42.4**	72.0	17:10	
		7/23	**38.9**	73.0	15:06	
		8/6	**37.4**	74.0	15:54	
		8/21	**41.7**	67.0	16:10	
		9/5	**36.9**	60.0	14:40	
		9/13	**39.4**	65.0	15:50	
		10/1	**39.6**	60.0	14:47	
		10/15	**48.6**	50.0	12:50	
		11/8	**41.7**	44.0	12:58	
SF Touchet R	SFT-17	5/31	**23.1**	56.0	09:40	Gephart Rd
		6/13	**15.6**	64.0	13:35	
		6/27	**10.4**	68.0	15:26	
		7/23	**2.7**	77.0	15:20	
		8/6	**2.0**	80.0	16:13	
		8/21	**0.9**	70.0	16:37	
		9/5	**0.5**	65.0	15:06	
		9/17	**0.5**	68.0	14:22	
		10/1	**1.6**	64.0	15:07	
		10/15	**7.4**	54.0	13:10	
		11/1	**15.2**	49.0	12:35	
		11/29	**31.0**	42.0	13:15	
Touchet River	TR-4	5/31	**108.2**	56.0	10:09	Football field in Dayton
		7/10	**43.6**	73.0	16:03	

[a] No Measurable Flow

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.						
Stream	**Site**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Touchet River (Cont.)	TR-4	7/23	**38.6**	72.0	16:05	Football field in Dayton
		8/6	**35.2**	74.0	16:49	
		8/21	**29.5**	68.0	17:10	
		9/5	**33.2**	61.0	15:33	
		9/17	**37.3**	64.0	14:45	
		10/1	**38.5**	59.5	13:35	
		10/15	**58.5**	51.0	13:38	
		11/1	**85.0**	49.0	12:58	
		11/29	**104.6**	43.0	12:56	
SF Patit Creek	SFP-1	5/22	**4.2**	44.0	09:17	200 ft above end of road
		6/13	**1.2**	52.0	14:14	
		7/10	**0.5**	64.0	15:06	
		7/23	**0.3**	52.0	09:23	
		9/4	**0.1**	57.5	16:50	
		10/1	**0.2**	46.5	09:30	
		11/1	**0.3**	44.0	09:15	
SF Coppei	SFC-1	4/11	**46.5**	42.0	12:50	Below Geir Rd
		5/30	**2.5**	58.0	13:02	
		6/13	**2.9**	50.0	09:30	
		6/27	**2.1**	58.5	10:45	
SF Coppei	SFC-2	7/12	**1.1**	67.0	12:02	Walker Rd Bridge
		7/23	**0.8**	67.0	16:17	
		8/6	**1.1**	69.0	16:50	
		8/21	**0.8**	64.0	14:50	
		9/4	**1.2**	64.0	15:24	
		9/17	**0.7**	62.0	13:19	
		10/2	**1.1**	56.0	13:39	
		10/16	**1.8**	51.0	14:26	
		11/1	**2.5**	48.0	10:34	
NF Coppei	NFC-1	4/11	**32.3**	43.0	13:20	0.7 mi above N. Fork Coppei Rd.
		5/30	**2.5**	58.0	13:27	
		6/13	**2.1**	51.0	09:51	
		6/27	**2.2**	59.5	11:25	
NF Coppei	NFC-2	7/12	**0.4**	65.0	12:23	Forks Bridge
		7/23	**0.9**	68.0	16:44	
		8/7	**0.7**	70.0	15:46	
		8/21	**0.4**	65.0	15:00	
		9/4	**1.0**	64.0	15:37	
		9/17	**1.0**	60.0	13:29	
		10/2	**1.0**	57.0	14:02	
		10/16	**1.4**	54.0	14:37	
		11/1	**1.9**	48.0	10:48	
Coppei Creek	MC-1	5/30	**4.8**	62.0	14:00	Above McCowan Rd Bridge
		6/13	**4.7**	54.0	10:10	
		6/27	**3.4**	62.0	12:08	
		7/12	**1.3**	71.0	12:44	
		7/23	**1.4**	76.0	16:55	
		8/7	**1.3**	76.0	16:00	
		8/21	**1.0**	69.0	15:22	
		9/4	**1.5**	70.0	15:50	

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Coppei Creek (Cont.)	MC-1	9/17	**1.4**	64.0	13:43	Above McCowan Rd Bridge
		10/2	**2.0**	60.0	14:23	
		10/16	**2.6**	55.0	14:51	
		11/1	**4.3**	48.0	11:19	
Touchet River	TR-17	5/30	**126.3**	63.0	15:04	Above Bolles Bridge
		6/11	**79.5**	57.0	08:36	
		6/27	**73.7**	64.5	12:44	
		7/12	**42.5**	75.5	13:14	
		7/23	**41.7**	66.0	09:17	
		8/6	**39.1**	68.0	09:23	
		8/21	**32.2**	72.0	16:22	
		9/4	**33.0**	62.0	09:25	
		9/17	**31.8**	61.0	08:30	
		10/2	**38.9**	61.0	14:51	
		10/17	**60.0**	53.0	14:55	
		11/1	**87.9**	50.0	11:45	
Touchet River	TR-20	4/10	**333.4**	46.0	09:07	Below Simms Road Bridge
		5/23	**196.5**	73.0	14:40	
		6/11	**82.1**	63.0	10:05	
		6/27	**50.7**	67.0	09:38	
		7/10	**36.0**	75.0	10:32	
		7/23	**27.9**	72.0	10:05	
		8/6	**26.4**	73.0	10:21	
		8/20	**19.1**	63.0	10:02	
		9/4	**10.0**	64.0	10:15	
		9/17	**16.8**	63.0	09:37	
		10/1	**40.9**	49.0	09:22	
		10/8	**30.8**	53.0	09:23	
		10/16	**55.6**	50.0	09:25	
		10/23	**51.2**	45.0	10:34	
		10/29	**62.7**	48.0	09:28	
		11/7	**55.2**	44.0	15:23	
		11/14	**57.5**	46.0	09:16	
		11/20	**65.0**	46.0	10:04	
Touchet River	TR-21	10/1	**36.3**	50.0	10:29	Above Hofer Dam
		10/8	**34.9**	53.0	09:56	
		10/16	**55.4**	51.0	09:55	
		10/23	**53.9**	48.0	11:15	
		10/29	**64.0**	48.0	10:06	
		11/7	**58.9**	44.0	14:29	
		11/14	**57.5**	46.0	09:46	
		11/20	**69.0**	46.0	10:35	
Touchet River	TR-22	4/10	**337.9**	47.0	09:58	Above Cummins Rd Bridge
		5/23	**177.1**	72.0	13:39	
		6/11	**50.6**	64.0	10:43	
		6/27	**27.3**	67.0	10:20	
		7/10	**17.8**	77.0	11:07	
		7/23	**7.1**	73.0	10:45	
		8/6	**5.1**	74.0	10:59	
		8/20	**14.3**	67.0	10:38	

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Touchet River (Cont.)	TR-22	9/4	**0.9**	65.0	10:59	Above Cummins Rd Bridge
		9/17	**4.2**	66.0	10:12	
		10/1	**16.2**	51.0	10:50	
		10/8	**12.8**	53.0	10:22	
		10/16	**36.7**	52.0	10:22	
		10/23	**33.2**	48.0	11:43	
		10/29	**42.4**	48.0	10:35	
		11/7	**36.3**	44.0	14:52	
		11/14	**44.8**	46.0	10:15	
		11/20	**55.7**	45.0	10:55	
Walla Walla R	WW-1	7/17	**14.6**	63.0	13:04	Stateline
		7/24	**8.5**	66.0	11:20	
		7/31	**9.7**	70.0	15:00	
		8/7	**13.9**	67.0	11:39	
		8/20	**13.9**	70.0	15:12	
		9/4	**12.8**	69.0	16:00	
		9/17	**12.9**	60.0	10:27	
		10/2	**23.4**	54.0	10:38	
		10/8	**18.9**	56.0	12:19	
		10/16	**36.9**	54.0	13:10	
		10/23	**55.2**	50.0	13:32	
		10/31	**73.0**	50.0	13:25	
		11/7	**16.9**	46.0	12:06	
		11/14	**33.7**	52.0	12:46	
		11/20	**34.2**	51.0	12:59	
Walla Walla R	WW-3	6/12	**27.1**	54.0	11:48	Above Pepper Rd Bridge
		6/21	**12.0**	70.0	13:20	
		6/26	**17.6**	68.0	14:00	
		7/5	**13.7**	71.0	14:48	
		7/11	**14.5**	73.0	16:00	
		7/17	**14.2**	63.0	13:26	
		7/24	**9.2**	67.0	11:39	
		7/31	**9.7**	71.0	15:45	
		8/7	**12.5**	70.0	13:00	
		8/20	**14.8**	71.0	15:41	
		9/4	**11.1**	69.0	14:15	
		9/17	**12.9**	60.0	10:39	
		10/2	**26.0**	56.0	10:51	
		10/16	**39.1**	52.0	13:26	
		10/23	**65.6**	50.0	13:17	
		10/31	**81.8**	50.0	13:41	
		11/7	**19.0**	46.0	12:24	
		11/14	**34.4**	52.0	12:59	
		11/20	**36.0**	51.0	13:12	
Walla Walla R	WW-4	5/22	**116.4**	N/A	N/A	0.4 mi above Hwy 125
		6/12	**29.6**	55.0	12:06	
		6/26	**16.3**	68.0	14:27	
		7/5	**13.7**	71.0	15:10	
		7/11	**14.6**	73.0	16:40	
		7/17	**13.4**	64.0	13:43	

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.						
Stream	**Site**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Walla Walla R (Cont.)	WW-4	7/24	**7.9**	68.0	11:58	0.4 mi above Hwy 125
		7/31	**9.8**	70.0	16:15	
		8/7	**13.3**	71.0	13:25	
		8/20	**12.9**	69.0	16:15	
		9/4	**11.3**	69.0	14:45	
		9/17	**13.2**	60.0	10:54	
		10/2	**22.1**	56.0	11:04	
		10/8	**19.4**	56.0	12:31	
		10/16	**37.5**	53.0	13:40	
		10/23	**60.9**	50.0	13:51	
		10/31	**70.2**	50.0	14:07	
		11/7	**18.3**	46.0	12:42	
		11/14	**33.4**	52.0	13:14	
		11/20	**35.2**	51.0	13:27	
		11/29	**85.4**	43.0	11:50	
Yellowhawk Ck	YC-1	4/11	**39.3**	44.0	10:37	Below Diversion
		5/30	**37.4**	55.0	10:57	
		6/12	**29.6**	53.0	13:31	
		6/20	**12.9**	68.0	13:25	
		6/21	**12.0**	64.0	09:42	
		6/26	**14.0**	60.0	10:10	
		7/3	**16.7**	68.0	11:35	
		7/11	**20.2**	65.0	11:07	
		7/17	**20.5**	60.0	11:20	
		7/24	**22.6**	68.0	10:05	
		7/31	**23.0**	61.0	10:45	
		8/7	**39.6**	73.0	14:50	
		8/21	**15.9**	62.0	10:02	
		9/4	**17.0**	70.0	14:01	
		9/17	**16.7**	65.0	12:01	
		10/2	**17.2**	59.0	11:50	
		10/8	**22.0**	54.0	14:07	
		10/17	**27.7**	52.0	12:45	
		10/23	**NM**[a]	N/A	N/A	Water too high, and muddy.
		10/31	**31.9**	N/A	N/A	
		11/7	**31.7**	44.0	11:27	
		11/20	**44.4**	47.0	14:34	
Russell Creek	RC-3	4/11	**22.1**	44.0	11:10	Above Depping Rd
		5/30	**1.4**	53.0	10:35	
		6/12	**0.9**	54.0	13:16	
		6/28	**NM**[a]	N/A	N/A	Not measurable from 6-28 to 10-31
Cottonwood Ck	CWC-4	5/30	**2.7**	52.0	10:15	Braden Road
		6/12	**1.0**	52.0	12:30	
		6/28	**1.1**	56.0	13:42	
		7/11	**0.3**	63.0	17:27	
		7/23	**0.1**	60.0	13:55	
		8/6	**0.1**	66.0	15:21	
		8/21	**NM**[a]	N/A	N/A	Not measurable from 8-21 to 10-31

[a] No Measurable Flow

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Yellowhawk Ck	YC-7	5/22	**48.6**	N/A	N/A	Above mouth
		6/12	**36.2**	54.0	10:21	
		6/21	**15.1**	64.0	10:25	
		6/26	**19.0**	62.0	12:20	
		7/3	**16.1**	69.0	14:11	
		7/11	**20.2**	72.0	15:45	
		7/17	**20.2**	61.0	15:02	
		7/24	**18.4**	70.0	12:52	
		7/31	**20.1**	64.0	14:45	
		8/7	**24.2**	70.0	11:14	
		8/21	**17.1**	65.0	12:22	
		9/4	**13.7**	64.0	12:05	
		9/17	**14.4**	64.0	09:42	
		10/2	**17.6**	56.0	09:57	
		10/17	**28.8**	50.0	10:55	
		10/23	**33.7**	49.0	12:59	
		10/31	**38.9**	50.0	12:35	
		11/7	**28.0**	43.0	13:01	
		11/14	**30.4**	51.0	12:28	
		11/20	**33.4**	50.0	12:42	
Walla Walla R	WW-6	5/30	**85.2**	53.0	09:07	Above Burlingame Diversion
		6/12	**78.6**	54.0	09:54	
		6/28	**68.2**	61.0	11:31	
		7/10	**41.9**	74.0	14:38	
		7/24	**36.0**	66.0	10:37	
		7/31	**43.9**	66.0	14:16	
		8/6	**48.6**	68.0	10:51	
		8/20	**54.6**	67.0	14:45	
		9/4	**46.8**	68.0	15:30	
		9/17	**41.6**	59.0	09:26	
		10/2	**62.4**	54.0	09:44	
		10/16	**90.2**	52.0	12:50	
		10/31	**136.6**	50.0	11:54	
East Little Walla Walla	ELW-1	4/10	**8.3**	53.0	13:40	Above river fork
		4/26	**8.0**	57.0	11:00	
		5/30	**8.1**	52.0	9:32	
		6/12	**9.6**	52.0	10:50	
		6/28	**8.9**	56.0	11:47	
		7/10	**6.6**	67.0	14:54	
		8/6	**5.6**	66.0	14:34	
		8/21	**5.7**	61.0	12:48	
		9/4	**7.5**	58.0	12:17	
		9/17	**7.6**	53.0	09:53	
		10/2	**9.6**	50.0	10:08	
		10/17	**9.9**	50.0	11:14	
		10/31	**10.5**	50.0	12:19	
Stone Creek	SC-2	4/11	**3.1**	49.0	09:25	Above Bussell Rd
		5/29	**NM**[a]	N/A	N/A	Not measurable 5/29 to 10/31

[a] No Measurable Flow

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Walla Walla R	WW-8	5/23	**93.7**	61.0	11:50	Below Mojonnier Rd
		6/12	**32.7**	55.0	09:22	
		6/26	**31.2**	66.0	13:35	
		7/5	**24.3**	69.0	14:15	
		7/10	**43.3**	74.0	14:20	
		7/11	**49.9**	71.0	14:50	
		7/17	**45.2**	63.0	14:42	
		7/24	**33.4**	66.0	10:20	
		7/37	**42.7**	67.0	13:51	
		8/7	**46.4**	68.0	10:11	
		8/20	**51.3**	67.0	14:06	
		9/4	**45.5**	67.0	15:00	
		9/17	**37.1**	60.0	09:10	
		10/2	**40.9**	55.0	09:30	
		10/8	**26.0**	53.0	11:57	
		10/16	**18.6**	53.0	12:35	
		10/23	**55.6**	50.0	12:36	
		10/31	**68.7**	50.0	11:32	
		11/7	**20.4**	47.0	13:26	
		11/14	**19.0**	51.0	12:09	
		11/20	**17.2**	49.0	12:23	
		11/29	**53.4**	43.0	11:23	
Garrison Ck	GC-1	4/11	**5.3**	44.0	10:16	Below Diversion
		5/30	**5.3**	55.0	11:06	
		6/12	**4.6**	53.0	13:45	
		6/20	**2.1**	67.0	13:13	
		6/26	**2.3**	60.0	10:00	
		7/3	**2.9**	68.0	11:20	
		7/11	**3.0**	65.0	10:45	
		7/17	**2.9**	60.0	11:12	
		7/24	**4.2**	68.0	09:45	
		7/31	**5.4**	61.0	10:30	
		8/7	**5.5**	72.0	14:30	
		8/21	**3.0**	62.0	09:50	
		9/4	**3.5**	70.0	13:50	
		9/17	**3.3**	65.0	11:52	
		10/2	**3.1**	59.0	11:59	
		10/8	**4.0**	54.0	13:51	
		10/17	**3.3**	52.0	13:07	
		10/31	**4.6**	N/A	N/A	
		11/20	**3.5**	47.0	14:24	
Garrison Ck	GC-6	4/10	**8.5**	52.0	14:20	Mojonnier Rd
		5/29	**6.1**	63.0	14:38	
		6/12	**2.4**	57.0	08:45	
		6/28	**1.8**	66.0	11:15	
		7/10	**0.2**	75.0	13:45	
		7/23	**0.1**	75.0	13:25	
		8/6	**0.3**	77.0	14:10	
		8/20	**0.5**	70.0	14:32	

[a] No Measurable Flow

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Garrison Ck	GC-6	9/4	**0.7**	68.0	14:30	Mojonnier Rd
(Cont.)		9/17	**0.3**	65.0	08:53	
		10/2	**0.9**	59.0	09:16	
		10/16	**2.1**	58.0	12:21	
		10/31	**4.7**	52.0	11:14	
Walla Walla R	WW-10	5/29	**30.3**	65.0	13:42	Swegle Rd Bridge
		6/11	**28.0**	59.0	13:05	
		6/27	**26.6**	64.0	13:34	
		7/10	**43.7**	73.0	13:08	
		7/24	**33.2**	66.0	09:58	
		7/31	**45.9**	68.0	13:18	
		8/6	**40.6**	72.0	13:10	
		8/20	**42.5**	66.0	13:56	
		9/4	**43.0**	66.0	14:00	
		9/17	**45.8**	64.0	12:00	
		10/1	**49.8**	51.0	14:15	
		10/16	**28.4**	54.0	11:57	
		10/31	**48.0**	50.0	10:46	
Mill Creek	MC-9	6/15	**39.8**	62.0	13:25	Below Five Mile Rd Bridge
		6/20	**34.1**	67.0	14:15	
		6/26	**36.5**	57.0	09:25	
		7/3	**33.1**	69.0	13:12	
		7/11	**31.9**	62.0	09:42	
		7/17	**30.8**	56.0	10:03	
		7/24	**32.5**	60.0	08:50	
		7/31	**32.4**	58.0	09:50	
		8/7	**44.0**	71.0	15:15	
		8/21	**26.4**	58.0	09:15	
		9/4	**25.3**	66.0	14:19	
		9/17	**25.3**	60.0	12:17	
		10/2	**25.5**	56.0	12:15	
		10/8	**27.0**	53.0	12:45	
		10/17	**34.6**	51.0	13:30	
		10/31	**62.7**	N/A	N/A	
		11/14	**90.3**	51.0	14:10	
		11/20	**52.1**	50.0	14:52	
Mill Creek	MC-20	6/15	**10.4**	67.0	12:10	Above Roosevelt St.
		6/20	**16.0**	72.0	12:35	
		6/26	**14.5**	64.0	11:55	
		7/3	**12.2**	68.0	08:45	
		7/11	**12.5**	74.0	11:55	
		7/17	**2.7**	66.0	10:40	
		7/24	**1.3**	78.0	10:30	
		7/31	**NM**[a]	N/A	N/A	Not measurable 7/31 to 10/31
		11/14	**5.5**	52.0	13:40	
		11/20	**11.1**	47.0	13:55	

[a] No Measurable Flow

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.						
Stream	**Site**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Mill Creek	MC-21	7/3	**11.1**	68.0	09:25	Wildwood Park
		7/11	**8.5**	71.0	12:13	
		7/17	**3.1**	65.0	11:52	
		7/24	**2.2**	74.0	11:00	
		7/31	**1.7**	64.0	11:15	
Mill Creek	MC-23	6/15	**11.5**	62.0	11:46	Above Clinton St.
		6/20	**13.3**	70.0	12:13	
		6/26	**15.2**	63.0	N/A	
		7/3	**11.8**	68.0	09:40	
		7/11	**9.8**	71.0	12:32	
		7/17	**3.7**	65.0	12:05	
		7/24	**2.3**	70.0	11:27	
		7/31	**NM**[a]	N/A	N/A	Not measurable 7/31 to 10/31
Mill Creek	MC-24	6/15	**21.7**	59.0	10:43	9th Ave
		6/20	**15.7**	66.0	11:40	
		6/26	**17.7**	63.0	11:30	
		7/3	**16.0**	76.0	14:38	
		7/11	**14.7**	70.0	13:15	
		7/17	**8.0**	65.0	15:24	
		7/24	**4.3**	70.0	11:47	
		7/31	**4.9**	66.0	11:30	
		8/7	**2.2**	72.0	14:01	
		8/21	**2.8**	64.0	10:39	
		9/4	**3.0**	70.0	13:05	
		9/17	**2.3**	63.0	11:34	
		10/2	**3.4**	59.0	11:28	
		10/8	**3.5**	56.0	12:57	
		10/17	**4.1**	54.0	12:10	
		10/31	**47.9**	N/A	N/A	
Mill Ck	MC-31	7/17	**5.8**	64.0	14:17	Below Wallula Rd bridge
		7/24	**3.5**	64.0	08:53	
		7/31	**6.6**	64.0	12:36	
		8/21	**4.0**	62.0	11:05	
		9/4	**4.2**	62.0	11:44	
		9/17	**3.7**	60.0	11:17	
		10/2	**3.9**	56.0	08:54	
		10/8	**4.8**	56.0	11:26	
		10/17	**9.1**	54.0	10:20	
		10/31	**11.5**	54.0	11:25	
		11/14	**20.6**	51.0	11:15	
		11/20	**18.9**	51.0	12:00	
Cold Creek	CC-1	4/10	**2.2**	50.0	12:50	Below Last Chance Rd
		5/29	**1.4**	59.0	14:52	
		6/11	**1.8**	63.0	10:55	
		6/28	**0.4**	60.0	14:29	
		9/4	**NM**[a]	N/A	14:15	Not measurable 9/4 to 10/17
		10/31	**2.1**	51.0	11:40	

[a] No Measurable Flow

Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.

