

Appendix A: Glossary of Acronyms

ABNP	Alaskan Basic Neuroscience Program	BASC	Barrow Arctic Science Consortium
ACAP	Arctic Council Action Plan to Eliminate Pollution in the Arctic	BLM	Bureau of Land Management
ACIA	Arctic Climate Impact Assessment	BRD	Biological Resources Division (USGS)
ACMAP	Atmospheric Chemistry Modeling and Analysis Program	CAFF	Conservation of Arctic Flora and Fauna
ACSYS	Arctic Climate System Study	CAREER	Faculty Early Career Development program (NSF)
ADCC	ARCSS Data Coordination Center	CDC	Centers for Disease Control and Prevention
ADEOS	Advanced Earth Observation System	CFC	Chloroflouorocarbon
ADRO	Applications Development Research Opportunity	CIRES	Cooperative Institute for Research in Environmental Sciences
AEDD	Arctic Environmental Data Directory	CISSET	Committee on International Science Engineering and Technology
AEPS	Arctic Environmental Protection Strategy	CLIC	Climate and Cryosphere program
AFB	Air Force Base	CLIVAR	Climate Variability and Predictability program
AFSC	Alaska Fisheries Science Center	CMDL	Climate Monitoring and Diagnostic Laboratory (NOAA)
AGES	Age, Gene/Environment Susceptibility study	COGA	Collaborative Study of the Genetics of Alcoholism
AHDRN	Arctic Health Disparities Research Dissemination Network	CRREL	Cold Regions Research and Engineering Laboratory
AICC	Arctic Icebreaker Coordination Committee	CRSTIAC	Cold Regions Science and Technology Information Analysis Center
AIP	Arctic Investigations Program	CT	Computerized tomography
AMAP	Arctic Monitoring and Assessment Program	DA	Department of Agriculture
AMEC	Arctic Military Environmental Cooperation	DAAC	Distributed Active Archive Center
AMMTAP	Alaska Marine Mammal Tissue Archival Project	DHHS	Department of Health and Human Services
AMSR	Advanced microwave radiometer sensor	DHS	Department of Homeland Security
ANTR	Alaska Native Tumor Registry	DMSP	Defense Meteorological Satellite Program
AO	Arctic Oscillation	DOC	Department of Commerce
ARC	Arctic Research Commission	DOD	Department of Defense
ARCSS	Arctic System Science	DOE	Department of Energy
ARCUS	Arctic Research Consortium of the United States	DOI	Department of the Interior
ARM	Atmospheric Radiation Measurement program (DOE)	DOS	Department of State
ARPA	Arctic Research and Policy Act	DOT	Department of Transportation
ASOF	Arctic/Sub-Arctic Ocean fluxes	EDF	Environmental Diplomacy Funds
ASF	Alaska SAR Facility	EO	Environmental Observatory
ATSDR	Agency for Toxic Substances and Disease Registry	EOS	Earth Observing System
AUV	Autonomous underwater vehicles	EOSDIS	Earth Observation System Data and Information System
AVHRR	Advanced very-high-resolution radiometer	EPA	Environmental Protection Agency
AWS	Automatic weather station	EPPR	Emergency Prevention, Preparedness and Response
		ERS	European Remote-sensing Satellite