Stream	Site	Date	CFS	Temp (F)	Time	Comments
Mill Creek	MC-33	4/10	**168.4**	48.0	12:34	Below Swegle Rd Bridge
		5/29	**18.0**	65.0	12:48	
		6/11	**6.3**	62.0	14:08	
		6/20	**12.7**	65.0	10:37	
		6/26	**15.4**	62.0	12:48	
		7/3	**11.7**	73.0	13:47	
		7/11	**9.3**	75.0	14:15	
		7/17	**5.0**	65.0	09:28	
		7/24	**3.3**	67.0	09:38	
		7/31	**3.4**	69.0	13:40	
		8/7	**2.0**	69.0	09:53	
		8/21	**N/A**	71.5	11:35	
		9/4	**3.4**	65.0	10:47	
		9/17	**2.6**	66.0	13:05	
		10/2	**4.1**	55.0	09:05	
		10/8	**3.8**	57.0	11:10	
		10/17	**9.5**	52.0	09:30	
		10/31	**15.7**	52.0	11:25	
		11/14	**27.6**	51.0	11:00	
		11/20	**19.4**	51.0	11:44	
		11/29	**61.2**	44.0	10:38	
Doan Creek	DNC-1	4/10	**1.5**	50.0	11:58	Whitman Mission
		5/29	**0.8**	60.0	13:06	
		6/11	**1.4**	57.0	13:37	
		6/27	**1.0**	62.0	14:10	
		7/10	**1.3**	68.0	13:25	
		7/23	**0.8**	66.0	12:52	
		8/6	**0.6**	68.0	13:30	
		8/20	**0.6**	65.0	13:23	
		9/04	**0.5**	65.0	13:40	
		9/17	**0.6**	65.0	12:26	
		10/01	**0.6**	55.0	14:34	
		10/17	**0.6**	50.0	09:40	
		10/31	**1.1**	52.0	10:56	
West Little Walla Walla	WLW-1	4/10	**3.3**	52.0	13:12	0.6 mi up Valley Chapel Rd
		4/26	**5.6**	59.0	11:50	
		5/30	**2.7**	54.0	09:42	
		6/12	**0.6**	54.0	11:10	
		6/28	**3.3**	62.0	12:03	
		7/11	**2.3**	71.0	17:00	
		8/6	**1.7**	71.0	14:55	
		8/21	**1.2**	64.0	11:59	
		9/4	**1.4**	64.0	12:32	
		9/17	**1.9**	63.0	10:06	
		10/2	**3.0**	55.0	10:20	
		10/17	**3.9**	52.0	11:35	
		10/31	**3.9**	53.0	12:32	

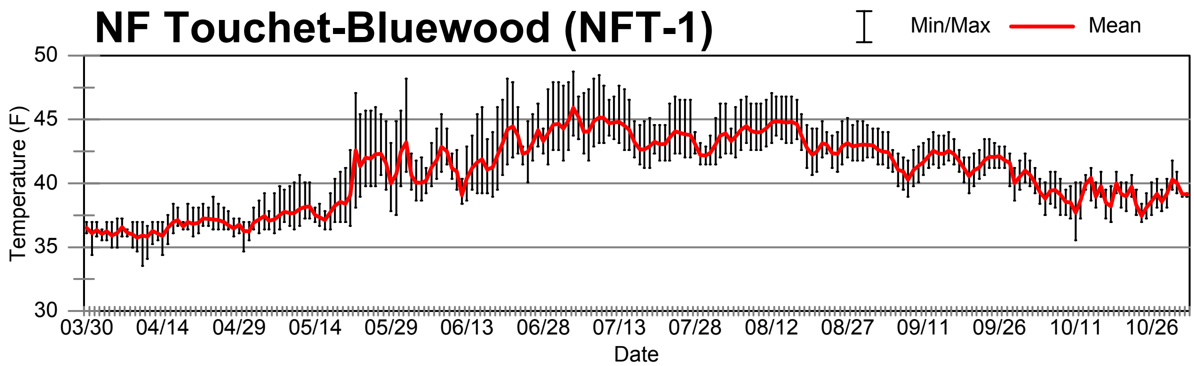
[a] No Measurable Flow

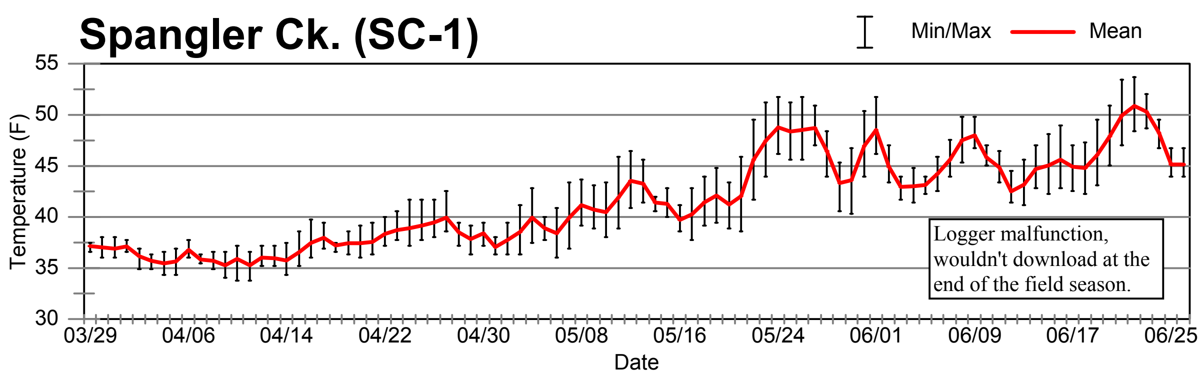
Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.						
Stream	**Site**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Walla Walla R	WW-11	5/23	**145.8**	66.0	12:18	Above Detour Rd. Bridge
		6/11	**34.1**	61.0	12:05	
		6/27	**47.0**	63.0	12:50	
		7/10	**57.3**	74.0	12:45	
		7/24	**38.8**	66.0	09:17	
		7/31	**52.8**	66.5	13:00	
		8/6	**43.6**	73.0	12:42	
		8/20	**41.1**	67.0	12:25	
		9/4	**44.3**	67.0	13:20	
		9/17	**44.3**	64.0	11:40	
		10/1	**54.3**	53.0	13:55	
		10/8	**35.7**	54.0	10:53	
		10/16	**35.4**	54.0	11:39	
		10/23	**69.7**	51.0	12:11	
		10/31	**69.1**	50.0	10:21	
		11/7	**40.7**	47.0	13:54	
		11/14	**66.1**	50.0	10:45	
		11/20	**47.3**	49.0	11:30	
Walla Walla R	WW-12	5/29	**19.6**	67.0	12:25	Above McDonald Rd Bridge
		6/11	**18.6**	63.0	11:34	
		6/27	**27.6**	63.0	11:37	
		7/10	**17.5**	78.0	12:17	
		7/23	**21.8**	75.0	12:22	
		8/6	**23.7**	75.0	12:10	
		8/20	**16.2**	72.0	11:56	
		9/4	**17.7**	71.0	12:40	
		9/17	**21.3**	66.0	11:05	
		10/1	**38.2**	54.0	13:33	
		10/16	**26.7**	54.0	11:17	
		10/31	**54.9**	50.0	09:53	
NF Dry Creek	NFD-1	4/11	**24.4**	41.0	11:58	0.4 mi up Scott Rd
		5/30	**1.9**	53.0	12:10	
		6/13	**1.7**	48.0	08:37	
		6/27	**1.5**	56.0	09:38	
		7/12	**0.9**	60.0	10:57	
		7/23	**0.4**	65.0	15:25	
		8/6	**0.6**	67.0	16:06	
		8/21	**0.5**	60.0	14:03	
		9/4	**0.7**	58.0	14:51	
		9/17	**0.7**	55.0	12:59	
		10/2	**0.8**	52.0	12:58	
		10/17	**1.0**	48.0	14:05	
		10/31	**2.0**	N/A	14:52	
Dry Creek	DRC-1	5/30	**5.8**	55.0	12:31	0.5 mi up Biscuit Ridge Rd
		6/13	**5.7**	51.0	09:00	
		6/27	**3.3**	59.5	10:22	
		7/13	**0.5**	66.0	11:36	
		7/23	**0.2**	73.0	16:04	
		8/6	**1.0**	73.0	16:31	
		8/21	**0.7**	66.0	14:44	

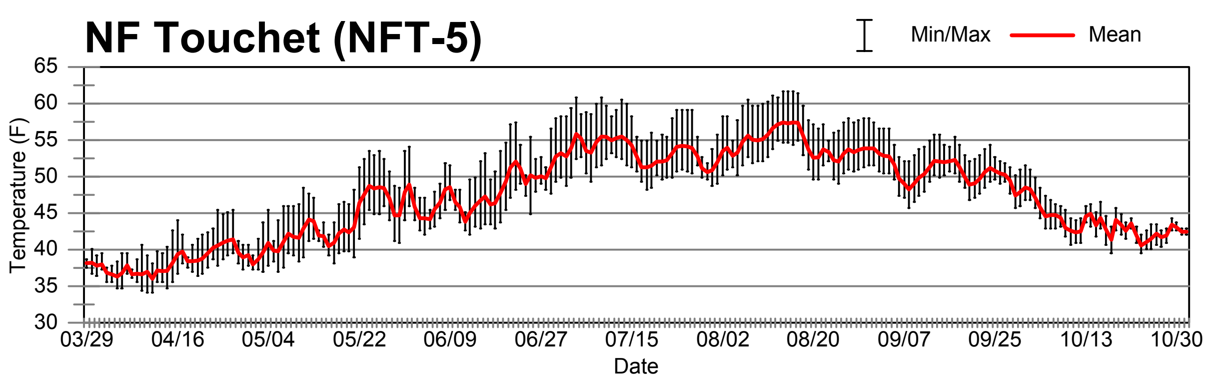
Appendix B. Table 1. (Continued) Manual discharge (cfs) measurements 2001.						
Stream	**Site**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Dry Creek (Cont.)	DRC-1	9/4	**1.0**	68.0	15:09	0.5 mi up Biscuit Ridge Rd
		9/17	**1.2**	62.0	12:40	
		10/2	**1.4**	60.0	13:17	
		10/17	**1.7**	50.0	14:25	
		11/1	**5.3**	47.0	10:01	
Mud Creek	MDC-1	4/10	**7.0**	48.0	10:47	Barney Rd Bridge
		5/29	**NM**[a]	N/A	N/A	Not measurable 5/29 to 6/11
		6/27	**0.9**	66.0	11:20	
		7/10	**3.0**	79.0	12:00	
		7/23	**1.7**	74.0	11:42	
		8/6	**1.0**	75.0	11:43	
		8/20	**1.2**	68.0	11:36	
		9/4	**0.6**	69.0	12:00	
		9/17	**0.8**	65.0	10:47	
		10/1	**1.3**	51.0	12:14	
		10/16	**0.8**	49.0	11:00	
Pine Creek	PC-2	4/10	**66.3**	46.0	10:24	Sand Pit Rd Bridge
		5/29	**3.5**	65.0	11:50	
		6/11	**4.2**	66.0	11:11	
		6/27	**0.8**	65.0	11:58	
		7/10	**1.1**	74.0	11:28	
		7/23	**0.3**	71.0	11:32	
		8/6	**0.1**	72.0	11:22	
		8/20	**0.1**	65.0	11:12	
		9/4	**NM**[a]	66.0	11:39	
		9/17	**NM**[a]	62.0	11:58	
		10/16	**5.6**	56.0	11:48	

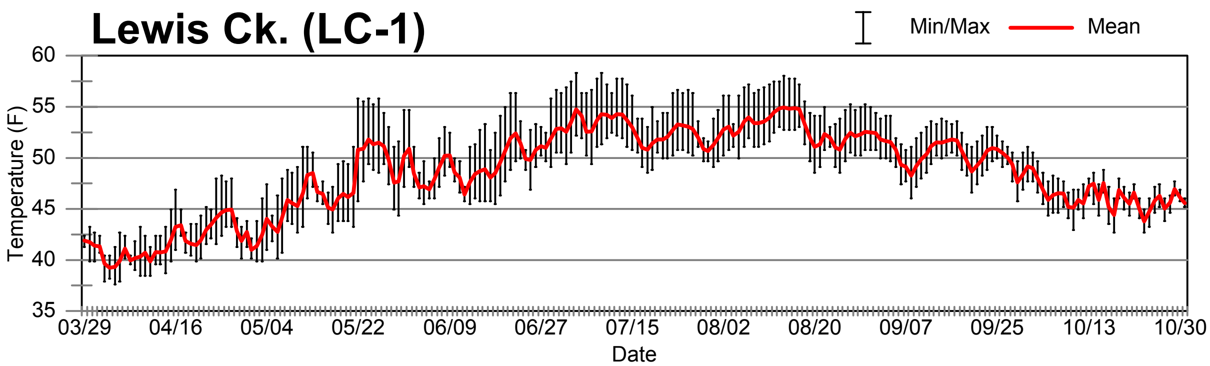
[a] No Measurable Flow

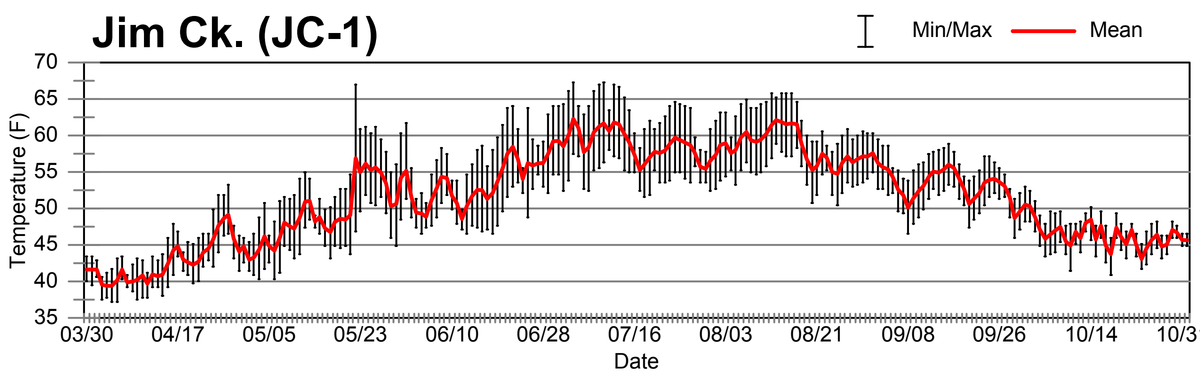
Appendix C - Stream Temperature Graphs (EF), 2001

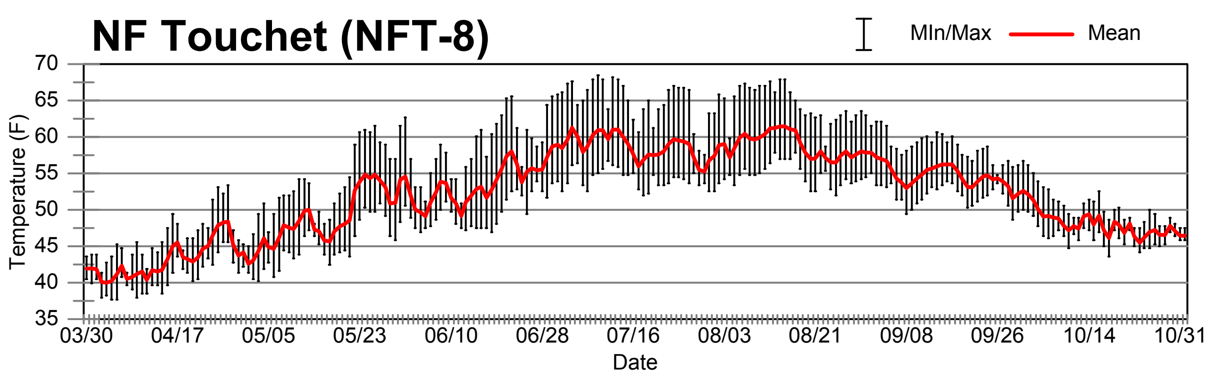

NF Touchet-Bluewood (NFT-1)
Min/Max
Mean
Temperature (F)
50
45
40
35
30
03/30
04/14
04/29
05/14
05/29
06/13
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

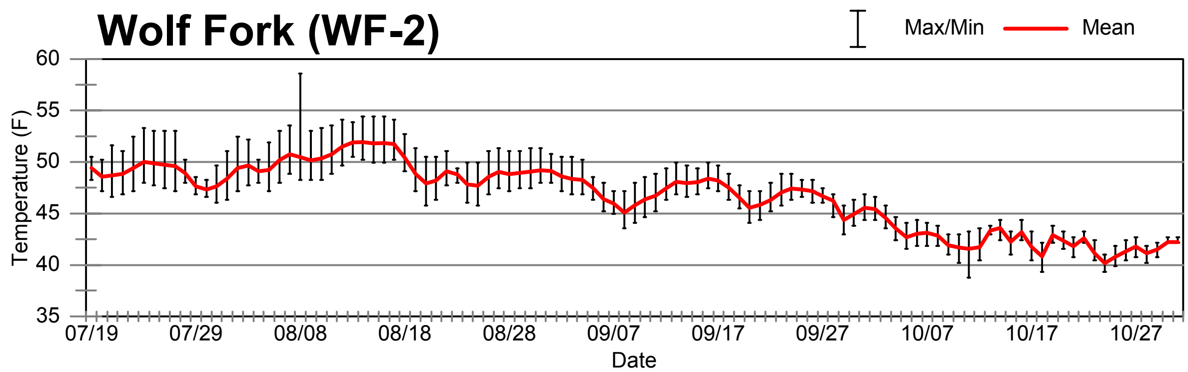

Spangler Ck. (SC-1)
Min/Max
Mean
Temperature (F)
55
50
45
40
35
30
03/29
04/06
04/14
04/22
04/30
05/08
05/16
05/24
06/01
06/09
06/17
06/25
Date
Logger malfunction, wouldn't download at the end of the field season.


NF Touchet (NFT-5)
Min/Max
Mean
Temperature (F)
65
60
55
50
45
40
35
30
03/29
04/16
05/04
05/22
06/09
06/27
07/15
08/02
08/20
09/07
09/25
10/13
10/30
Date

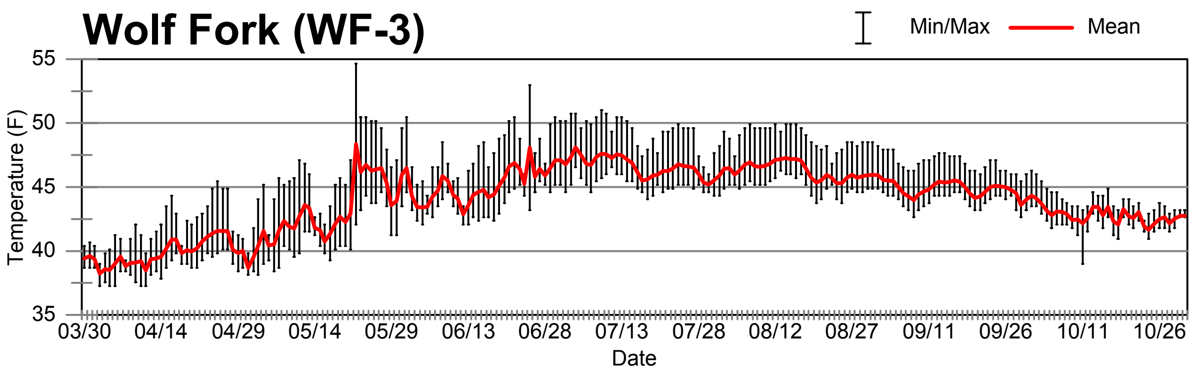

Lewis Ck. (LC-1)
Min/Max
Mean
Temperature (F)
60
55
50
45
40
35
03/29
04/16
05/04
05/22
06/09
06/27
07/15
08/02
08/20
09/07
09/25
10/13
10/30
Date


Jim Ck. (JC-1)
Min/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
35
03/30
04/17
05/05
05/23
06/10
06/28
07/16
08/03
08/21
09/08
09/26
10/14
10/31
Date

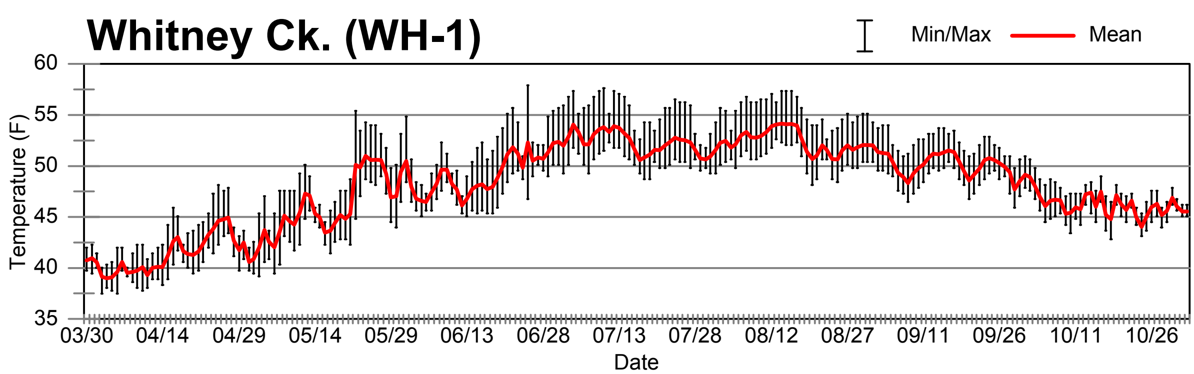

NF Touchet (NFT-8)
MIn/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
35
03/30
04/17
05/05
05/23
06/10
06/28
07/16
08/03
08/21
09/08
09/26
10/14
10/31
Date



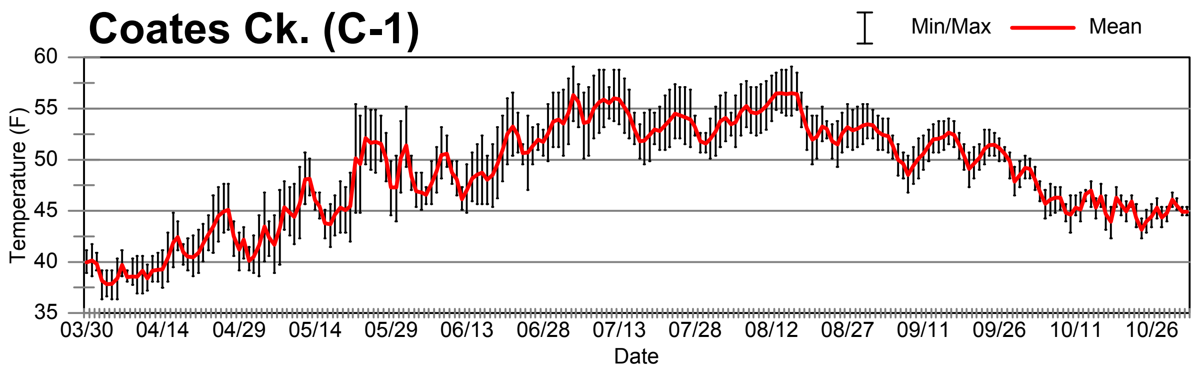
Wolf Fork (WF-2)
Max/Min
Mean
Temperature (F)
60
55
50
45
40
35
07/19
07/29
08/08
08/18
08/28
09/07
09/17
09/27
10/07
10/17
10/27
Date

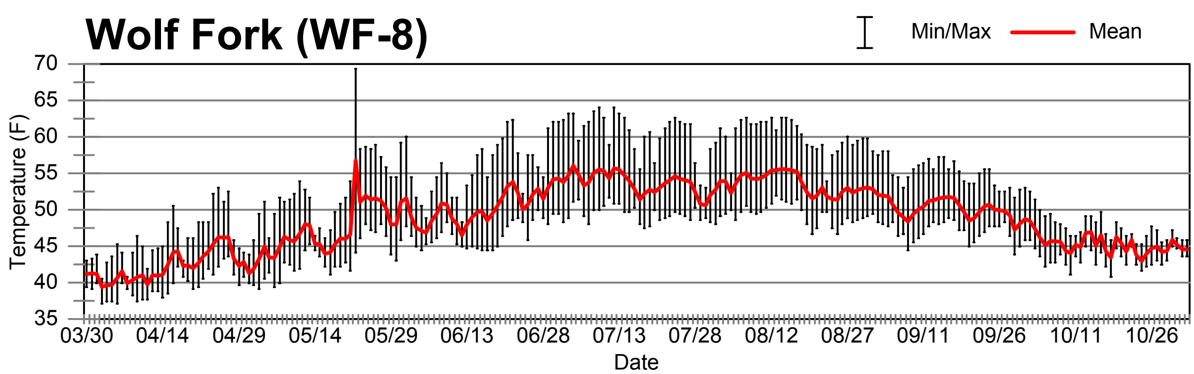


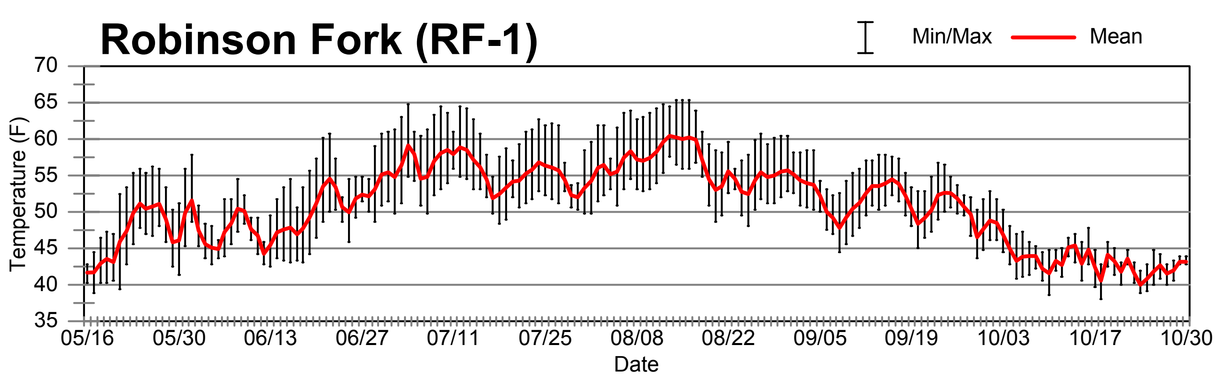
Wolf Fork (WF-3)
Min/Max
Mean
Temperature (F)
55
50
45
40
35
03/30
04/14
04/29
05/14
05/29
06/13
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

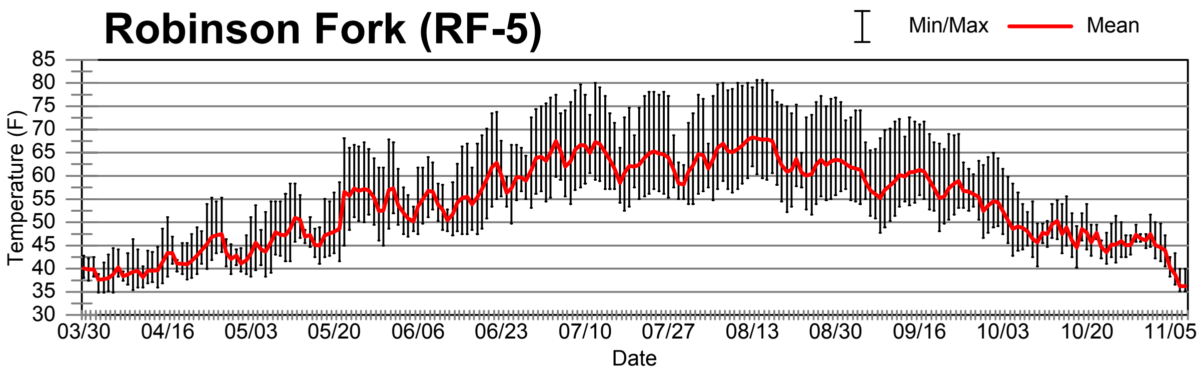


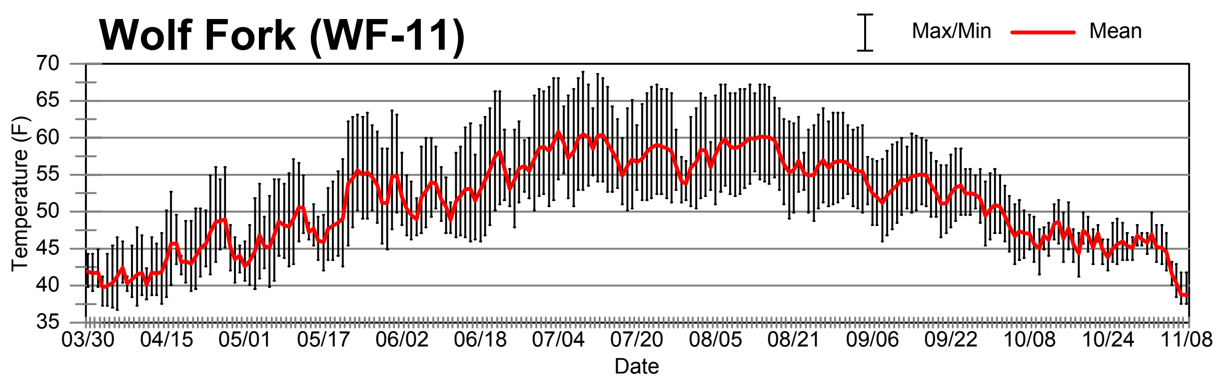
Whitney Ck. (WH-1)
Min/Max
Mean
Temperature (F)
60
55
50
45
40
35
03/30
04/14
04/29
05/14
05/29
06/13
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

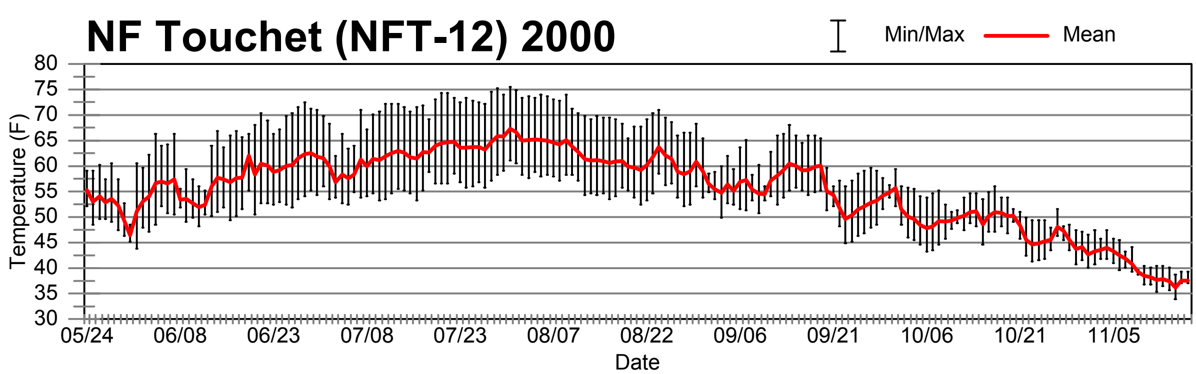

Coates Ck. (C-1)
Min/Max
Mean
Temperature (F)
60
55
50
45
40
35
03/30
04/14
04/29
05/14
05/29
06/13
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

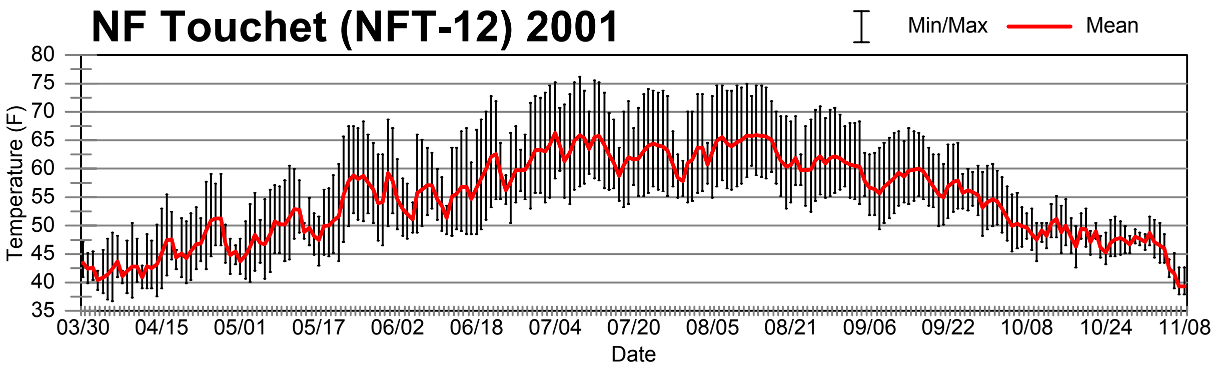

Wolf Fork (WF-8)
Min/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
35
03/30
04/14
04/29
05/14
05/29
06/13
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

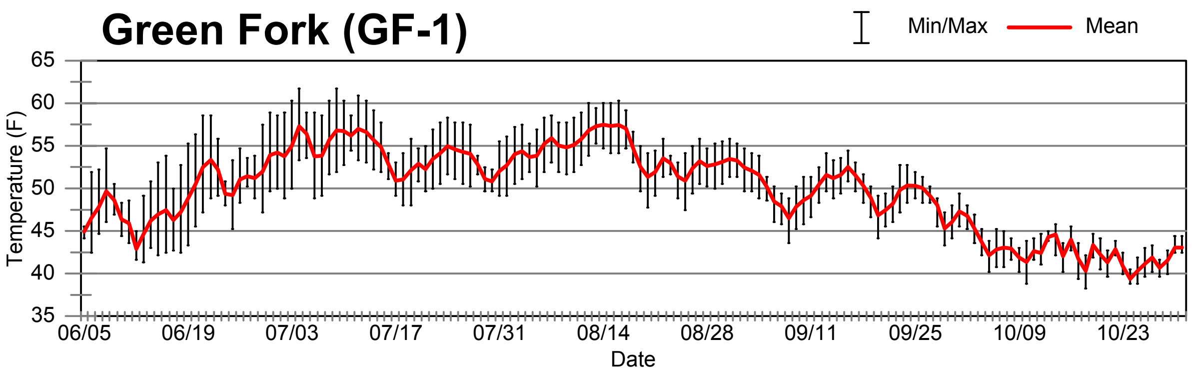

Robinson Fork (RF-1)
Min/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
35
05/16
05/30
06/13
06/27
07/11
07/25
08/08
08/22
09/05
09/19
10/03
10/17
10/30
Date

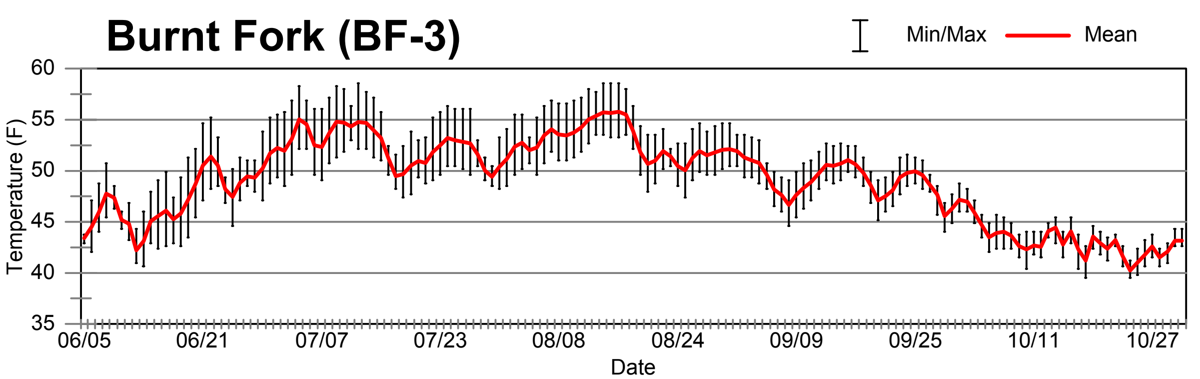

Robinson Fork (RF-5)
Min/Max
Mean
85
80
75
70
65
60
55
50
45
40
35
30
Temperature (F)
03/30
04/16
05/03
05/20
06/06
06/23
07/10
07/27
08/13
08/30
09/16
10/03
10/20
11/05
Date

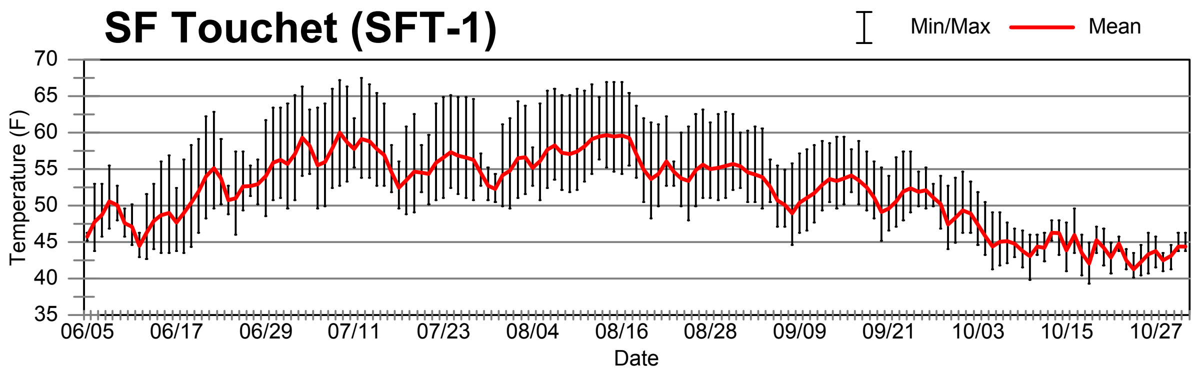

Wolf Fork (WF-11)
Max/Min
Mean
70
65
60
55
50
45
40
35
Temperature (F)
03/30
04/15
05/01
05/17
06/02
06/18
07/04
07/20
08/05
08/21
09/06
09/22
10/08
10/24
11/08
Date

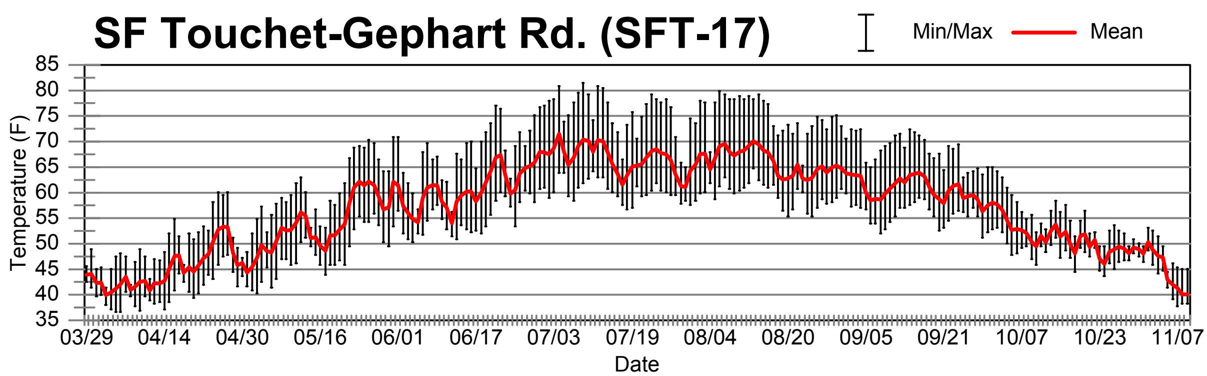

NF Touchet (NFT-12) 2000
Min/Max
Mean
80
75
70
65
60
55
50
45
40
35
30
Temperature (F)
05/24
06/08
06/23
07/08
07/23
08/07
08/22
09/06
09/21
10/06
10/21
11/05
Date

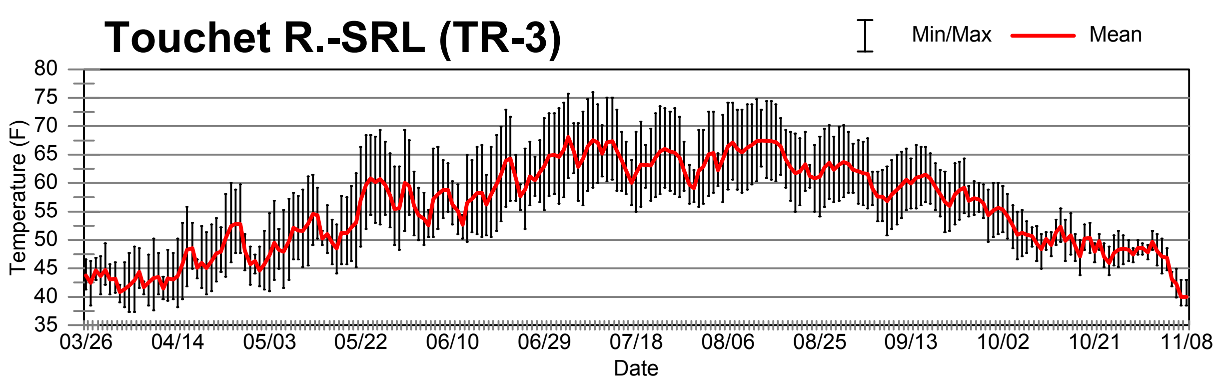

NF Touchet (NFT-12) 2001
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
03/30
04/15
05/01
05/17
06/02
06/18
07/04
07/20
08/05
08/21
09/06
09/22
10/08
10/24
11/08
Date

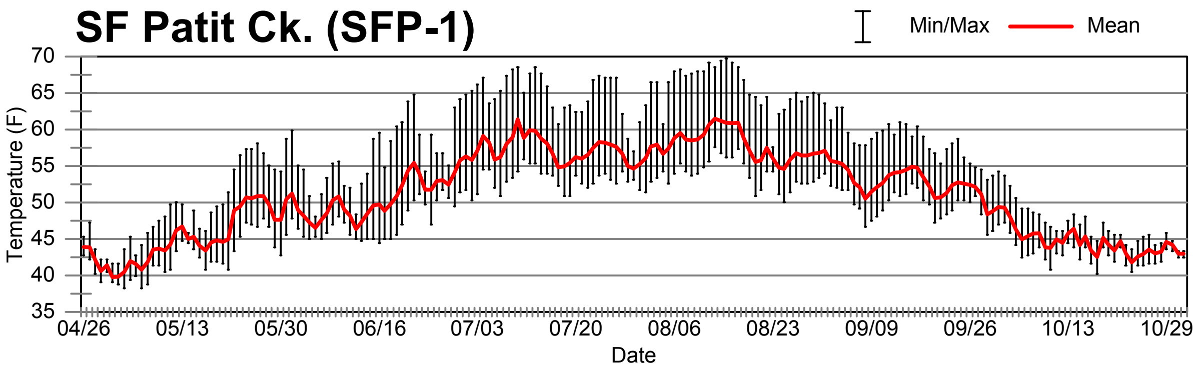

Green Fork (GF-1)
Min/Max
Mean
Temperature (F)
65
60
55
50
45
40
35
06/05
06/19
07/03
07/17
07/31
08/14
08/28
09/11
09/25
10/09
10/23
Date

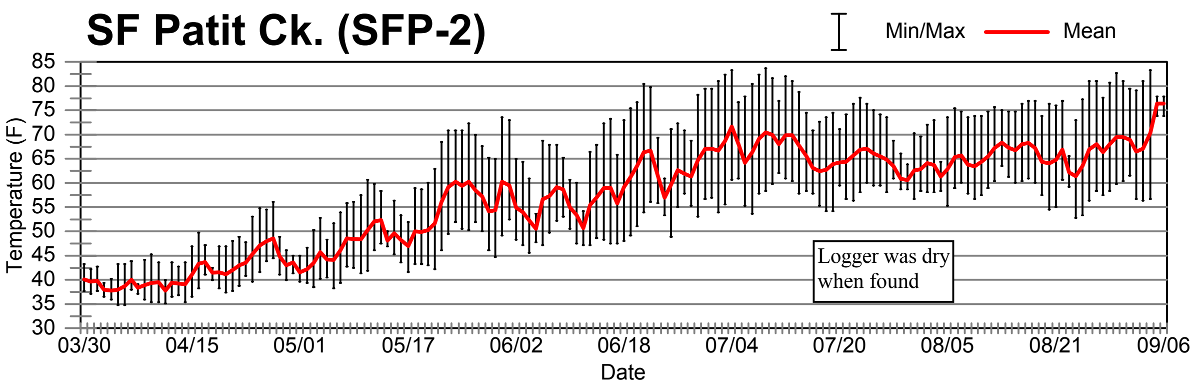

Burnt Fork (BF-3)
Min/Max
Mean
Temperature (F)
60
55
50
45
40
35
06/05
06/21
07/07
07/23
08/08
08/24
09/09
09/25
10/11
10/27
Date

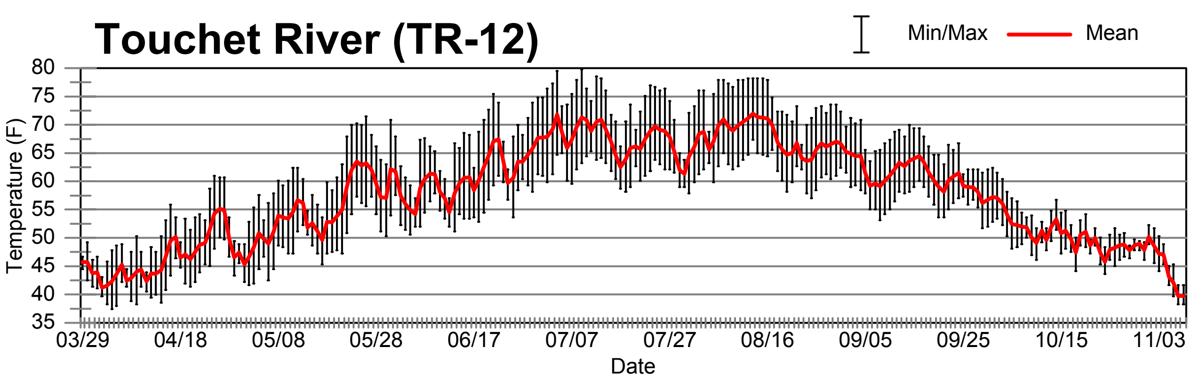

SF Touchet (SFT-1)
Min/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
35
06/05
06/17
06/29
07/11
07/23
08/04
08/16
08/28
09/09
09/21
10/03
10/15
10/27
Date