EWG	Environmental Working Group	IUCH	International Union for Circumpolar Health
FAA	Federal Aviation Administration	IWG	Interagency Working Group
FERF	Frost Effects Research Facility	JCCEM	Joint Coordinating Committee for Environmental Management
FOCI	Fisheries–Oceanography Cooperative Investigations	LANL	Los Alamos National Laboratory
FSU	Former Soviet Union	LTER	Long-Term Ecological Research
FUDS	Formerly used defense sites	MAB	Man and the Biosphere
FWS	Fish and Wildlife Service	MMS	Minerals Management Service
FY	Fiscal year	MOA	Memorandum of agreement
GCM	General circulation model	MODIS	Moderate Resolution Imaging Spectroradiometer
GC-Net	Greenland Climate Network	MRI	Magnetic resonance imaging
GEF	Global Environment Facility	NAGPRA	Native American Graves Protection Act
GIS	Geographic information system	NASA	National Aeronautics and Space Administration
GISS	Goddard Institute for Space Studies	NATO	North Atlantic Treaty Organization
GLAS	Geoscience laser altimeter system	NAVICE	Naval Ice Center
GLIMS	Global Land Ice Measurements from Space	NCCOS	National Centers for Coastal Ocean Science
GOCADAN	Genetics of Coronary Artery Disease in Alaska Natives study	NCDC	National Climate Data Center
GODAR	Global Oceanographic Data Archaeology and Rescue Project	NCEH	National Center for Environmental Health
GPS	Global positioning system	NCI	National Cancer Institute
HAARP	High Frequency Active Auroral Research Program	NCID	National Center for Infectious Diseases
HARC	Human Dimensions of the Arctic System (NSF)	NDSC	Network for Detection of Stratospheric Change
HBV	Hepatitis B virus	NEI	National Eye Institute
HCH	Hexachlorocyclohexane	NEP	Needle exchange program
HCV	Hepatitis C virus	NESDD	NOAA's Environmental Services Data Directory
HDGC	Human Dimensions of Global Change program	NESDIS	National Environmental Satellite Data and Information Service
HF	High frequency	NEWNET	Neighborhood Environmental Watch Network
HIRS	High-resolution infrared radiation sounder	NGDC	National Geophysical Data Center
HIV	Human immunodeficiency virus	NGO	Non-governmental organization
HRSA	Health Resources Services Administration	NIA	National Institute on Aging
HVS	Heavy vehicle simulator	NIAAA	National Institute on Alcohol Abuse and Alcoholism
IARPC	Interagency Arctic Research Policy Committee	NIC	National Ice Center
IASC	International Arctic Science Committee	NIDA	National Institute on Drug Abuse
IASSA	International Arctic Social Sciences Association	NIH	National Institutes of Health
ICS	International Circumpolar Surveillance	NIOSH	National Institute for Occupational Safety and Health
IOC	Intergovernmental Oceanographic Commission	NISC	National Information Services Corporation
IPA	Intergovernmental Personnel Act	NISE	Near Real Time Ice and Snow in EASE grid
IPCC	Intergovernmental Panel on Climate Change	NIST	National Institute of Standards and Technology
IPMC	Interagency Program Management Committee		

NLM	National Library of Medicine	SDWG	Sustainable Development Working Group
NMFS	National Marine Fisheries Service		
NOAA	National Oceanic and Atmospheric Administration	SEARCH	Study of Environmental Arctic Change
NODC	National Oceanographic Data Center	SEER	Surveillance, Epidemiology, and End Results program (NCI)
NPR–A	National Petroleum Reserve–Alaska	SGER	Small Grants for Exploratory Research (NSF)
NPS	National Park Service	SHEBA	Surface Heat Budget of the Arctic Ocean program
NSF	National Science Foundation	SI	Smithsonian Institution
NSIDC	National Snow and Ice Data Center	SIDS	Sudden infant death syndrome
NSR	Northern Sea Route	SMMR	Scanning multichannel microwave radiometer
NTS	Nevada Test Site	SPAWAR	Space and Naval Warfare Systems Command
NTSB	National Transportation Safety Board	SSC	Science steering committee
NURP	National Undersea Research Program (NOAA)	SSM/I	Special sensor microwave/imager
NWR	National Wildlife Refuge	SUSV	Small unit support vehicle
NWS	National Weather Service (NOAA)	TEA	Teachers Experiencing the Arctic program (NSF)
OAS	Office of Aircraft Services	THC	Thermohaline circulation
OLS	Operational linescan system	TIAC	Technical Information Analysis Center
OMAO	Office of Marine and Aviation Operations (NOAA)	UAA	University of Alaska Anchorage
OMB	Office of Management and Budget	UAF	University of Alaska Fairbanks
ONR	Office of Naval Research	UNEP	United Nations Environmental Program
OPP	Office of Polar Programs (NSF)	UNOLS	University National Oceanographic Laboratory System
OSRI	Oil Spill Recovery Institute	USACE	United States Army Corps of Engineers
PAME	Protection of the Arctic Marine Environment	USCG	United States Coast Guard
PARCA	Program for Arctic Regional Climate Assessment	USDA	United States Department of Agriculture
PCB	Polychlorinated biphenyls	USFS	United States Forest Service
PDO	Pacific Decadal Oscillation	USGCRP	United States Global Change Research Program
PMEL	Pacific Marine Environmental Laboratory (NOAA)	USGS	United States Geological Survey
POLES	Polar Exchange at the Sea Surface	USIABP	United States Interagency Arctic Buoy Program
POP	Persistent organic pollutants	UV	Ultraviolet
PROBES	Processes and Resources of the Bering Sea Shelf	VPR	VECO Polar Resources
RAIPON	Russian Indigenous Peoples of the North	WC&P	West Coast and Polar Center (NOAA)
RAPS	Resource Apprenticeship Program (DOI)	WCRP	World Climate Research Program
REU	Research Experience for Undergraduates program	WDC	World Data Center
RGI	Regional Geographic Initiative (EPA)	WHO	World Health Organization
RGPS	Radarsat Geophysical Processor System		
ROV	Remotely operated vehicle		
SAR	Synthetic aperture radar		
SBI	Western Arctic Shelf Basin Interaction program (NSF)		