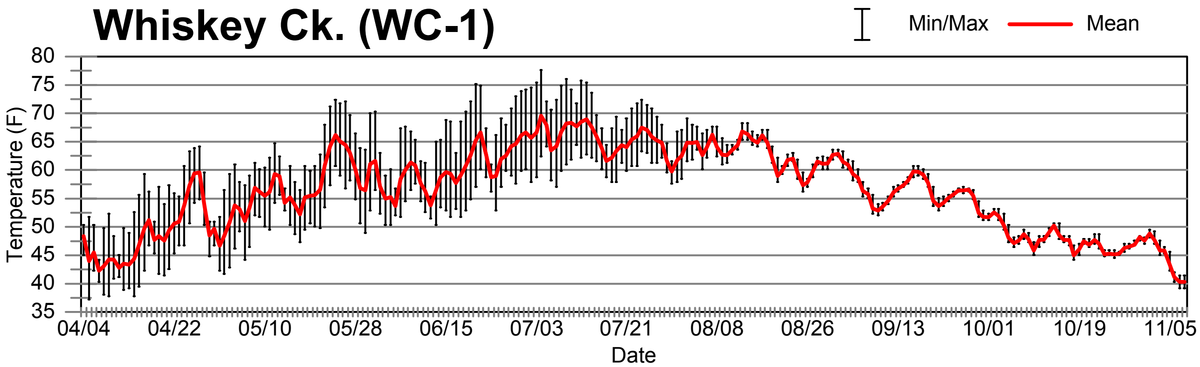

SF Touchet-Gephart Rd. (SFT-17)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
35
03/29
04/14
04/30
05/16
06/01
06/17
07/03
07/19
08/04
08/20
09/05
09/21
10/07
10/23
11/07
Date

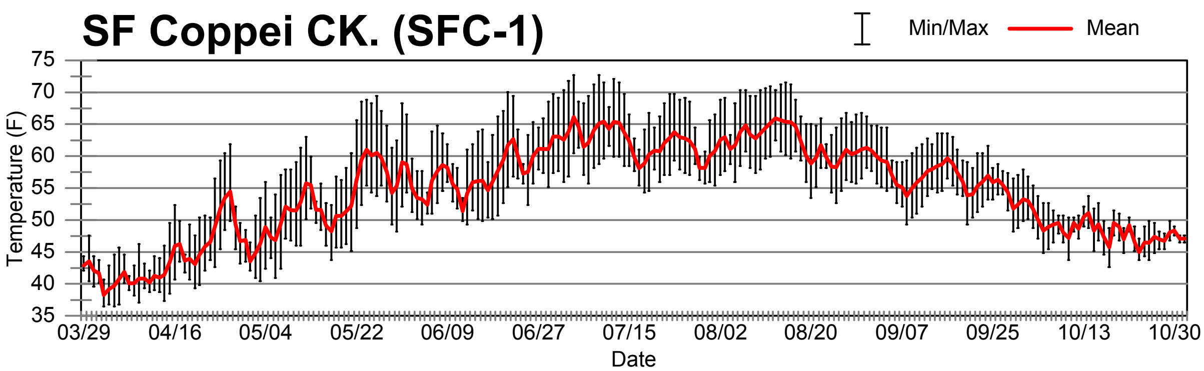

Touchet R.-SRL (TR-3)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
03/26
04/14
05/03
05/22
06/10
06/29
07/18
08/06
08/25
09/13
10/02
10/21
11/08
Date

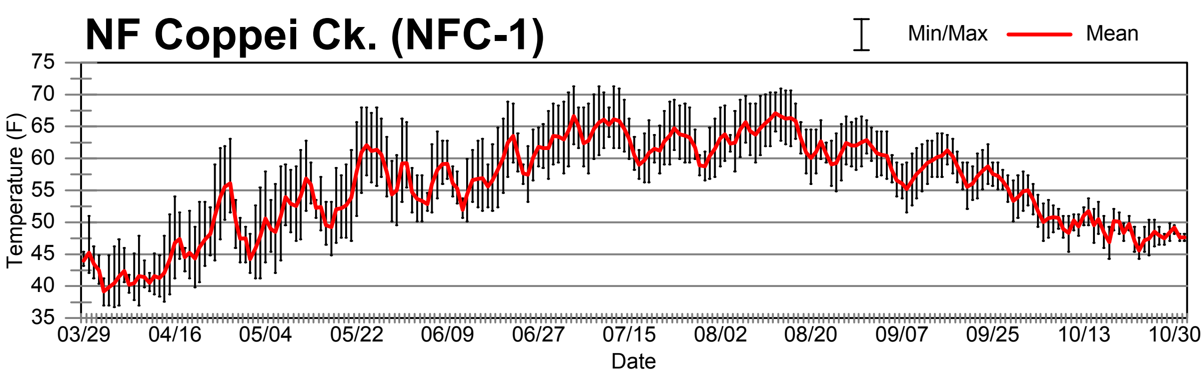

SF Patit Ck. (SFP-1)
Min/Max
Mean
Temperature (F)
Date
70
65
60
55
50
45
40
35
04/26
05/13
05/30
06/16
07/03
07/20
08/06
08/23
09/09
09/26
10/13
10/29

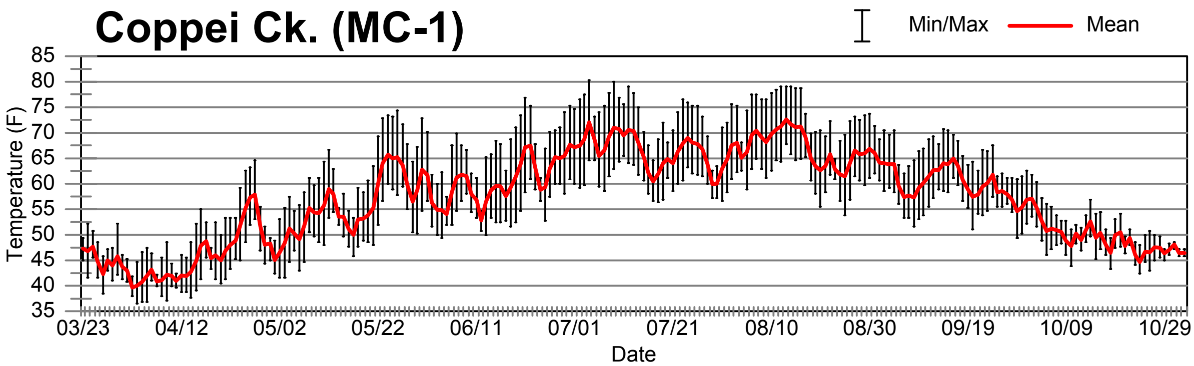

SF Patit Ck. (SFP-2)
Min/Max
Mean
Temperature (F)
Date
Logger was dry when found
85
80
75
70
65
60
55
50
45
40
35
30
03/30
04/15
05/01
05/17
06/02
06/18
07/04
07/20
08/05
08/21
09/06

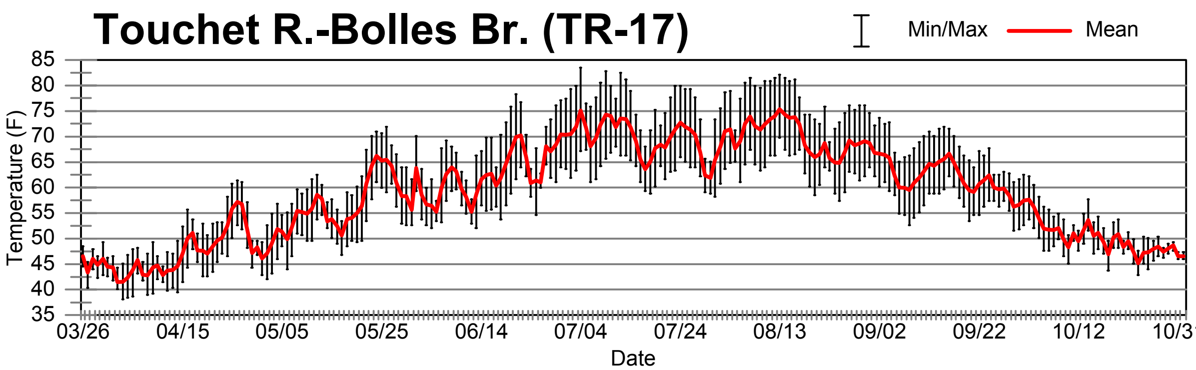

Touchet River (TR-12)
Min/Max
Mean
Temperature (F)
Date
80
75
70
65
60
55
50
45
40
35
03/29
04/18
05/08
05/28
06/17
07/07
07/27
08/16
09/05
09/25
10/15
11/03

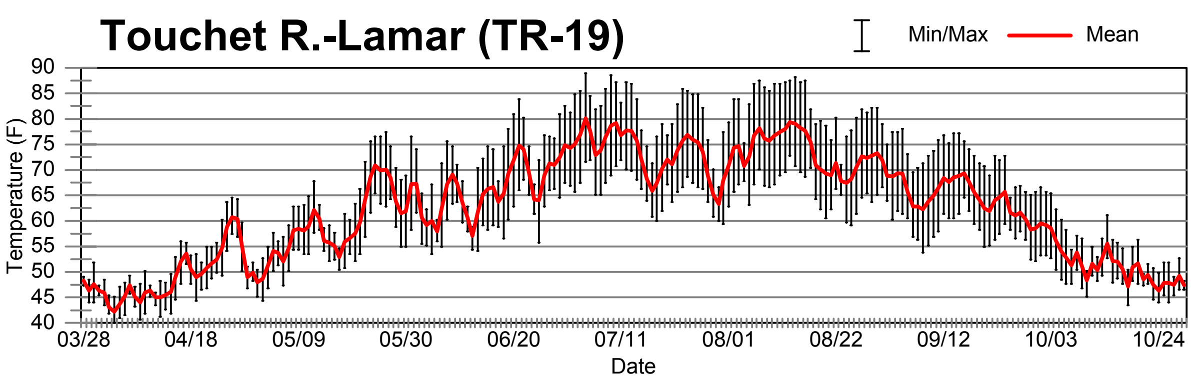

Whiskey Ck. (WC-1)
Min/Max
Mean
80
75
70
65
60
55
50
45
40
35
Temperature (F)
04/04
04/22
05/10
05/28
06/15
07/03
07/21
08/08
08/26
09/13
10/01
10/19
11/05
Date

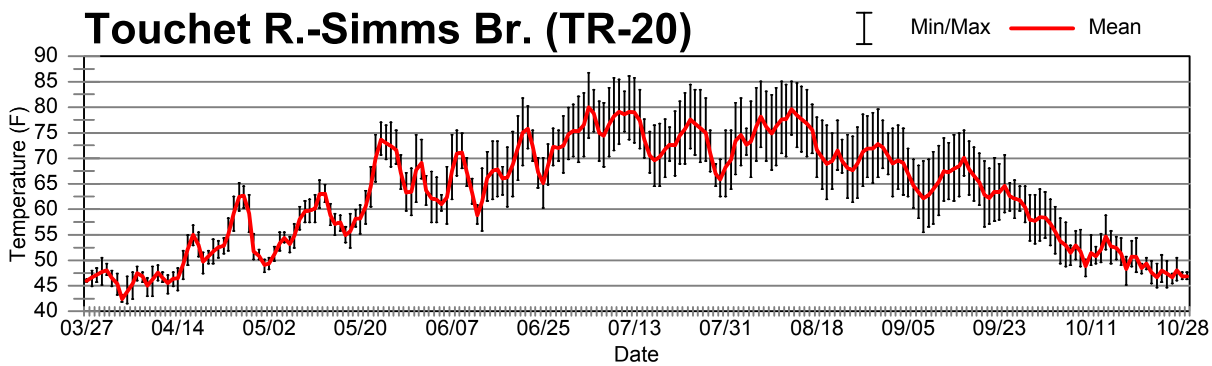

SF Coppei CK. (SFC-1)
Min/Max
Mean
75
70
65
60
55
50
45
40
35
Temperature (F)
03/29
04/16
05/04
05/22
06/09
06/27
07/15
08/02
08/20
09/07
09/25
10/13
10/30
Date

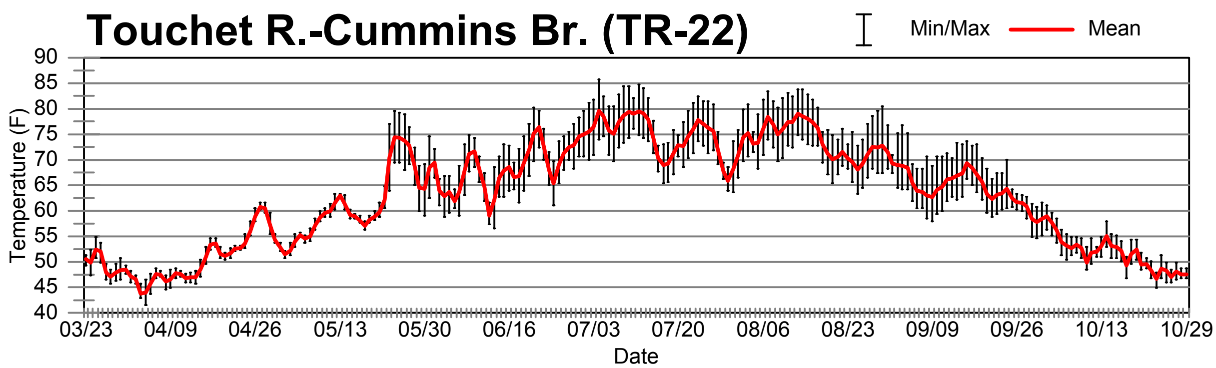

NF Coppei Ck. (NFC-1)
Min/Max
Mean
75
70
65
60
55
50
45
40
35
Temperature (F)
03/29
04/16
05/04
05/22
06/09
06/27
07/15
08/02
08/20
09/07
09/25
10/13
10/30
Date

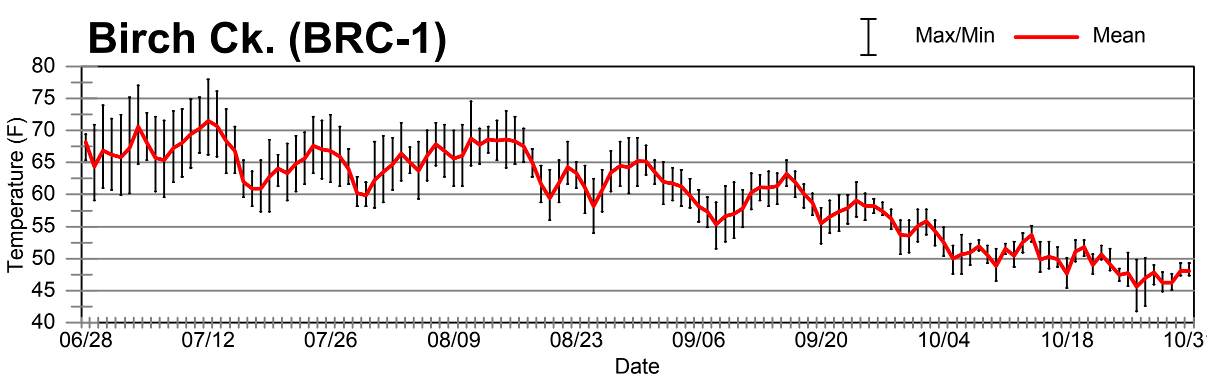

Coppei Ck. (MC-1)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
35
03/23
04/12
05/02
05/22
06/11
07/01
07/21
08/10
08/30
09/19
10/09
10/29
Date

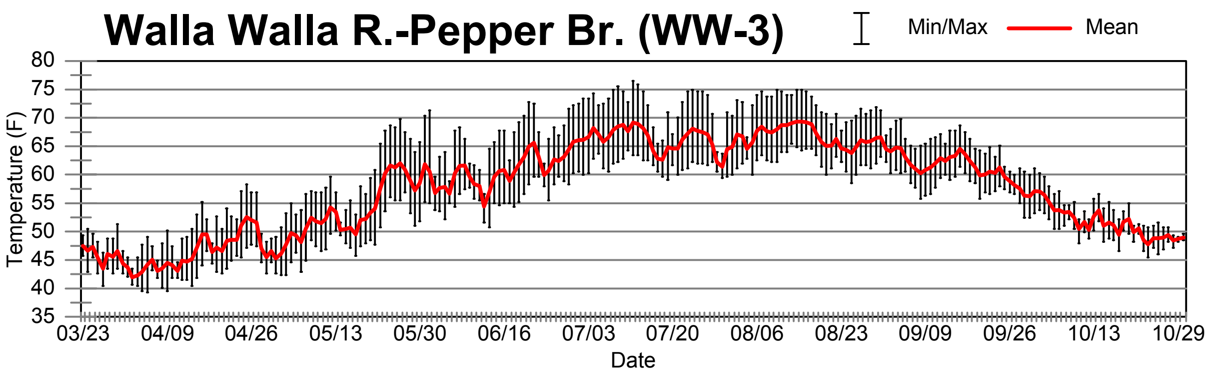

Touchet R.-Bolles Br. (TR-17)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
35
03/26
04/15
05/05
05/25
06/14
07/04
07/24
08/13
09/02
09/22
10/12
10/31
Date

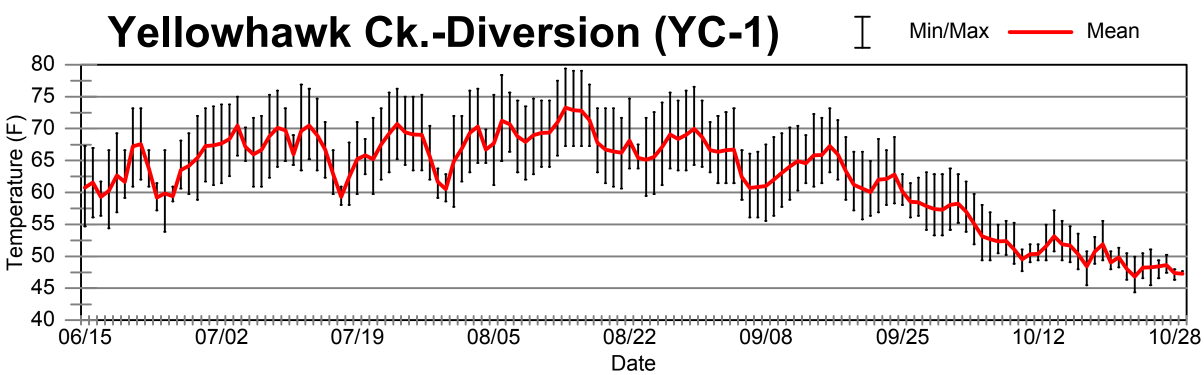

Touchet R.-Lamar (TR-19)
Min/Max
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
40
03/28
04/18
05/09
05/30
06/20
07/11
08/01
08/22
09/12
10/03
10/24
Date

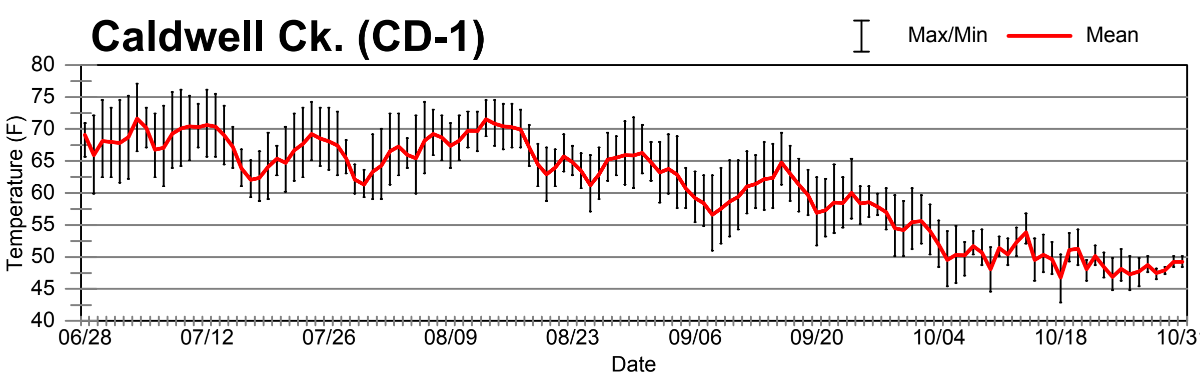

Touchet R.-Simms Br. (TR-20)
Min/Max
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
40
03/27
04/14
05/02
05/20
06/07
06/25
07/13
07/31
08/18
09/05
09/23
10/11
10/28
Date

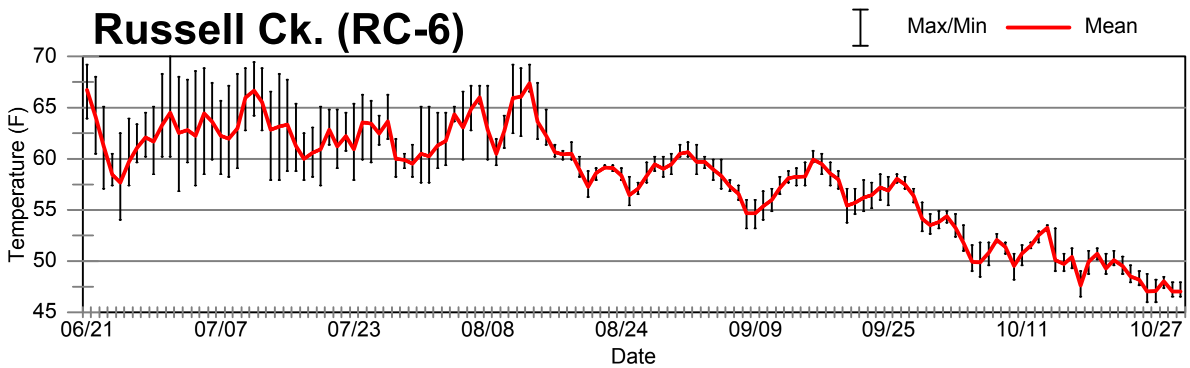

Touchet R.-Cummins Br. (TR-22)
Min/Max
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
40
03/23
04/09
04/26
05/13
05/30
06/16
07/03
07/20
08/06
08/23
09/09
09/26
10/13
10/29
Date

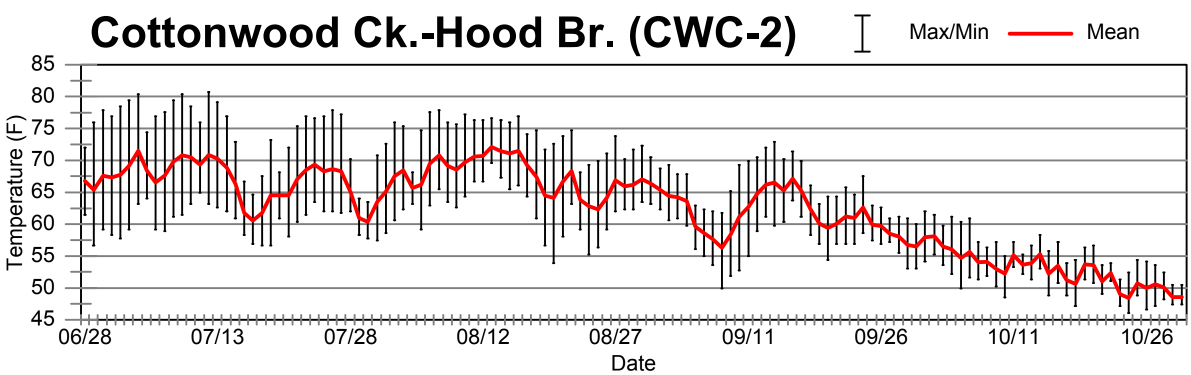

Birch Ck. (BRC-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
06/28
07/12
07/26
08/09
08/23
09/06
09/20
10/04
10/18
10/31
Date

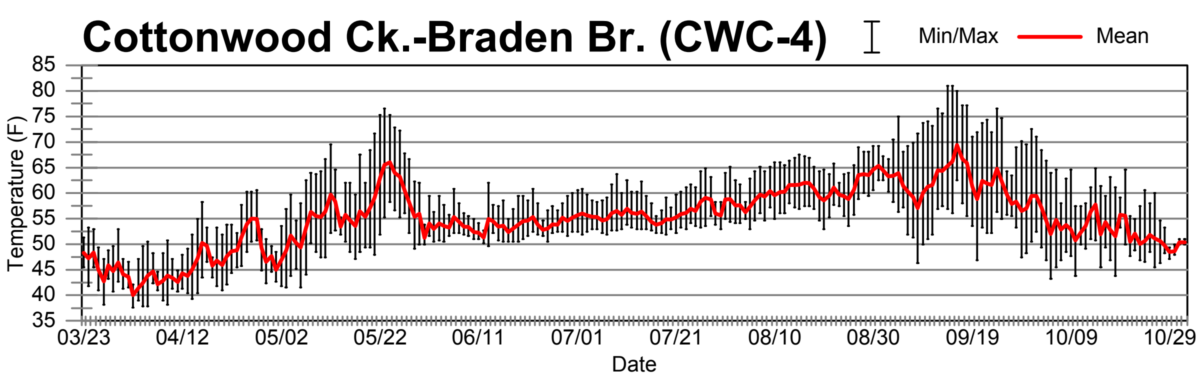

Walla Walla R.-Pepper Br. (WW-3)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
03/23
04/09
04/26
05/13
05/30
06/16
07/03
07/20
08/06
08/23
09/09
09/26
10/13
10/29
Date

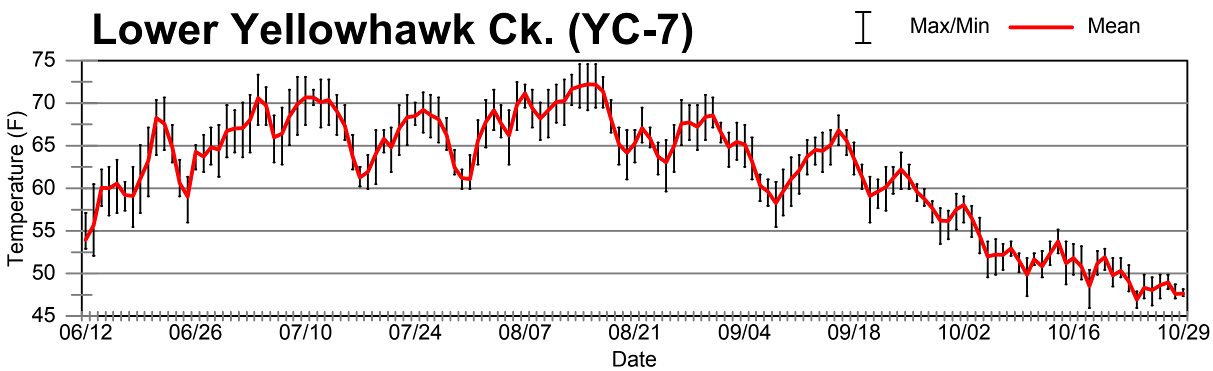

Yellowhawk Ck.-Diversion (YC-1)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
06/15
07/02
07/19
08/05
08/22
09/08
09/25
10/12
10/28
Date

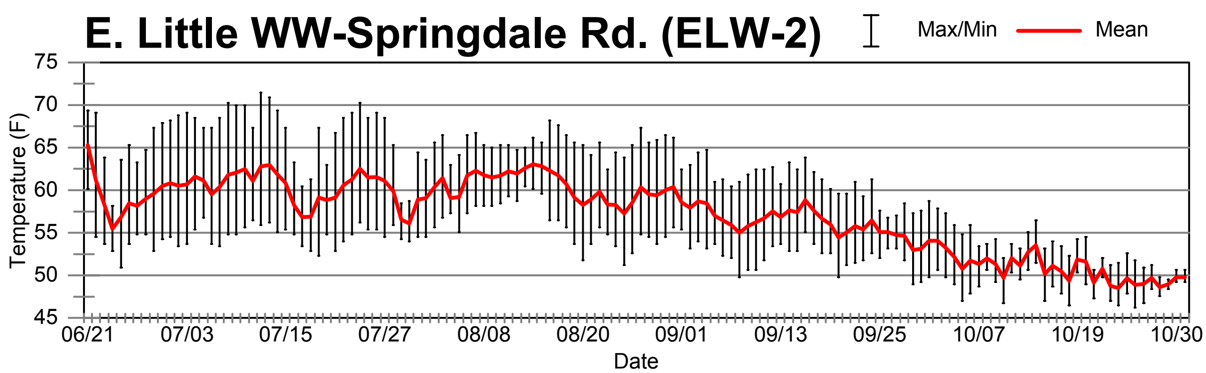

Caldwell Ck. (CD-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
06/28
07/12
07/26
08/09
08/23
09/06
09/20
10/04
10/18
10/31
Date

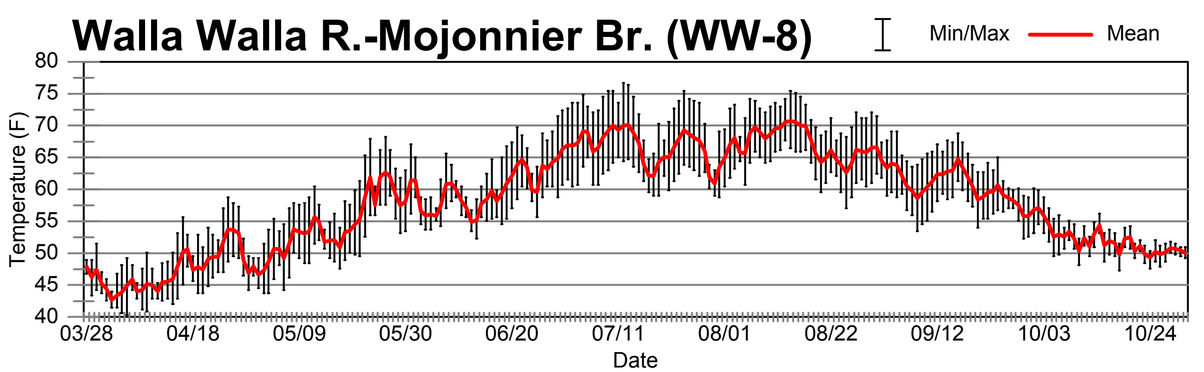

Russell Ck. (RC-6)
Max/Min
Mean
Temperature (F)
70
65
60
55
50
45
06/21
07/07
07/23
08/08
08/24
09/09
09/25
10/11
10/27
Date

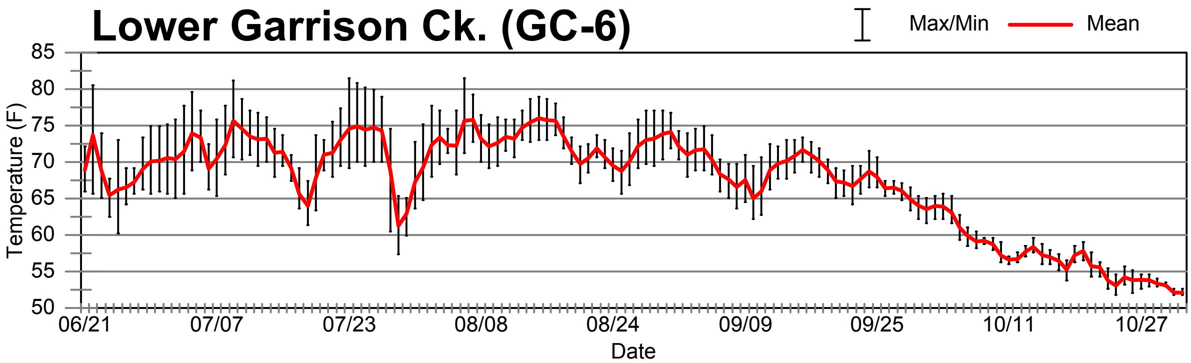

Cottonwood Ck.-Hood Br. (CWC-2)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

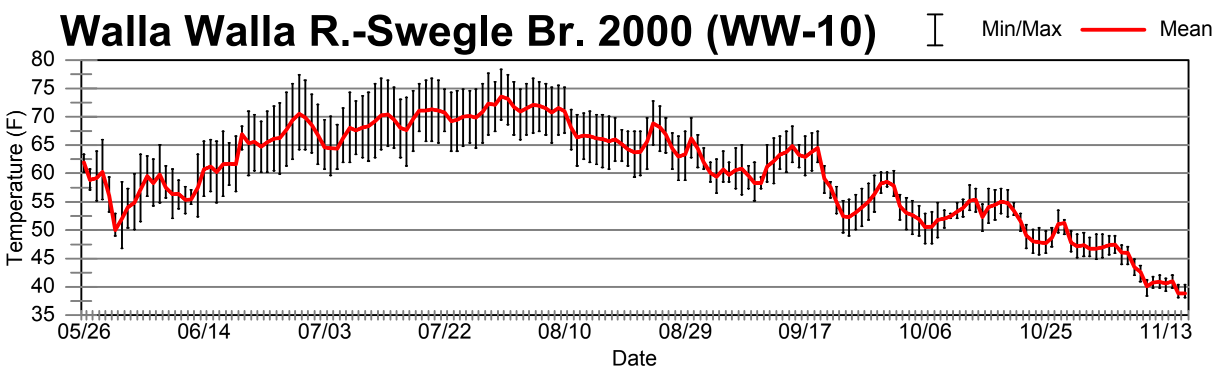

Cottonwood Ck.-Braden Br. (CWC-4)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
35
03/23
04/12
05/02
05/22
06/11
07/01
07/21
08/10
08/30
09/19
10/09
10/29
Date

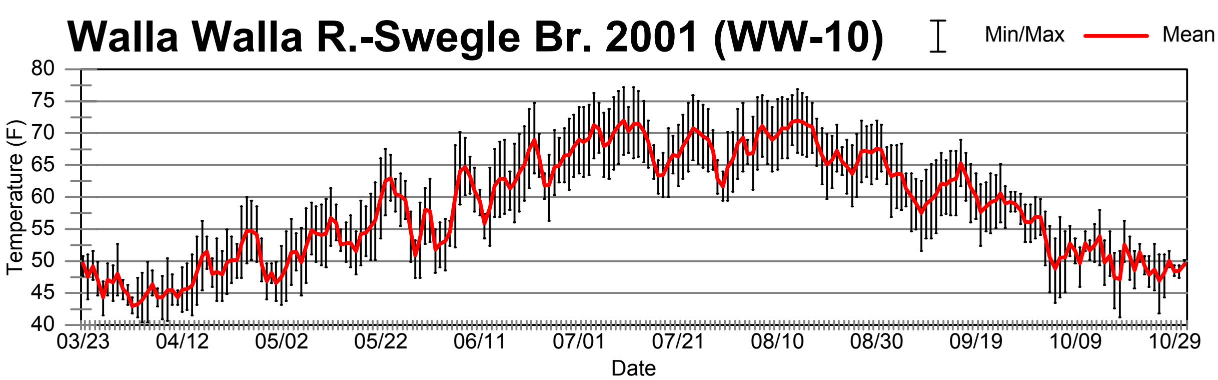

Lower Yellowhawk Ck. (YC-7)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
06/12
06/26
07/10
07/24
08/07
08/21
09/04
09/18
10/02
10/16
10/29
Date

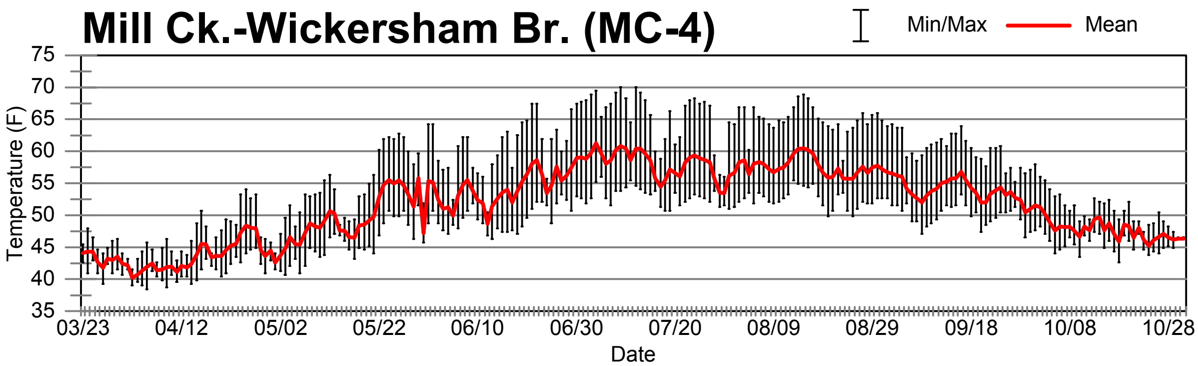

E. Little WW-Springdale Rd. (ELW-2)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
06/21
07/03
07/15
07/27
08/08
08/20
09/01
09/13
09/25
10/07
10/19
10/30
Date


Walla Walla R.-Mojonnier Br. (WW-8)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
03/28
04/18
05/09
05/30
06/20
07/11
08/01
08/22
09/12
10/03
10/24
Date

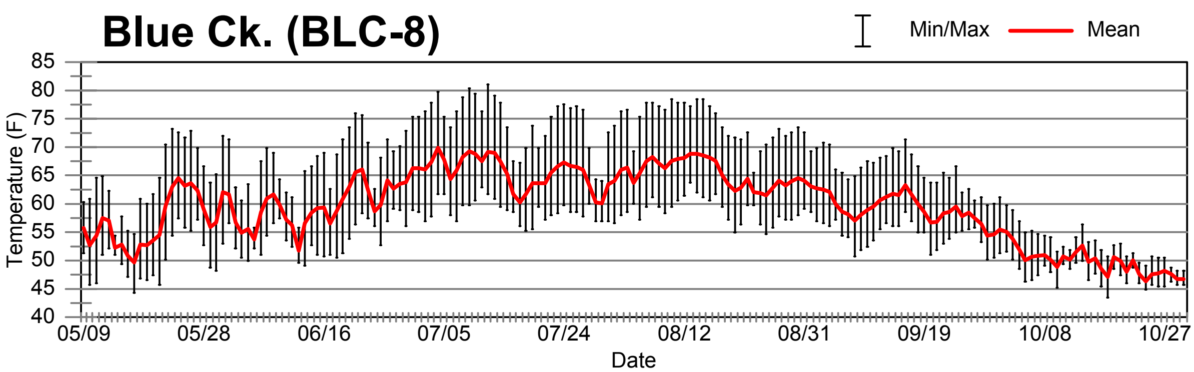

Lower Garrison Ck. (GC-6)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
06/21
07/07
07/23
08/08
08/24
09/09
09/25
10/11
10/27
Date


Walla Walla R.-Swegle Br. 2000 (WW-10)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
05/26
06/14
07/03
07/22
08/10
08/29
09/17
10/06
10/25
11/13
Date

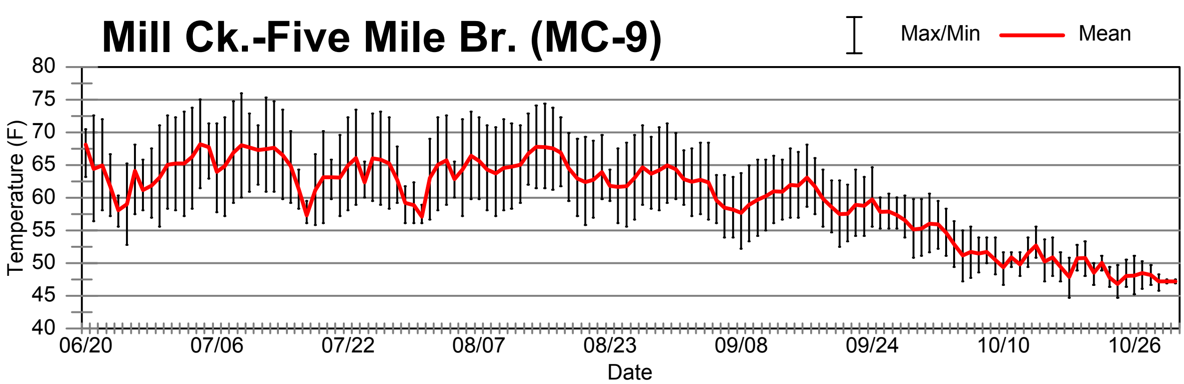

Walla Walla R.-Swegle Br. 2001 (WW-10)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
03/23
04/12
05/02
05/22
06/11
07/01
07/21
08/10
08/30
09/19
10/09
10/29
Date



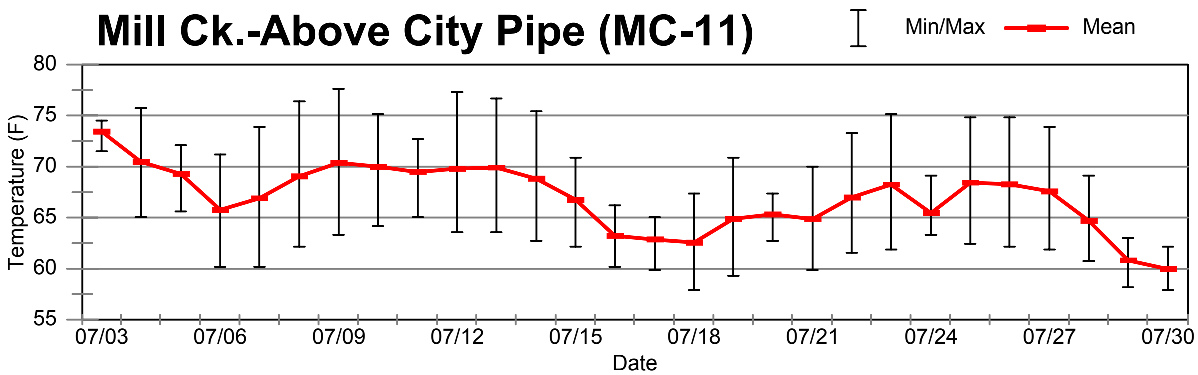
Mill Ck.-Wickersham Br. (MC-4)
Min/Max
Mean
Temperature (F)
75
70
65
60
55
50
45
40
35
03/23
04/12
05/02
05/22
06/10
06/30
07/20
08/09
08/29
09/18
10/08
10/28
Date



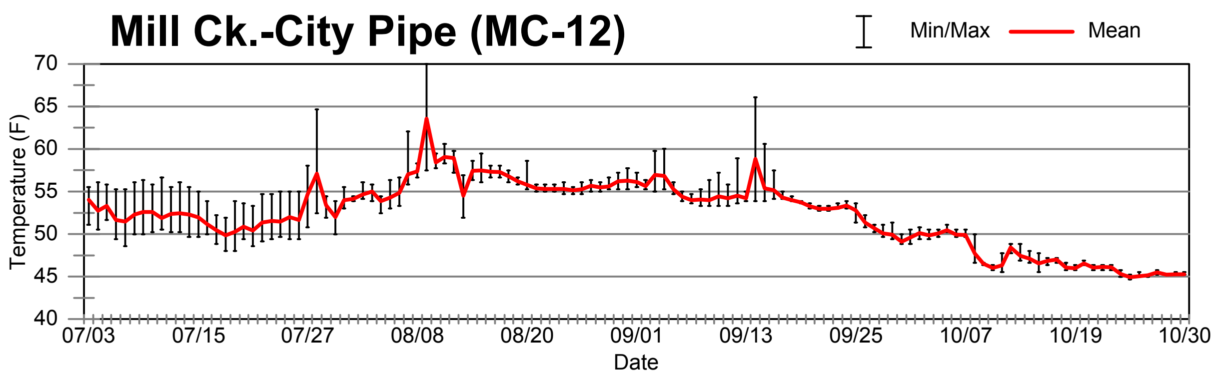
Blue Ck. (BLC-8)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
05/09
05/28
06/16
07/05
07/24
08/12
08/31
09/19
10/08
10/27
Date



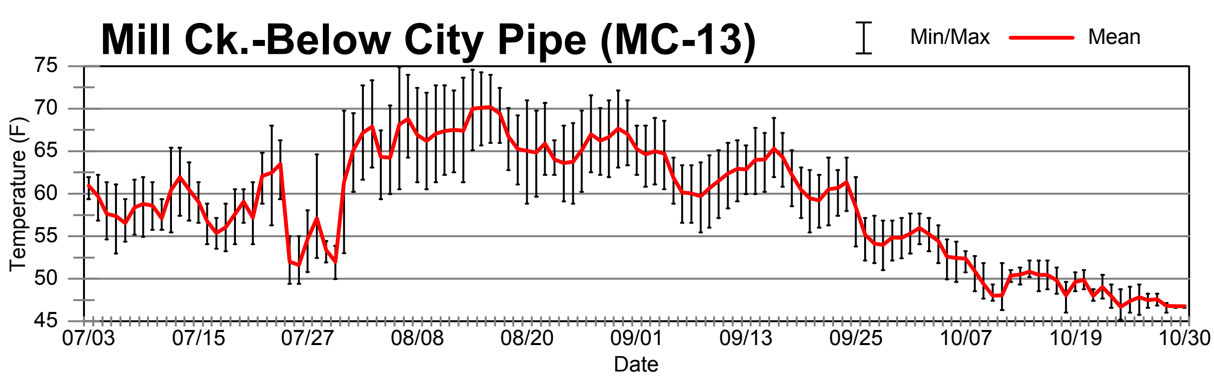
Mill Ck.-Five Mile Br. (MC-9)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
06/20
07/06
07/22
08/07
08/23
09/08
09/24
10/10
10/26
Date



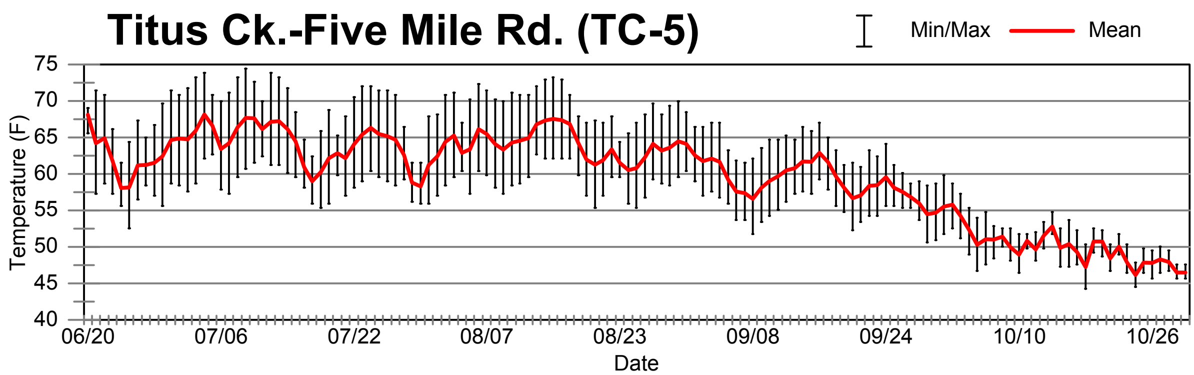
Mill Ck.-Above City Pipe (MC-11)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
07/03
07/06
07/09
07/12
07/15
07/18
07/21
07/24
07/27
07/30
Date