Appendix B: Ninth Biennial Report of the Interagency Arctic Research Policy Committee to the Congress

February 1, 2000, to January 31, 2002

Background

Section 108(b) of Public Law 98-373, as amended by Public Law 101-609, the Arctic Research and Policy Act, directs the Interagency Arctic Research Policy Committee (IARPC) to submit to Congress, through the President, a biennial report containing a statement of the activities and accomplishments of the IARPC. The IARPC was authorized by the Act and was established by Executive Order 12501, dated January 28, 1985.

Section 108(b)(2) of Public Law 98-373, as amended by Public Law 101-609 directs the IARPC to submit to Congress, through the President, as part of its biennial report, a statement “detailing with particularity the recommendations of the Arctic Research Commission with respect to Federal interagency activities in Arctic research and the disposition and responses to those recommendations.” In response to this requirement, the IARPC has examined all recommendations of the Arctic Research Commission since January 2000.

Activities and Accomplishments

During the period February 1, 2000, to January 31, 2002, the IARPC has:

- Prepared and published the sixth biennial revision to the United States Arctic Research Plan, as required by Section 108(a)(4) of the Act.
- Published and distributed four issues of the journal *Arctic Research of the United States*. These issues reviewed all Federal agency Arctic research accomplishments for FY 98 and 99 and included summaries of IARPC meetings and activities. The Fall/Winter 2001 issue contained the full text of the sixth biennial

revision of the U.S. Arctic Research Plan.

- Consulted with the Arctic Research Commission on policy and program matters described in Section 108(a)(3), was represented at meetings of the Commission, and responded to Commission reports and recommendations (Appendix A).
- Continued the processes of interagency cooperation required under Section 108(a)(6), (7), (8) and (9).
- Provided input to an integrated budget analysis for Arctic research, which estimated \$241.9 million in Federal support for FY 00 and \$240.4 million in FY 01.
- Arranged for public participation in development of the sixth biennial revision to the U.S. Arctic Research Plan as required in Section 108(a)(10).
- Supported continued U.S. participation in the non-governmental International Arctic Science Committee, via the National Research Council.
- Participated in the continuing National Security Council/U.S. Department of State implementation of U.S. policy for the Arctic. U.S. policy for the Arctic now includes an expanded focus on science and environmental protection and on the valued input of Arctic residents in research and environmental management issues.
- Participated in policy formulation for the Arctic Council. The Council incorporates a set of principles and objectives for the protection of the Arctic environment and for promoting sustainable development. IARPC supports the contributions being made to projects under the Council’s Arctic Monitoring and Assessment Program by a number of Federal agencies.

Prepared by the National Science Foundation for the Interagency Arctic Research Policy Committee.

- Approved coordinated Federal agency research initiatives on 1) the Study of Arctic Environmental Change (SEARCH), 2) Bering Sea Integrated Assessment, and 3) Arctic Health. These initiatives are designed to augment individual agency mission-related programs and expertise and to promote the resolution of key unanswered questions in Arctic research and environmental protection. The initiatives are intended to help guide

internal agency research planning and priority setting. It is expected that funding for the initiatives will be included in agency budget submissions as the objectives and potential value are of high relevance to the mission and responsibilities of IARPC agencies.

- Convened formal meetings of the Committee and its working groups, staff committees, and task forces to accomplish the above.

Appendix C: Arctic Research Budgets of Federal Agencies

		<i>Budget (dollars in thousands)</i>		
<i>Dept/Bureau</i>	<i>Program name</i>	<i>FY 02 actual</i>	<i>FY 03 estimated</i>	<i>FY 04 estimated</i>
DOD	Arctic Engineering	2,750	1,246	1,150
DOD	Permafrost/Frozen Ground	430	500	400
DOD	Snow and Ice Hydrology	1,485	1,877	1,900
DOD	High Latitudes Program	3,030	3,050	2,959
DOD	Lower Atmosphere	100	269	100
DOD	High-Freq Active Auroral Program	10,700	7,600	10,000
DOD	Medical and Human Engineering	898	700	600
	DOD TOTAL	19,393	15,242	17,109
DOI/MMS	Technology Assessment/Research	2,892	3,100	3,000
DOI/MMS	Environmental Studies	4,248	4,176	4,000
DOI/USGS	Energy and Minerals	3,500	3,500	2,000
DOI/USGS	Natural Hazards	3,500	7,500	7,500
DOI/USGS	Global Change	1,000	1,000	1,000
DOI/USGS	Marine and Coastal Geology	250	250	250
DOI/USGS	Geomagnetism	250	250	250
DOI/USGS	Ice and Climate	250	250	250
DOI/USGS	Hydrology	1,270	1,280	1,370
DOI/USGS	Mapping	750	1,540	1,540
DOI/USGS/BRD	Marine Mammals	1,660	1,560	1,660
DOI/USGS/BRD	Migratory Birds	2,390	2,250	2,350
DOI/USGS/BRD	Fisheries Research	360	360	360
DOI/USGS/BRD	Cooperative Research	330	330	330
DOI/USGS/BRD	Terrestrial Ecology	1,130	1,060	1,110
DOI/USGS/BRD	Park Research	1,140	1,070	1,070
DOI/BLM	Natural Ecology	1,698	1,294	1,043
DOI/BLM	Minerals Research (Non-O & G)	2,247	2,063	1,830
DOI/BLM	Minerals Research (O & G, NPR-A)	1,159	1,809	1,393
DOI/BLM	Cultural Resources	205	208	179
DOI/BLM	Pipeline Monitoring	564	130	0
DOI/BLM	Fire Control	223	382	339
DOI/BLM	Mining Administration	350	0	0
DOI/NPS	Cultural Resources	1,400	1,296	1,351
DOI/NPS	Natural Ecology	2,486	2,810	1,950
DOI/NPS	Inventory and Monitoring	0	3,500	5,000
DOI/BIA	Cultural Resources	600	600	600
DOI/BIA	Subsistence Studies	1,250	1,250	1,250

<i>Dept/Bureau</i>	<i>Program name</i>	<i>Budget (dollars in thousands)</i>		
		<i>FY 02 actual</i>	<i>FY 03 estimated</i>	<i>FY 04 estimated</i>
DOI/FWS	Migratory Birds	3,884	3,800	3,800
DOI/FWS	Fisheries	4,068	4,300	4,300
DOI/FWS	Marine Mammals	1,768	2,255	2,231
DOI/FWS	Conservation of Flora and Fauna (CAFF)	200	200	200
DOI/FWS	U.S.–Russia Environmental Agreement	150	350	350
	DOI TOTAL	47,172	55,723	53,856
NSF/OPP	Arctic Natural Science	11,472	12,200	14,152
NSF/OPP	Arctic System Science Program	19,093	20,699	24,011
NSF/OPP	Arctic Social Sciences Program	1,975	2,758	3,199
NSF/OPP	Arctic Research and Education	250	300	300
NSF/OPP	Arctic Research Support	797	823	848
NSF/OPP	Arctic Data/Info/Coordination	248	270	300
NSF/OPP	Arctic Research Commission	1,017	1,080	1,190
NSF/OPP	Arctic Logistics/Instrumentation	27,580	29,166	31,400
NSF/OPP	Sub-total OPP	62,431	67,296	75,400
NSF	Other NSF Science Programs	23,557	24,786	26,302
	NSF TOTAL	85,988	93,082	101,702
NASA	Polar Ice Interactions	4,000	4,500	5,000
NASA	Ecology	535	700	700
NASA	Solid Earth Science	5,000	1,500	2,000
NASA	Arctic Ozone	6,500	7,000	6,500
NASA	Atmospheric Chemistry	0	1,500	1,500
NASA	Clouds and Radiation	750	750	1,200
NASA	Sub-orbital Science	2,500	2,500	2,000
NASA	Iono/Thermo/Mesospheric SR&T	1,500	1,500	1,500
NASA	Magnetospheric SR&T	200	200	200
NASA	Geospace Sciences	2,100	2,100	2,100
NASA	FAST Auroral Snapshot	1,300	1,300	1,300
NASA	Solar Terrestrial Theory	400	400	400
NASA	Arctic Data Systems	12,600	11,000	12,000
NASA	Sounding Rocket Program	1,100	1,100	1,100
	NASA TOTAL	38,485	36,050	37,500
DOC/NOAA	Atmos Trace Constituents	800	300	400
DOC/NOAA	Fisheries Assessment/Management	18,900	18,900	18,900
DOC/NOAA	Marine Mammal Assessment	12,675	6,675	6,675
DOC/NOAA	Ocean Assessment	15	10	10
DOC/NOAA	Stratospheric Ozone	250	200	250
DOC/NOAA	Data Management	357	331	331
DOC/NOAA	Remote Sensing	388	273	345
DOC/NOAA	Aircraft/Vessels	2,053	550	950
DOC/NOAA	Weather Research	0	25	25
DOC/NOAA	Western Arctic/Bering Sea Ecosystem	7,507	2,050	2,100
DOC/NOAA	Barrow Observatory	1,350	650	850
DOC/NOAA	Ocean Exploration	808	250	300
DOC/NOAA	Tsunami Warning/Environ. Observations	250	250	250
DOC/NOAA	Arctic Research Initiative	1,650	2,000	1,650
DOC/NOAA	Ocean Observations/Arctic Fluxes	360	360	360