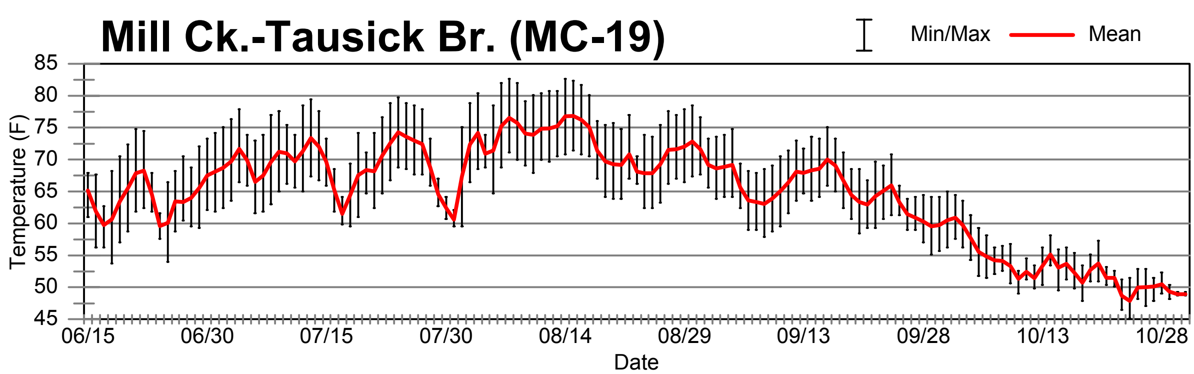


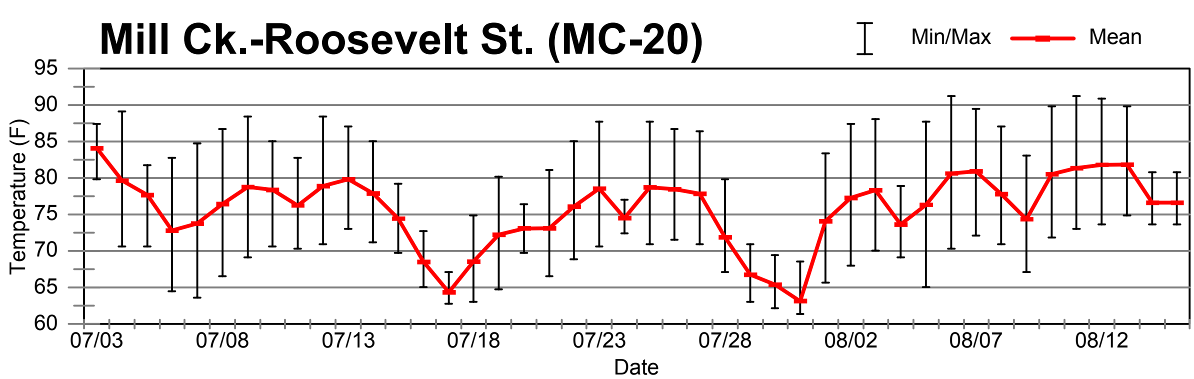
Mill Ck.-City Pipe (MC-12)
Min/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
07/03
07/15
07/27
08/08
08/20
09/01
09/13
09/25
10/07
10/19
10/30
Date

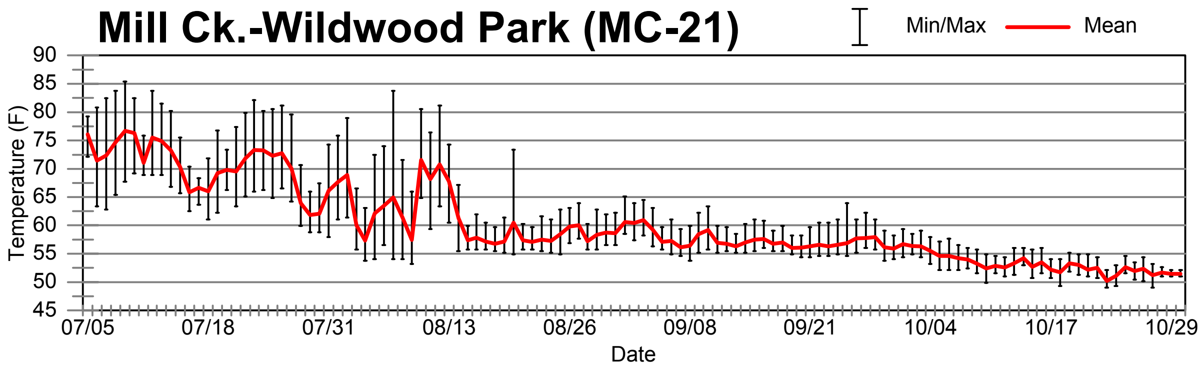


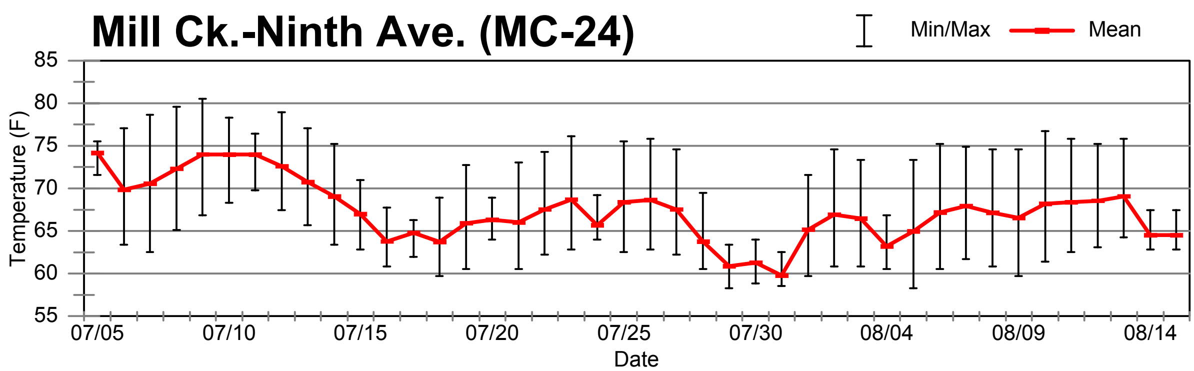
Mill Ck.-Below City Pipe (MC-13)
Min/Max
Mean
Temperature (F)
75
70
65
60
55
50
45
07/03
07/15
07/27
08/08
08/20
09/01
09/13
09/25
10/07
10/19
10/30
Date

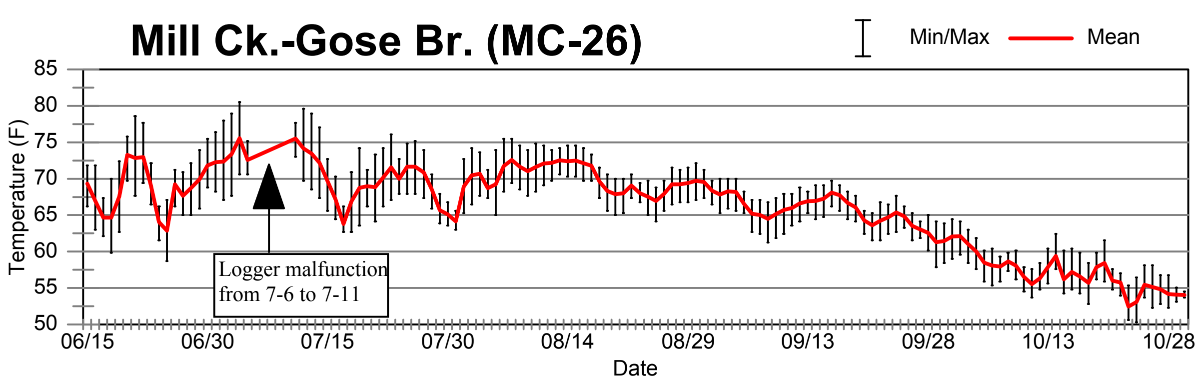

Titus Ck.-Five Mile Rd. (TC-5)
Min/Max
Mean
Temperature (F)
75
70
65
60
55
50
45
40
06/20
07/06
07/22
08/07
08/23
09/08
09/24
10/10
10/26
Date

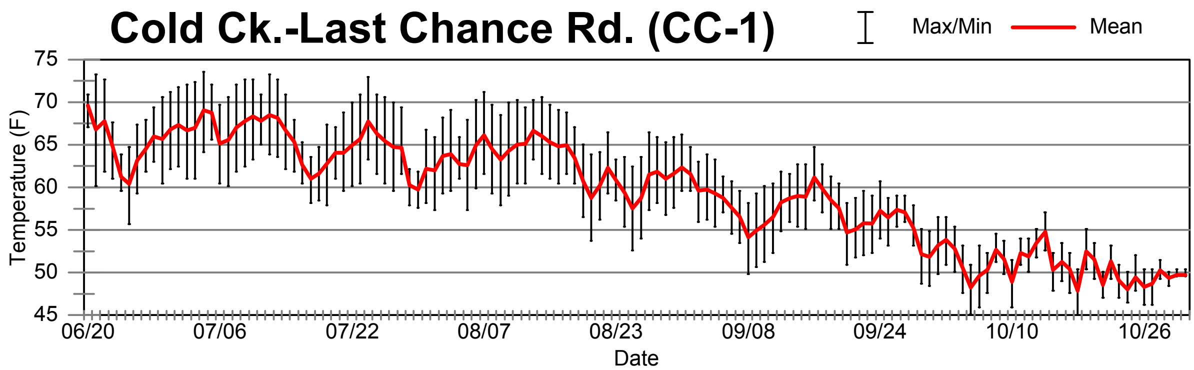

Mill Ck.-Tausick Br. (MC-19)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
06/15
06/30
07/15
07/30
08/14
08/29
09/13
09/28
10/13
10/28
Date

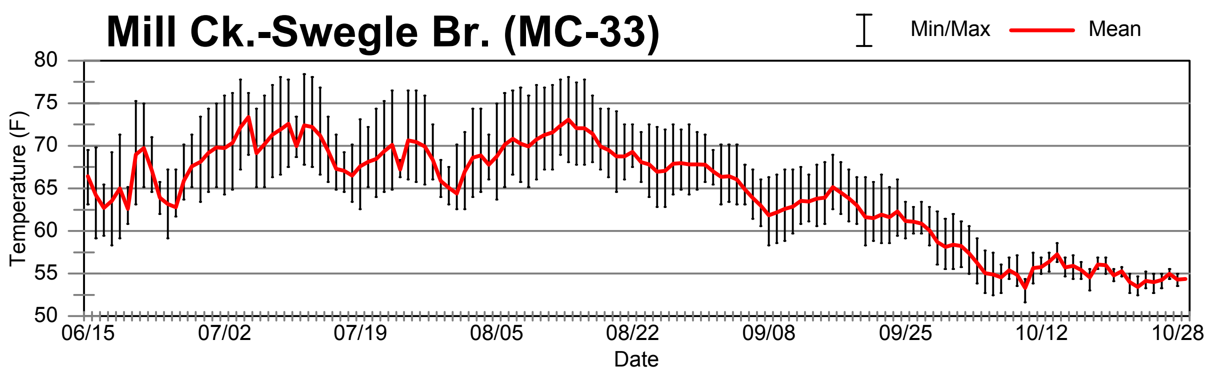

Mill Ck.-Roosevelt St. (MC-20)
Min/Max
Mean
Temperature (F)
95
90
85
80
75
70
65
60
07/03
07/08
07/13
07/18
07/23
07/28
08/02
08/07
08/12
Date

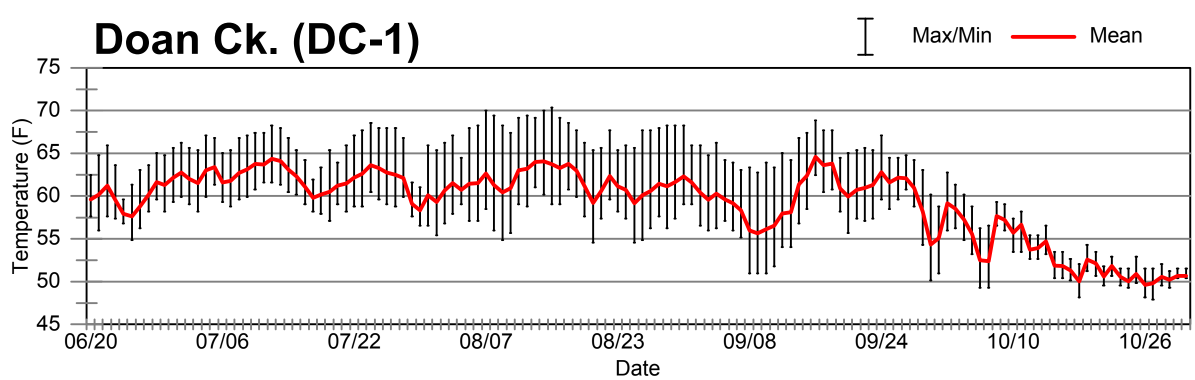

Mill Ck.-Wildwood Park (MC-21)
Min/Max
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
07/05
07/18
07/31
08/13
08/26
09/08
09/21
10/04
10/17
10/29
Date

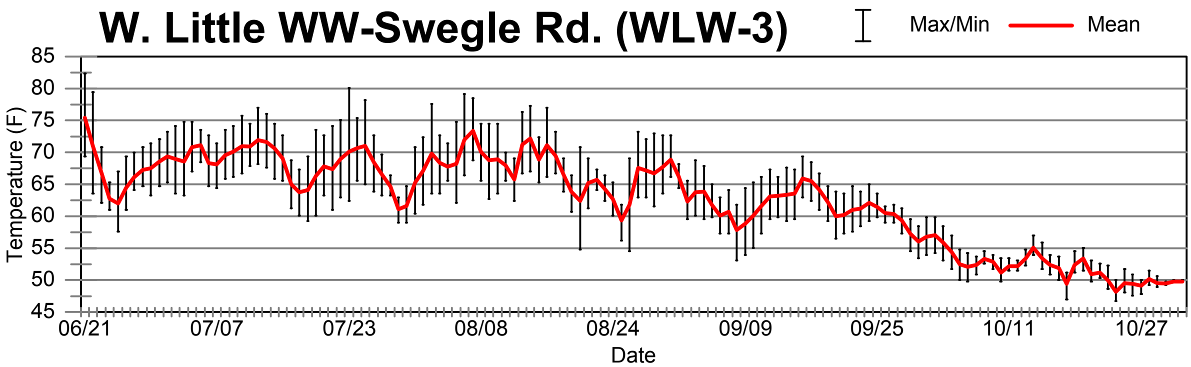

Mill Ck.-Ninth Ave. (MC-24)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
07/05
07/10
07/15
07/20
07/25
07/30
08/04
08/09
08/14
Date

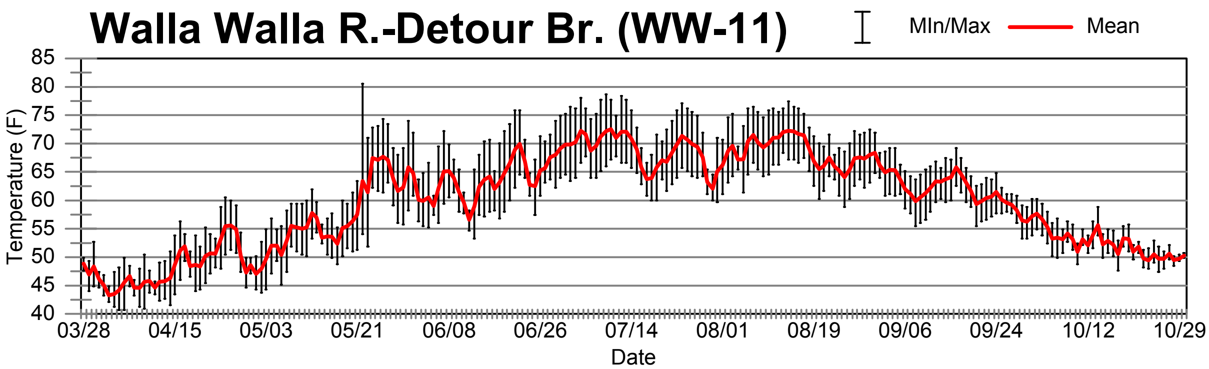

Mill Ck.-Gose Br. (MC-26)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
Logger malfunction
from 7-6 to 7-11
06/15
06/30
07/15
07/30
08/14
08/29
09/13
09/28
10/13
10/28
Date

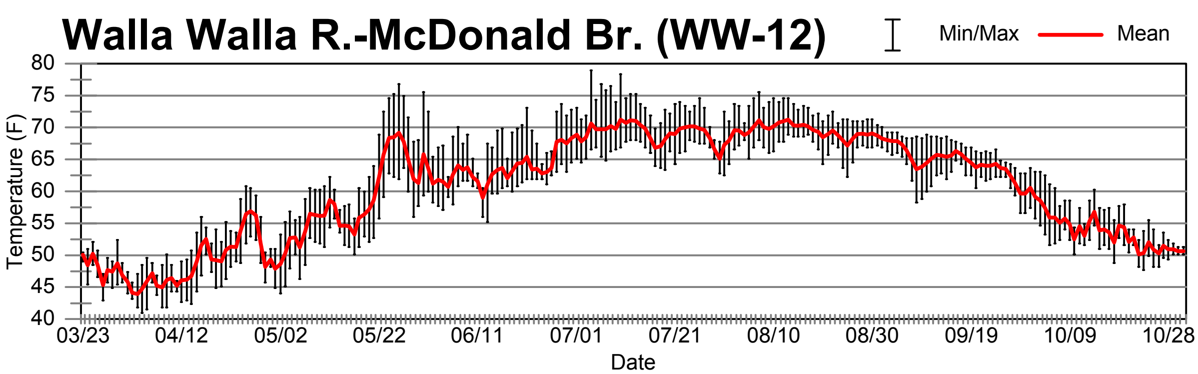

Cold Ck.-Last Chance Rd. (CC-1)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
06/20
07/06
07/22
08/07
08/23
09/08
09/24
10/10
10/26
Date

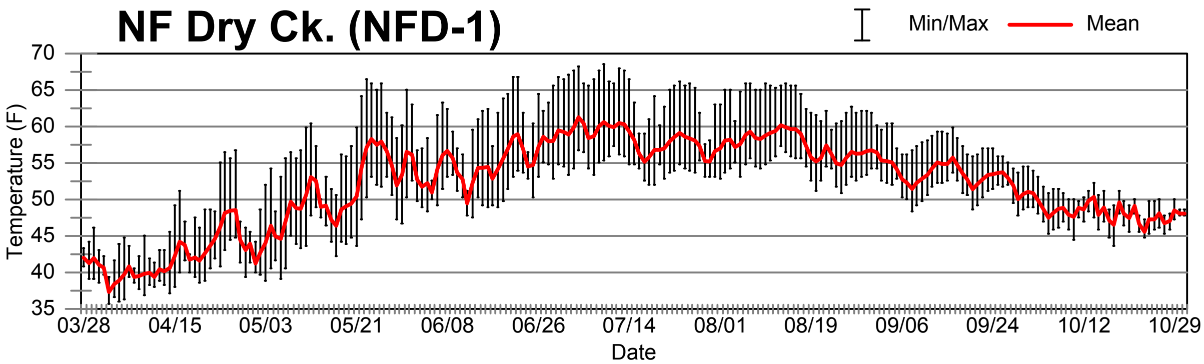

Mill Ck.-Swegle Br. (MC-33)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
06/15
07/02
07/19
08/05
08/22
09/08
09/25
10/12
10/28
Date

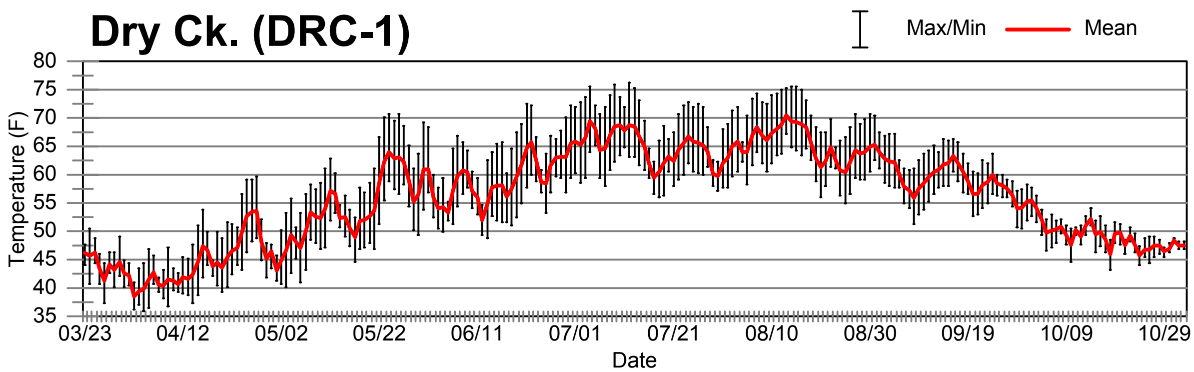

Doan Ck. (DC-1)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
06/20
07/06
07/22
08/07
08/23
09/08
09/24
10/10
10/26
Date

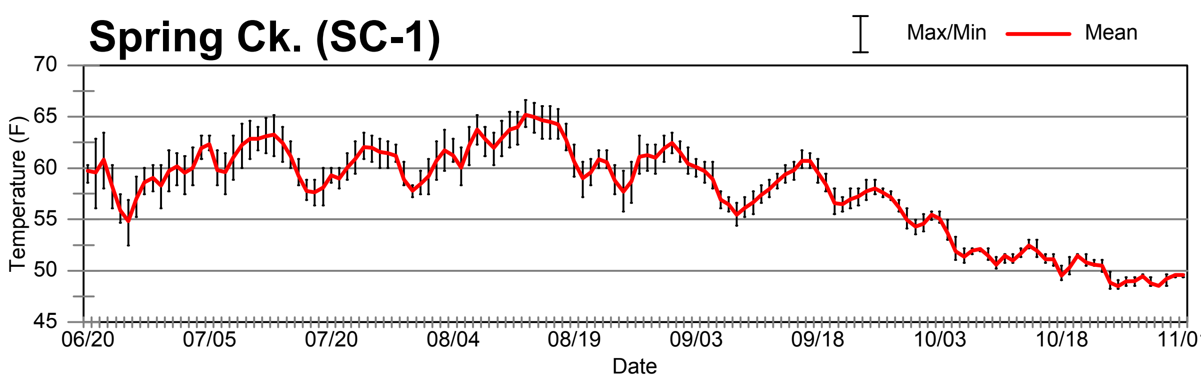

W. Little WW-Swegle Rd. (WLW-3)
Max/Min
Mean
85
80
75
70
65
60
55
50
45
Temperature (F)
06/21
07/07
07/23
08/08
08/24
09/09
09/25
10/11
10/27
Date