<i>Dept/Bureau</i>	<i>Program name</i>	<i>Budget (dollars in thousands)</i>		
		<i>FY 02 actual</i>	<i>FY 03 estimated</i>	<i>FY 04 estimated</i>
DOC/NOAA	Arctic Climate Research (SEARCH)	0	2,000	2,000
DOC/NOAA	CIFAR	0	350	0
	DOC/NOAA TOTAL	47,363	35,174	35,396
DOE/SC	Nat Inst Global Env Change	106	200	200
DOE/SC	Atmos Radiation/Planning	3,200	3,200	3,200
DOE/FE	Alaska Fossil Fuels	9,800	8,300	250
DOE/EE	Wind Activities in Alaska	1,900	750	750
DOE/EM	Neighborhood Environmental Watch	50	50	50
DOE/EM	JCCEM/Arctic Transport Studies	750	3,750	0
	DOE TOTAL	15,806	16,250	4,450
DHHS	National Institutes of Health	21,292	32,776	33,775
DHHS	Health Resources Services Administration	500	0	0
DHHS	Centers for Disease Control/Prevent.	4,400	4,400	4,400
	DHHS TOTAL	26,192	37,176	38,175
SMITHSONIAN	Anthropology	400	400	400
SMITHSONIAN	Arctic Biology	50	50	50
	SMITHSONIAN TOTAL	450	450	450
DHS/USCG	Arctic Science/Logistics Support	10,375	5,841	8,186
DHS/USCG	Extramural Science Support	30	30	30
	DHS TOTAL	10,405	5,871	8,216
EPA	Research and Development	200	377	340
EPA	Regional Activities	100	100	100
EPA	International Activities	100	100	100
	EPA TOTAL	400	577	540
USDA/FS	Forest Service–Global Change	729	653	653
USDA/NRCS	Natural Resources Cons Svc–Soil Survey	560	360	260
USDA/ARS	Agricultural Res Service–Global Change	2,000	2,000	2,000
	USDA TOTAL	3,289	3,013	2,913
	GRAND TOTALS	294,994	298,608	300,307

Appendix D: Federal Arctic Research Program Descriptions

Department of Defense

- Arctic Engineering: The study and development of technologies for construction and maintenance of facilities and equipment in Arctic environments.
- Permafrost/Frozen Ground: The study of the formation, structure, characteristics, and dynamics of permafrost and frozen ground.
- Snow and Ice Hydrology: The study of the snowpack and river, lake, and sea ice, their formation, structure, and dynamics.
- Oceanography: The study of Arctic Ocean features and processes including sea ice dynamics.
- Lower Atmosphere: The study of Arctic weather with an emphasis on heat budget.
- Upper Atmosphere: The study of physical processes in the thermosphere, ionosphere, and magnetosphere. Studies also include applied research to investigate, predict, and assess the impacts from the thermosphere, ionosphere, and magnetosphere to communication, navigation, surveillance, and satellite systems.
- High-Frequency Active Auroral Research Program (HAARP): The use of radiowave energy to study basic physical response and composition of the ionosphere and upper atmosphere.
- Medical and Human Engineering: The study of human response to cold climates and methods to mitigate those effects.