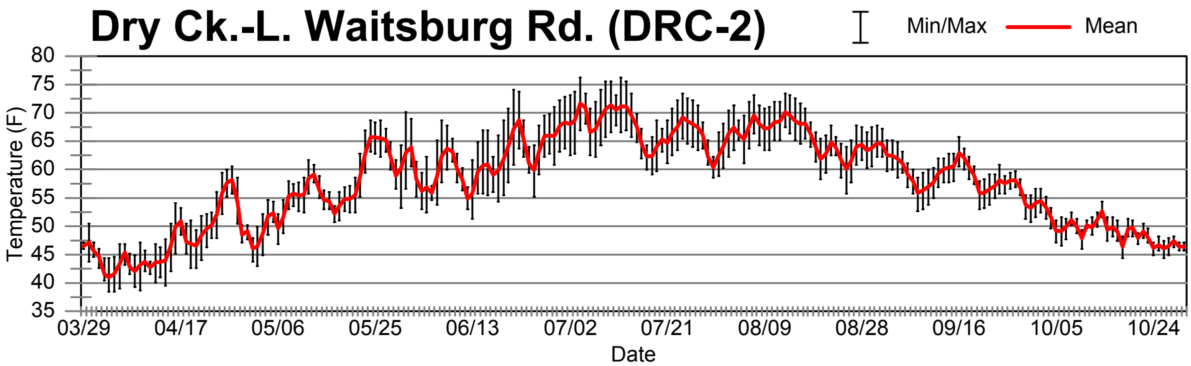

Walla Walla R.-Detour Br. (WW-11)
MIn/Max
Mean
85
80
75
70
65
60
55
50
45
40
Temperature (F)
03/28
04/15
05/03
05/21
06/08
06/26
07/14
08/01
08/19
09/06
09/24
10/12
10/29
Date

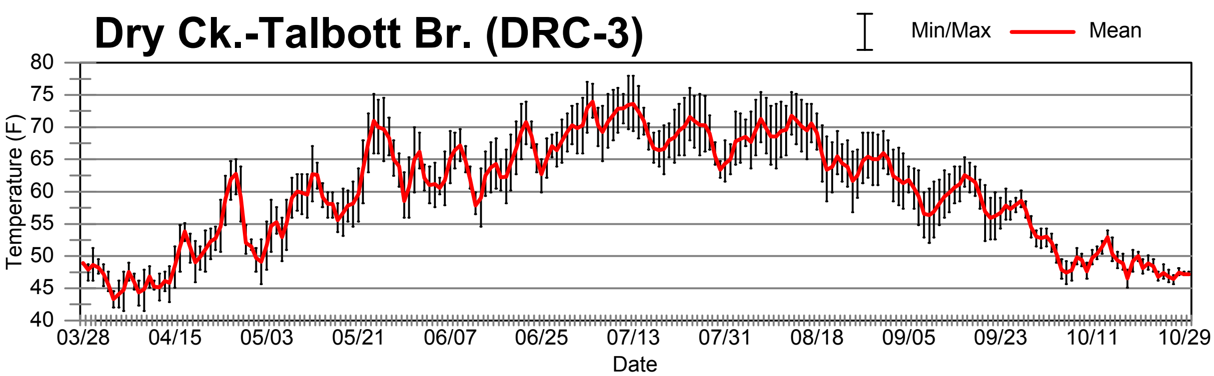

Walla Walla R.-McDonald Br. (WW-12)
Min/Max
Mean
80
75
70
65
60
55
50
45
40
Temperature (F)
03/23
04/12
05/02
05/22
06/11
07/01
07/21
08/10
08/30
09/19
10/09
10/28
Date

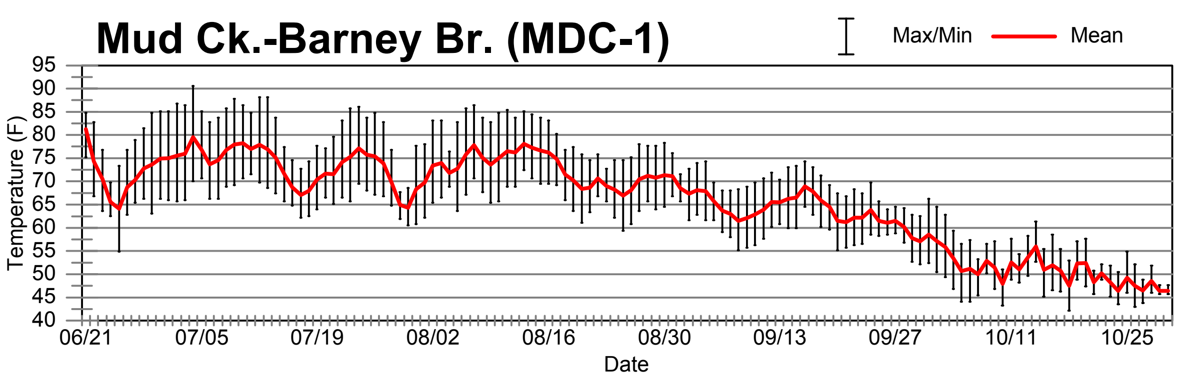

NF Dry Ck. (NFD-1)
Min/Max
Mean
Temperature (F)
70
65
60
55
50
45
40
35
03/28
04/15
05/03
05/21
06/08
06/26
07/14
08/01
08/19
09/06
09/24
10/12
10/29
Date

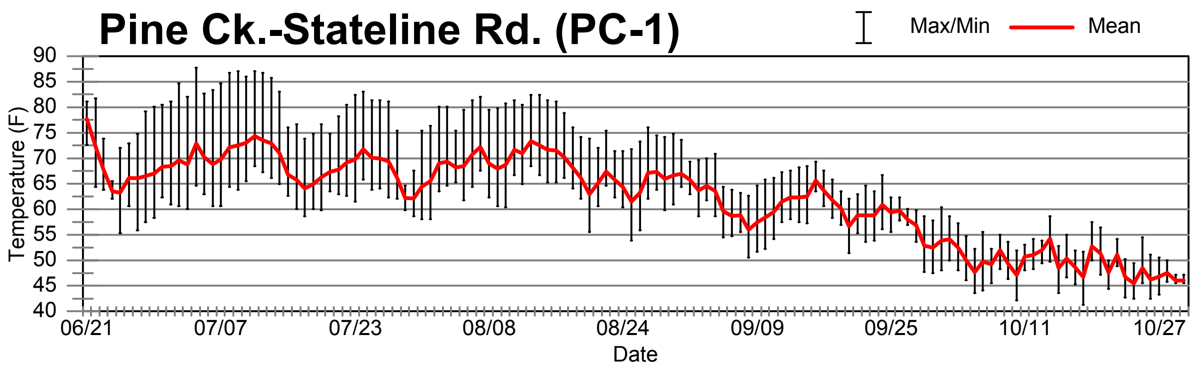

Dry Ck. (DRC-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
03/23
04/12
05/02
05/22
06/11
07/01
07/21
08/10
08/30
09/19
10/09
10/29
Date

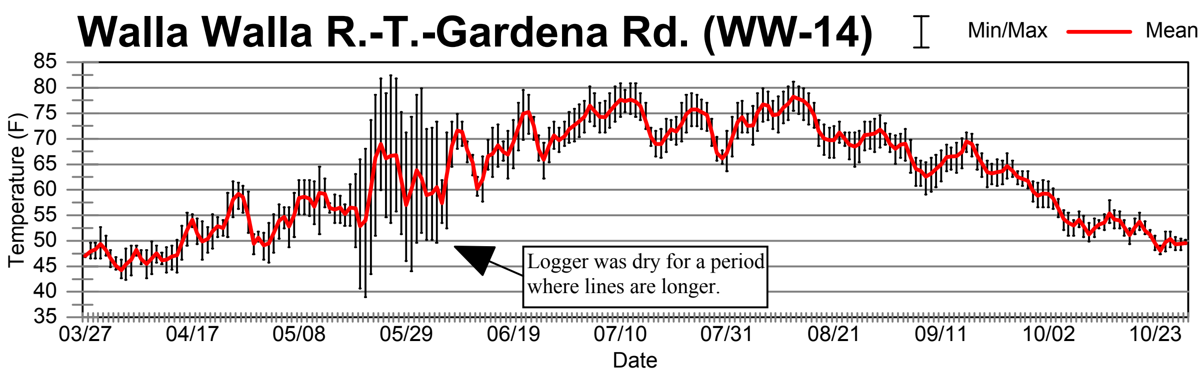

Spring Ck. (SC-1)
Max/Min
Mean
Temperature (F)
70
65
60
55
50
45
06/20
07/05
07/20
08/04
08/19
09/03
09/18
10/03
10/18
11/01
Date

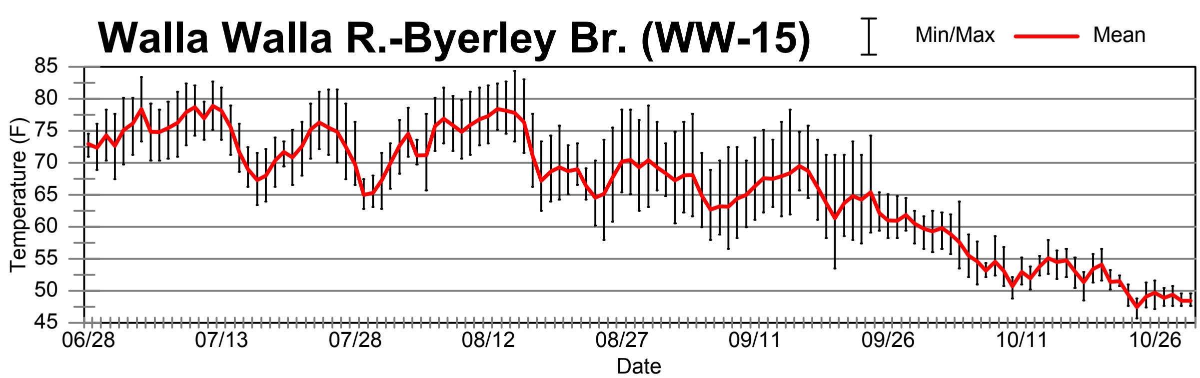

Dry Ck.-L. Waitsburg Rd. (DRC-2)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
03/29
04/17
05/06
05/25
06/13
07/02
07/21
08/09
08/28
09/16
10/05
10/24
Date


Dry Ck.-Talbott Br. (DRC-3)
Min/Max
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
03/28
04/15
05/03
05/21
06/07
06/25
07/13
07/31
08/18
09/05
09/23
10/11
10/29
Date


Mud Ck.-Barney Br. (MDC-1)
Max/Min
Mean
Temperature (F)
95
90
85
80
75
70
65
60
55
50
45
40
06/21
07/05
07/19
08/02
08/16
08/30
09/13
09/27
10/11
10/25
Date


Pine Ck.-Stateline Rd. (PC-1)
Max/Min
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
40
06/21
07/07
07/23
08/08
08/24
09/09
09/25
10/11
10/27
Date


Walla Walla R.-T.-Gardena Rd. (WW-14)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
35
Logger was dry for a period where lines are longer.
03/27
04/17
05/08
05/29
06/19
07/10
07/31
08/21
09/11
10/02
10/23
Date


Walla Walla R.-Byerley Br. (WW-15)
Min/Max
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
06/28
07/13
07/28
08/12
08/27
09/11
09/26
10/11
10/26
Date

List of Lost/Stolen Loggers 2001

Mill Ck @ Above cold return

< Dropped logger on 7/3
< Collected data from7/3 to 7/31 (has graph)
< Couldn't find on 11/01

Mill Ck @ Clinton St.

< Dropped on 6/15/
< Have data from 6/20 to 6/26 (no graph)
< Couldn't find on 7/5

Mill Ck @ Cockerlines

< Dropped two loggers on 9/4, one in irrigation return ponds and one in Mill Ck
< Couldn't find on 11/29

Pine Ck @ Sandpit Rd.

< Dropped logger on 6/21
< Couldn't find on 10/31

Walla Walla @ Nine Mile Bridge

< Dropped logger on 6/21
< Couldn't find on 10/29

Appendix D. Qualitative Electrofishing, 2001

Relative abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001.

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Patit Creek	PC-1 Below Patit Rd. Brg.	9/26	60	16 0+ RBT's (55-79mm), nine 1+ RBT's (115-162 mm) found. SCP, RSS, SD, BLS-common, NPM-uncommon	High intensity survey, removing fish for instream project
	PC-1 Below Patit Rd. Brg.	10/04	60	16 0+ RBT's (52-79 mm), six 1+ RBT's (115-162 mm) found. RSS, SD-abundant, BLS, NPM-common, SCP-uncommon	High intensity survey, removing fish for instream project
Touchet River	TR-18 Below Hart Rd.	8/28	31	No salmonids found. SD-abundant, RSS, NPM-uncommon, LPY-Rare	High intensity survey, no salmonids, called after pass one
Walla Walla River	WW-8 Below Mojonnier Rd.	8/21	30	Two 0+ RBT's (71 and 99mm), one 1+ RBT (175 mm) found. SD, SCP-abundant, RSS-common	High intensity survey, called after pass one because of low fish numbers
	WW-9 Below Last Chance Rd.	8/14	30	One 1+ RBT (187 mm) found. SD, SCP, RSS, BLS-abundant, NPM-common, LSS-uncommon, CMO-rare, crayfish-rare	High intensity survey, called after pass one because of low fish numbers and water became very cloudy
	WW-11 Above Detour Rd.	8/14	30	Five 0+ RBT's (66-94 mm), three adult RBT's (223-241mm). SD, RSS-abundant, SCP, BLS-common	High intensity survey, called after pass two because of low fish numbers
	WW-12 Above McDonald Rd.	8/23	30	No salmonids found. BLS, SD, RSS-abundant, NPM, crayfish-uncommon, LPY-rare	High intensity survey, called after pass one because of low fish numbers
	WW-13 Above Lowden Gardena Rd.	8/8	30	No salmonids found. SD, NPM, RSS, BLS-abundant, LPY, SMB-rare	High intensity survey, called after pass one because of low fish numbers
Yellowhawk Creek	YC-3 Fern St.	8/29	32	Five 0+ RBT's (46-75mm), nine 1+ RBT's (110-156mm), one adult RBT (206 mm) found. SCP-abundant, SD, RSS-common	High intensity survey, lost bottom net on pass 1

Relative abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001. (Cont.)

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Yellowhawk Creek (Cont.)	YC-4 0.2 mi below Fern St.	10/04	five	Four 0+ RBT's (60-89 mm), 1+ RBT's (129-198mm), one adult RBT (261 mm) found. SCP-common, RSS, BLS-rare crayfish-rare	Moderate intensity survey.
Russell Creek	RC-1 0.3 mi below Foster Rd.	7/25	60	No fish found.	Light intensity survey, very little water
	RC-2 CCC dam	7/19	30	86 0+ RBT's (38-78mm) found. SCP-rare	Moderate intensity survey Lots of 0+ RBT's, only shocked pool below CCC dam and small area of riffle/run below pool
	RC-4 Below Depping Rd.	7/19	30	Two 0+ RBT's (55 and 63 mm), ten 1+ RBT's (132-193 mm), 11 adult RBT's (202-282 mm) found. SD, RSS-abundant, SCP, BLS-common	Moderate intensity survey, one large pool below bridge that held most of the fish
	RC-5 S. Wilbur Ave.	9/13	20	No fish found.	Light intensity survey, standing water with dry spots
Reeser Ck	REC-1 Foster Rd.	9/13	30	No fish found.	Light intensity survey, little water, no riparian, heavy sedimentation.
Cottonwood Creek	CWC-1 1.0 mi above Hood Rd.	8/29	50	Two 0+ RBT's (64 and 65mm) found. SCP-common, SD-abundant	Moderate intensity survey, almost no water
	CWC-3 Above Braden Rd.	7/19	30	82 0+ RBT's (40-89 mm), two 1+ RBT's (186-188 mm), three adult RBT's (203-210 mm) found. SD-uncommon, SCP-rare	Moderate intensity survey, one large pool under bridge lots of overhanging grass
Stone Ck	SC-1 Howard St.	9/13	30	No salmonids found. SCP-common, SD-rare	Light intensity survey, Irises throughout most of stream good shade.
Garrison Creek	GC-2 Bridge St. at Pioneer Jr. High	9/11	50	No salmonids found. LPY-rare SCP-abundant, SD-common	Light intensity survey
	GC-3 Garrison School	9/11	60	Two 0+ RBT's (86 and 91mm) found. SCP-abundant, SD-common	Light intensity survey, nice habitat
	GC-4 Fort Walla Walla	9/11	50	No salmonids found. SCP, RSS-common	Light intensity survey

Relative abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001. (Cont.)

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Garrison Creek (Cont.)	GC-5 Lyon's Park	9/11	50	One 270mm RBT found. SCP, RSS-common, SD-rare	Light intensity survey, stream full of irises
	GC-7 Culvert to mouth	9/11	100	No salmonids found. SCP-uncommon, RSS, SD-abundant	Light intensity survey
Bryant Ck	BC-1 Jefferson Park	9/13	50	No salmonids found. SCP-common, SD-uncommon SMB-rare	Light intensity survey, heavy sedimentation, dense grass riparian.
Mill Creek	MC-5a 1.0 mi below Wickersham Brg.	8/2	30	46 0+ RBT's (30-88 mm), 15 1+ RBT's (105-187 mm), three adult RBT's (227-355 mm) 25 0+ WCH's (76-98 mm), one 1+ BT (160 mm) found. SCP-abundant, SD-common, LND-uncommon	High intensity survey, lost bottom net after pass 1
	MC-5b 1.0 mi below Wickersham Brg.	8/2	30	21 0+ RBT's (51-95 mm), 16 1+ RBT's (104-180 mm), Two adult RBT's (210-215 mm), 11 0+ WCH's (62-90 mm) found. SCP, LND-abundant, SD-common, RSS-rare	High intensity survey, lost bottom net after pass 1
	MC-9 Below 5mi Rd.	7/30	30	12 0+ RBT's (40-75 mm), 50 1+ RBT's (120-194 mm), eight adult RBT's (200-240 mm), three 0+ WCH's (89-95 mm) found. SD, SCP, RSS, BLS-abundant, LND-rare	High intensity survey, lost bottom net after pass 2
	MC-10 Below Bennington	10/10	32	Seven 0+ RBT's (66-96 mm), eight 1+ RBT's (122-193 mm), four adult RBT's (203-370 mm) one 0+ WCH (97 mm) found. BLS, RSS-abundant, SCP, SD-common, LPY-rare	High intensity survey First two weirs below Dam
	MC-14 Below Cold Return	08/15		One 1+ RBT (177mm), and four adult RBT's (228-343mm) found.	Moderate intensity survey. took temperatures where fish were found.
	MC-15 Above Diversion	08/15		Four 1+ RBT's (152-203mm) found.	Moderate intensity survey. took temperatures where fish were found.

Relative abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001. (Cont.)

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Mill Creek (Cont.)	MC-15 Above Diversion	10/10	54	Four 1+ RBT's (162-195 mm), four adult RBT's (209-267 mm) found. SCP, SD, RSS, BLS-abundant, LPY-rare	High intensity survey. First 2 weirs above Yellowhawk diversion
	MC-16 Below Diversion	08/15		Two 1+ RBT's (165-190mm), and six adult RBT's (203-330mm) found.	Moderate intensity survey. took temperatures where fish were found.
	MC-16 Below Diversion	10/10	54	One 1+ RBT (154 mm), three adult RBT's (258-301 mm) found. SCP, SD, RSS, BLS-abundant	Moderate intensity survey. 3rd and 4th weirs below the Yellowhawk diversion
	MC-18 Titus Ck to Below Tausick Way Brg.	7/3	50	One 0+ RBT, 14 adult RBT's found.	High intensity survey, captured fish were moved above the Yellowhawk diversion.
	MC-18 Titus Ck to Below Tausick Way Brg.	08/15		Two 1+ RBT's (165-190mm), and one adult RBT (279mm) found.	Moderate intensity survey. took temperatures where fish were found.
	MC-18 Titus Ck to Below Tausick Way Brg.	08/15		Three 1+ RBT's (152mm-172mm) found.	Moderate intensity survey. took temperatures where fish were found.
	MC-19 Tausick Way Brg.	08/15		No salmonids found.	Moderate intensity survey, took temperatures where fish were found.
	MC-19 Tausick Way Brg.	10/10	54	No salmonids found. SD, RSS, BLS-abundant, SCP-common	Low intensity survey. First two weirs above Tausick Way Brg.
	MC-20 Below Wilbur St.	7/3	50	No salmonids found. RSS, BLS-rare, SD-abundant	High intensity survey, fish salvage due to low flows
	MC-23 Wildwood Park to Clinton St.	7/5		Four 0+ RBT's (40-90 mm), two adult RBT's (206-256 mm) found. SD-uncommon, SCP, RSS, BLS-rare	High intensity survey.

Relative abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001. (Cont.)

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Mill Creek (Cont.)	MC-23 Wildwood Park to Clinton St.	10/10		One 0+ RBT (120 mm), two 1+ RBT's (126-131 mm) found. SD, RSS-common, BLS-rare	Moderate intensity survey, low flow.
	MC-25 9th Ave.	7/5	100	One 0+ RBT (76 mm), one 1+ RBT (195 mm), one adult RBT (211 mm) found. LPY-uncommon, bullfrogs-abundant	Moderate intensity survey. From under brg. upstream
	MC-25 9th Ave.	8/21		Three 0+ RBT's (99-105 mm), three 1+ RBT's (130-132 mm), nine adult RBT's (200-270 mm) found. SCP, SD, RSS, BLS, NPM-abundant	High intensity survey.
	MC-25 9th Ave.	8/21		One 1+ RBT (182 mm) found with open sores (lesions.) SCP, NPM, RSS, BLS, SD-abundant, 1 NPM with lessions.	Low intensity survey, shocked mainly pools. 1st weir above RR brg. upstream to below 9th Ave. (5 weirs total).
	MC-25 9th Ave.	10/10	100	Five 1+ RBT's (135-178 mm), five adult RBT's (212-278 mm) found. BLS-uncommon, SCP, LPY-rare	High intensity survey.
	MC-26 Above Gose	7/26		Eight 0+ RBT's (89-103 mm), one adult RBT (265 mm) found. SD-abundant, BLS, NPM, RSS-common, SCP-uncommon	Moderate intensity survey shocked in pool in last concrete section under bridge
	MC-26 Above Gose	8/21	>100	No salmonids found. SCP, dace-abundant, NPM-common, RSS and BLS-uncommon 2 NPM and 1 sucker with lesions.	Moderate intensity survey, mostly pools in survey area. Started 5 weirs above Gose St.to the treatment plant (9 weirs total).
Blue Creek	BLC-1 RM 7.4	8/16		15 1+ RBT's (101-191 mm) found. SCP-rare	High intensity survey.
	BLC-4 End of Rd.	8/16		Two 0+ RBT's (55 and 58 mm), twelve 1+ RBT's (104-193 mm), and two adult RBT's (200 and 205 mm). SCP and SD-rare, crayfish-present	Moderate intensity survey, looked mainly in pools.

Relative Abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001. (Cont.)

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Blue Creek (Cont.)	BLC-5 RM 1.8	8/16	38.4	One 0+ RBT (64 mm) found. SCP and SD-abundant	High intensity survey, stopped after pass one because of only found one RBT
	BLC-6 Below Klicker Mt. Rd.	8/16	95.2	One 0+ RBT (65 mm), six 1+ RBT's (125-197 mm), and three adult RBT's (205-218mm) found. BLS-uncommon	Moderate intensity survey.
	BLC-7 Below Klicker Mt. Rd.	8/16	33	Fourteen 0+ RBT's (50-65 mm) and three 1+ RBT's (102-138mm) found. SCP, RSS, SD-rare, and BLS-uncommon	Moderate intensity survey.
	BLC-9 Below Mill Ck. Rd.	8/16	61.7	Two 0+ RBT's (49 and 75 mm) and four 1+ RBT's (111-134mm) found. SCP and SD-abundant	Light intensity survey, shocked mainly in pools
Titus Creek	TC-1 Below 7mi Rd.	8/29	50	No fish found.	Light intensity survey, Small pond at headwaters Little to no flow.
	TC-2 0.1 mi above covered Brg.	9/12	35	One 0+ RBT (98 mm), five 1+ RBT's (107-135 mm), one adult RBT (223 mm) found. SD, SCP-abundant, LND, crayfish-uncommon, BLS-rare	Low intensity survey.
	TC-3 Covered Brg.	9/12	20	Two 0+ RBT's (50 and 67 mm), five 1+ RBT's (105-165 mm), Two 0+ WCH (82 and 84 mm) found. SCP, LND, SD-abundant LPY-rare, crayfish-present	Low intensity survey.
	TC-4 Below Covered Brg.	9/12	30	Two 1+ RBT's (106 and 126mm), One adult RBT (205mm), and One 0+ WCH (86 mm). RSS, SD, SCP, BLS-common, LND-uncommon, LPY-rare	Low intensity survey.
Cold Ck	CC-1 Last Chance Rd.	9/13	50	No salmonids found. SCP-common, SD-rare	Light intensity survey, heavy sedimentation and instream vegetation.

Relative Abundance of fish from qualitative electrofishing in the Walla Walla River basin, 2001. (Cont.)

Stream	Site#	Date	Approx Site Length (m)	Relative Abundance*	Comments
Doan Ck	DNC-2 Below irrigation diversion	9/13	100	No salmonids found. SCP, SD-common, RSS-rare	Light intensity survey, little flow, heavy sedimentation.
West Little Walla Walla	WLW-1 0.6 mi up Valley Chapel Rd.	7/19		One 0+ RBT (87mm) found. SCP-common	High intensity survey, SD, RSS, BLS-abundant, heavy sedimentation.
	WLW-2 Below Frog Hollow	7/25	50	No salmonids found. SD, RSS-common	Low intensity survey.
	WLW-3 Above Swegle Rd.	7/25	30	No salmonids found. SD-common, RSS-uncommon	Moderate intensity survey.
Mud Ck	MDC-1 Barney Rd.	7/26	50	No salmonids found. SD, RSS-abundant	Light intensity survey, overhanging grasses, heavy sedimentation.
Pine Ck	PC-2 Sand Pit Rd.	7/26	40	No salmonids found. RSS-common, SMB-uncommon, TM, BG-rare	Light intensity survey, very heavy sedimentation.

* RBT=rainbow, WCH=chinook, BT=bull trour, SCP=sculpin, RSS=redside shinner, SD=speckled dace, BLS=bridgelip sucker, NPM=northern pikeminnow, LPY=lamprey, LSS=largescale sucker, CMO=chiselmouth, SMB=smallmouth bass, LND=longnose dace, TM=tadpole madtom, BG=bluegill
Rare=#3, Uncommon=4-10, Common=11-100, Abundant=$101

Appendix E. Relative Abundance of Non–Salmonids, 2001

Appendix E. Table 1. Relative Abundance of Non-salmonids in the Touchet River Basin 2001.

Species	NF Touchet 8 Lewis Ck	NF Touchet 9 Lewis Ck	Wolf Fork 8 Robinson Fk	Wolf Fork 9 Robinson Fk	Robinson Fork	Burnt Fork	South Fork Touchet	Touchet River	Patit Ck
Petromyzontidae Lamprey	1	1	0	0	1	0	1	1	0
Cyprinidae Speckled dace *Rhinichthys osculus*	3	4	3	3	4	0	4	4	4
Longnose dace *Rhinichthys cataractae*	0	0	0	0	2	0	2	0	0
Chiselmouth *Acrocheilus alutaceus*	0	0	0	0	0	0	0	2	0
Redside shiner *Richardsonius balteatus*	0	0	0	0	1	0	1	3	4
Northern pikeminnow *Ptychocheilus oregonesis*	0	0	0	0	0	0	0	1	3
Catostomidae Suckers[a] *Catostomus spp.*	0	0	0	0	1	0	1	2	3
Gasterosteidae Threespine stickleback *Gasterosteus aculeatus*	0	0	0	0	0	0	0	0	0
Cottidae Sculpin[a] *Cottus spp.*	3	4	3	3	3	3	3	4	0
Tailed Frogs *Ascaphus truei*	3	0	2	0	0	3	0	0	0
Crayfish *Pacifastacus spp.*	0	0	0	0	0	0	0	0	0

[a]. Noted by genus only, not identified by species.
[b]. Relative abundance derive from qualitative electrofishing.

Appendix E. Table 2.	Relative Abundance of Non-salmonids in the Walla Walla River Basin 2001.																
Species	Walla Walla River	Yellowhawk Creek	Russell Creek	Reeser Creek	Cottonwood Creek	East Little Walla Walla	Stone Creek	Garrison Creek	Bryant Creek	Mill Creek	Blue Creek	Titus Creek	Cold Creek	Doan Creek	West Little Walla Walla	Mud Creek	Pine Creek
Petromyzontide Lamprey	1	1	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0
Cyprinidae Speckled dace *Rhinichtys osculus*	4	3	2	0	3	3	1	3	2	4	3	4	1	3	3	4	0
Longnose dace Rhinichtys cataractae	0	1	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0
Chiselmouth *Acroheilus alutaceus*	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Redside shiner *Richardsonius balteatus*	4	3	2	0	0	0	0	3	0	4	1	2	0	1	3	0	3
Northern pikeminnow *Ptychocheilus oregonesis*	3	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Carp *Cyprinus carpio*	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ictaluridae Tadpole Madtom *Notorus gyrinus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Catostomidae Suckers[a] *Catostomus sp.*	3	1	1	0	2	0	0	0	0	4	1	2	0	0	2	0	0
Gasterosteidae Threespine stickleback *Gasterosteus aculeatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Centrarchidae Smallmouth Bass *Micropterus dolomieu*	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
Bluegill *Lepomis macro*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cottidae Sculpin *Cottus sp.*	4	4	2	0	2	4	3	3	1	4	3	4	3	3	2	0	0
Crayfish *Pacifastacus Spp.*	P	P	0	0	0	0	0	0	0	P	P	P	0	0	0	0	0

Table 2. Categories of relative abundance.

Category	Count	Ranking Value
Absent	0	0
Rare	1-3	1
Uncommon	4-10	2
Common	11-100	3
Abundant	100+	4

P = present,
[a]. Nnoted by genus only, not identified by species.
[b]. Relative abundance derive from qualitative electrofishing.

Appendix F. Manual Flow Summary for the Walla Walla River, 1998-2001

Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through September, 1998-2001, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above Hwy. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Stateline[a]								
July							17 24 31	14.59 8.5 9.68
Average Monthly CFS (Standard Deviation)								10.92 (2.637)
August							7 20	13.91 13.88
Average Monthly CFS (Standard Deviation)								13.90 (0.015)
September							4 17	12.79 12.93
Average Monthly CFS (Standard Deviation)								12.86 (0.070)
October							2 8 16 23 31	23.35 18.91 36.88 55.16 73.02
Average Monthly CFS (Standard Deviation)								41.46 (20.205)
Pepper Rd.								
June			14 30	78.5 9.9	20 29	79.3 5.5	12 21 26	27.13 11.98 17.60
Average Monthly CFS (Standard Deviation)				44.2 (34.300)		42.4 (36.900)		18.9 (6.253)
July	27	3.16	13 28	5.1 2.3	11 20	3.6 4.0	5 11 17 24 31	13.65 14.45 14.16 9.19 9.66
Average Monthly CFS (Standard Deviation)		N/A[b]		3.7 (1.400)		3.8 (0.200)		12.22 (2.303)

[a] No data was collected in June at these sites.
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.

Table 1. (Cont.) Manual flow summary (average monthly cfs and standard deviation) from June through September, 1998-2001, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above Hwy. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Pepper Rd. (Cont.)								
August	3 17	3.42 3.09	10	3.1	7	4.1	7 20	12.51 14.79
Average Monthly CFS (Standard Deviation)		3.26 (0.165)		N/A[b]		N/A[b]		13.65 (1.140)
September	1 16	2.79 3.32	15 28	2.7 2.7	18 18 26 26	4.3 4.7 5.3 5.7	4 17	11.13 12.87
Average Monthly CFS (Standard Deviation)		3.06 (0.265)		2.7 (0.000)		5.00 (0.539)		12.00 (0.870)
October	16 28	2.86 3.22	5 13	2.6 2.7	4 19	81.0 23.7	2 16 23 31	26.00 39.08 65.61 81.84
Average Monthly CFS (Standard Deviation)		3.04 (0.180)		2.65 (0.050)		52.35 (28.650)		53.13 (21.872)
0.4 mi above hwy. 125								
June							12 26	29.58 16.28
Average Monthly CFS (Standard Deviation)								22.93 (6.650)
July							5 11 17 24 31	13.74 14.62 13.35 7.86 9.82
Average Monthly CFS (Standard Deviation)								11.88 (2.590)
August							7 20	13.34 12.92
Average Monthly CFS (Standard Deviation)								13.13 (0.210)
September							4 17	11.29 13.15
Average Monthly CFS (Standard Deviation)								12.22 (0.930)

[a] No data was collected in June at these sites.
[b] N/A- only one measurement was taken during the month, no average or standard deviation was calculated.

Table 1. (Cont.) Manual flow summary (average monthly cfs and standard deviation) from June through September, 1998-2001, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above Hwy. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS
0.4 mi above hwy. 125 (Cont.)								
October							2 8 16 23 31	22.06 19.42 37.47 60.90 70.22
Average Monthly CFS (Standard Deviation)								42.01 (20.404)
Mojonnier Rd.								
June			1 9 30	296.0 83.7 5.9	20 29	104.6 10.5	12 26	32.69 31.22
Average Monthly CFS (Standard Deviation)				128.53 (122.602)		57.55 (47.050)		31.96 (0.735
July	9 20	29.48 36.05	13 28	15.5 25.7	11 20	16.4 42.2	5 10 11 17 24 31	24.26 43.28 49.88 45.24 33.42 42.65
Average Monthly CFS (Standard Deviation)		32.77 (3.285)		20.60 (5.100)		29.30 (12.900)		39.79 (8.501)
August	3 17	25.77 25.14	10 23	22.6 25.0	7 21	29.9 32.2	7 20	46.42 51.26
Average Monthly CFS (Standard Deviation)		25.46 (0.315)		23.80 (1.200)		31.05 (1.150)		48.84 (2.420)
September	1 16	28.30 35.01	15 28	21.7 26.1	5 18	49.0 47.7	4 17	45.48 37.08
Average Monthly CFS (Standard Deviation)		31.655 (3.355)		23.90 (2.200)		48.35 (0.650)		41.28 (4.200)
October	16 28	1.83 13.72	5 13 18	31.4 15.1 8.4	4 19	93.4 16.5	2 8 16 23 31	40.86 25.97 18.58 55.64 68.74
Average Monthly CFS (Standard Deviation)		7.78 (5.945)		18.30 (9.659)		54.95 (38.450)		41.96 (18.481)

[a] No data was collected in June at these sites.
[b] N/A- only one measurement was taken during the month, no average or standard deviation was calculated.

Table 1. (Cont.) Manual flow summary (average monthly cfs and standard deviation) from June through September, 1998-2001, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above Hwy. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Swegel Rd.								
June			1 9 30	287.6 85.6 7.0	26	42.9	11 27	27.95 26.64
Average Monthly CFS (Standard Deviation)				126.73 (118.189)		N/A[b]		27.30 (0.655)
July	2 9 20	3.43 31.65 35.52	13 28	17.5 23.7	11	22.2	10 24 31	43.74 33.21 45.93
Average Monthly CFS (Standard Deviation)		23.53 (14.303)		20.60 (3.100)		N/A[b]		40.96 (5.553)
August	3 17	27.22 21.66	10 23	23.6 24.9	7 21	29.1 36.7	6 20	40.58 42.52
Average Monthly CFS (Standard Deviation)		24.44 (2.780)		24.25 (0.650)		32.90 (3.800)		41.55 (0.970)
September	1 16	25.55 37.28	15 28	26.6 31.3	5 18	54.8 56.3	4 17	42.95 45.80
Average Monthly CFS (Standard Deviation)		31.42 (5.865)		28.95 (2.350)		55.55 (0.750)		44.38 (1.425)
October	16 26	8.32 20.43	13	20.4	4 19	97.1 23.7	1 16 31	49.81 28.41 47.96
Average Monthly CFS (Standard Deviation)		14.38 (6.055)		N/A[b]		60.40 (36.700)		42.06 (9.682)
Detour Rd.								
June			1 9 30	403.4 121.9 15.9	20 29	171.7 22.7	11 27	34.10 46.95
Average Monthly CFS (Standard Deviation)				180.40 (163.515)		97.20 (74.500)		40.53 (6.425)
July			13 28	19.2 26.8	10 20	25.6 38.5	10 24 31	57.32 38.75 52.82
Average Monthly CFS (Standard Deviation)				23.00 (3.800)		32.05 (6.450)		49.63 (7.910)

[a] No data was collected in June at these sites.
[b] N/A- only one measurement was taken during the month, no average or standard deviation was calculated.

Table 1. (Cont.) Manual flow summary (average monthly cfs and standard deviation) from June through September, 1998-2001, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above Hwy. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Detour Rd. (Cont.)								
August			10 24	30.6 32.6	7 21	29.3 38.1	6 20	43.55 41.11
Average Monthly CFS (Standard Deviation)				31.6 (1.000)		33.70 (4.400)		42.33 (1.220)
September			15 28	29.0 35.4	5 18	55.0 59.9	4 17	44.29 44.25
Average Monthly CFS (Standard Deviation)				32.20 (3.200)		57.45 (2.450)		44.27 (0.020)
October			13	31.8	4 19	128.2 41.7	1 8 16 23 31	54.34 35.71 35.43 69.66 69.10
Average Monthly CFS (Standard Deviation)				N/A[b]		84.95 (43.250)		52.85 (15.140)
McDonald Rd.								
June					26	36.6	11 27	18.62 27.61
Average Monthly CFS (Standard Deviation)						N/A[b]		23.12 (4.495)
July	9 20	4.09 4.92	13	6.73	10	5.9	10 23	17.50 21.83
Average Monthly CFS (Standard Deviation)		4.51 (0.415)		N/A[b]		N/A[b]		19.67 (2.165)
August	3 17	0.00 7.96	10 23	9.1 11.4	7 21	11.0 17.8	6 20	23.71 16.23
Average Monthly CFS (Standard Deviation)		3.98 (3.98)		10.25 (1.150)		14.40 (3.400)		19.97 (3.740)
September	1 17	9.97 17.31	15 28	12.1 14.5	5 18	34.3 41.0	4 17	17.73 21.26
Average Monthly CFS (Standard Deviation)		13.64 (3.670)		13.3 (1.200)		37.65 (3.350)		19.50 (1.765)

[a] No data was collected in June at these sites.
[b] N/A- only one measurement was taken during the month, no average or standard deviation was calculated.

Table 1. (Cont.) Manual flow summary (average monthly cfs and standard deviation) from June through September, 1998-2001, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above Hwy. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS
McDonald Rd. (Cont.)								
October			13	15.8	4	112.2	1	38.2
					19	27.3	16	26.68
							31	54.9
Average Monthly CFS (Standard Deviation)				N/A[b]		69.75 (42.450)		39.93 (11.585)
McKay Rd.[a]								
July	27	3.80						
Average Monthly CFS (Standard Deviation)		N/A						
August	17	0.00						
Average Monthly CFS (Standard Deviation)		N/A[b]						
September	1	2.42						
	28	15.21						
Average Monthly CFS (Standard Deviation)		8.82 (6.395)						
October	16	0.76						
	28	7.63						
Average Monthly CFS (Standard Deviation)		4.20 (3.435)						

[a] No data was collected in June at these sites.
[b] N/A- only one measurement was taken during the month, no average or standard deviation was calculated.

Appendix G. Touchet River Trap Data, 2001

Appendix G. Table 1. Touchet River trap data for spring chinook (collected by personnel from the Snake River Lab), 2001.									
Date	Origin	Sex	Length (cm)	Marks AD,LV,TC	DNA #	Scale #	Passed, Kept, Mort	Recap	Comments
05/09	W				SCH1	CH1-1	Passed	No	
05/11	W				SCH2	CH1-2	Passed	No	
05/11	W				SCH3	CH1-3	Passed	No	
05/12	W				SCH4	CH1-4	Passed	No	
05/12	W				SCH5	CH1-5	Passed	No	
05/12	W				SCH6	CH1-6	Passed	No	
05/12	W				SCH7	CH2-1	Passed	No	
05/12	W				SCH8	CH2-2	Passed	No	
05/12	H			AD	SCH9	CH2-3	Kept	No	Sacrificed, for coded wire tag
05/13	W						Passed	No	
05/13	W						Passed	No	
05/13	W						Passed	No	
05/13	W						Passed	No	
05/14	W	F			SCH10	CH2-4	Passed	No	
05/14	W	M			SCH11	CH2-5	Passed	No	
05/14	W	M			SCH12	CH2-6	Passed	No	
05/14	W	F			SCH13	CH3-1	Passed	No	
05/15	H	J		AD			Kept		Sacrificed, for coded wire tag
05/15	W	F				CH3-2	Passed	No	
05/15	W	M			SCH14	CH3-3	Passed	No	
05/16	W	M			SCH15	CH3-4	Passed	No	
05/22	W	F			SCH16	CH3-5	Passed	No	

Appendix G. Table 1. (Cont.) Touchet River trap data for spring chinook (collected by personnel from the Snake River Lab), 2001.									
Date	Origin	Sex	Length (cm)	Marks AD,LV,TC	DNA #	Scale #	Passed, Kept, Mort	Recap	Comments
05/24	W	F				CH3-6	Passed	No	
05/24	W	F					Passed	Yes	
05/25	W	M			SCH18	CH4-1	Passed	No	
05/30	H	M		AD			Kept	No	Sacrificed, for coded wire tag
05/30	W						Passed	Yes	
06/01	W	M			SCH19	CH4-2	Passed	No	
06/01	H	M		AD			Kept	No	Sacrificed, for coded wire tag
06/01	H	M		AD			Kept	No	Sacrificed, for coded wire tag
06/02	W	F	74				Passed	Yes	
06/03	W	M	71				Passed	Yes	
06/04	H			AD			Kept	No	Sacrificed, for coded wire tag
06/07	H	M	64	AD			Kept	No	Sacrificed, for coded wire tag
06/10	W	F	71		SCH20	CH4-3	Passed	No	

Appendix G. Table 2. Touchet River trap data for bull trout (collected by personnel from the Snake River Lab), 2001.											
Date	Origin	Sex	Length (cm)	Weight (g)	DNA #	Scale #	Age	Pit Tag #	Fish # or Radio Tag	Passed, Kept, Mort	Recap
04/01	W		36.0							Passed	No
04/06	W		31.0							Passed	No
04/15	W									Passed	No
04/17	W		41.0							Passed	No
04/17	W		29.0							Passed	No
04/17	W		34.0							Passed	No
04/18	W		34.0							Passed	No
04/18	W		44.0							Passed	No
04/20	W		31.0	250.0						Passed	No
04/20	W		31.0	250.0						Passed	No
04/20	W		33.0	360.0						Passed	No
04/25	W		28.0	238.6						Passed	No
04/25	W		30.0	302.0						Passed	No
04/25	W		33.5	436.0						Passed	No
04/26	W		28.5	208.2						Passed	No
04/27	W	F	50.0	1250.0	BT01FM-1				0/93	Passed	No
04/27	W	M	50.0	1540.0	BT01FM-2				0/105	Passed	No
05/02	W	F	47.0	1060.0	BT01FM-3			1BF11B9CAC	0/91	Passed	No
05/02	W	M	47.0	1290.0	BT01FM-4			1BF11E94B4	0/97	Passed	No
05/02	W	M	33	340.0				1BF0F5F7FB		Passed	No
05/08	W		42.5			BT2-1	4	1BF0ED5E5F		Passed	No

Appendix G. Table 2. (Cont.) Touchet River trap data for bull trout (collected by personnel from the Snake River Lab), 2001.											
Date	Origin	Sex	Length (cm)	Weight (g)	DNA #	Scale #	Age	Pit Tag #	Fish # or Radio Tag	Passed, Kept, Mort	Recap
05/10	W		41.0	700.0	BT01FM-5			1BF11EC702		Passed	No
05/12	W	M	45	880.0				1BF11B9E12	0/100	Passed	No
05/14	W		35.5	390.0				1BF0EDD0F2		Passed	No
05/14	W		36.0	515.0				1BF0EDB5BB		Passed	No
05/14	W		32.5	360.0				1BF1107490		Passed	No
05/14	W	M	59.0		BT01FM-6			1BF11B89CA	0/102	Passed	No
05/14	W		33.0	345.0				1BF11135F6		Passed	No
05/15	W		27.0							Passed	No
05/23	W	M	44.0	930.0	BT01FM-7			1BF0EDBD4C	0/106	Passed	No
05/23	W		27.0					1BF11BF98E		Passed	No
05/24	W		30.0					1BF0ED5003		Passed	No
05/24	W		34.0					1BF0E99D83		Passed	No
05/25	W		30.5					1BF0F8CA8D		Passed	No
05/29	W		33.0					1BF0EC5D70		Passed	No
05/29	W		35.5					1BF0EDCE80		Passed	No
05/29	W		33.0					1BF0ED02B2		Passed	No
05/29	W		31.5					1BF0ED6885		Passed	No
05/29	W		28.5					1BF0EDA19D		Passed	No
05/29	W		29.5					1BF0EDD5A7		Passed	No
05/30	W		33.0					1BF0E7E271		Passed	No
06/11	W		33.5					1BF0EDB198		Passed	No
06/18	W		33.0					1BF0EDA754		Passed	No

Appendix G. Table 3. Touchet River trap data for brown trout (collected by personnel from the Snake River Lab), 2001.

Date	Origin	Sex	Length (cm)	Scale #	Age	Passed, Kept, Mort	Recap
04/01	H		37.0			Passed	No
04/26	H		28.5			Passed	No
04/27	H		48.0			Passed	No
05/10	H		34.5	BRT1-1	4	Passed	No
05/30	H	F	53.0	BRT1-2	R	Passed	No
06/04	H		45.0	BRT1-3	R	Passed	No
06/07	H	F	58.0	BRT1-5	R	Passed	No
06/07	H		47.0	BRT1-4	2	Passed	No
06/08	H		47.0	BRT1-6	R	Passed	No
06/08	H		45.0			Passed	No
06/08	H		45.0			Passed	No
06/18	H		27.5	BRT2-1	R	Passed	No
06/19	H		29.5	BRT2-3	2	Passed	No
06/19	H		36.0	BRT2-2	R	Passed	No

Appendix G. Table 4. Touchet River trap data for mountain whitefish (collected by personnel from the Snake River Lab), 2001.						
Date	Origin	Length (cm)	DNA #	Scale #	Passed, Kept, Mort	Recap
05/12	W	30.0	00AV37		Passed	No
05/25	W	28.0	00AV45	WF1-2	Passed	No
05/25	W	30.5	00AV42	WF1-1	Mort	No
06/08	W	30.5		WF1-3	Passed	No