Department of the Interior

Minerals Management Service

- Technology Assessment and Research Program: Research to support Minerals Management Service offshore operations. Studies address operational needs for permitting of drilling and production operations, safety and pollution inspections, enforcement action, accident investigations, and well control training requirements.
- Environmental Studies Program: Research to provide information needed for prediction, assessment, and management of impacts from

offshore natural gas and oil and mineral development activities on human, marine, and coastal environments of Alaska.

U.S. Geological Survey

- Energy and Minerals: Research to assess the distribution, quantity, and quality of energy and mineral resources with an increasing emphasis on characterizing the environmental impact of resource occurrence and use. This information assists the Nation in managing its land, formulating environmental policies, and ensuring stable and safe supplies of resources.
- Natural Hazards: Research to forecast and delineate hazards from earthquakes, volcanoes, landslides, and related phenomena. Losses from future natural hazard events can be significantly reduced through studies of past and potential events applied to disaster mitigation and response planning.
- Global Change: Research to investigate the impact that potential global change, such as global warming, would have on our planet. This is part of the U.S. Global Change research program, which provides the scientific basis for developing policy relating to natural and human-induced changes in the global earth system.
- Marine and Coastal: Research to address issues of national, regional, and local concern that involve marine and coastal geology. These issues involve natural hazards, natural resources, and environmental quality and restoration; they span the full continuum from coastal wetlands and seashores to the deep ocean.
- Geomagnetism: Research to measure, map, and model the earth's magnetic field within various time scales and to publish and disseminate this information for use in navigation and orientation by Federal, state, local, and international groups. Eleven magnetic observatories are operated, and repeat magnetic field surveys are performed to determine how and how fast the earth's magnetic field is changing.
- Ice and Climate: Research to understand the

causes, characteristics, and effects of changes in glacier conditions over annual to decadal time scales, as well as of changes in snow conditions in mountainous areas over monthly to seasonal time scales.

- **Hydrology:** Research to monitor and assess the sensitivity of surface water and wetland hydrology to variations and changes in climate.
- **Mapping:** Program to develop geologic and environmental maps of Arctic Alaska.

U.S. Geological Survey—Biological Resources Division

- **Marine Mammals:** Research on marine mammals to provide information needed for USGS to fulfill its stewardship responsibilities under the Marine Mammal Protection Act.
- **Migratory Birds:** Research on migratory birds to provide basic biological information needed for responsible implementation of the Migratory Bird Treaty Act.
- **Fisheries:** Research related to land management responsibilities on National Wildlife Refuges and National Parks or focusing on treaty issues involving the U.S. and Canada.
- **Cooperative Research:** Research addressing issues relating to short-term or site-specific resource management issues.
- **Terrestrial Ecology:** Research related to land management, emphasizing potential effects of resource development on National Wildlife Refuges.
- **Park Research:** Research related to land management, emphasizing issues specific to National Parks.

Bureau of Land Management

- **Natural Ecology:** Inventorying and monitoring the quantity and status of waters, soils, vegetation, fish and wildlife populations, and habitats in Arctic Alaska. This is a major effort to support lands and resources management in this unique area.
- **Cultural Resources:** Studies of man's prehistoric activities in the Arctic. Recent findings in northern Alaska have helped in understanding man's migration into North America.
- **Pipeline Monitoring:** Program to ascertain that permittees are in compliance with the agreement and grant right-of-way for the Trans-Alaska Pipeline in Arctic Alaska. There is constant monitoring of pipeline integrity and the status of the natural resources in and adjacent to the right-of-way.

- **Fire Control:** Studies of fuels, ignition, burning, fire spreading, and methods of control of wildfires in the Arctic. A network of remote automatic weather stations has been established. The primary purpose of this network is to help understand the influence of weather on wildfires.
- **Mining Administration:** Monitoring of placer mining on public lands in Arctic Alaska. The goal is to assure compliance with the approved plan of operations and minimize the impact of mining on the riparian wetland resource.

National Park Service

- **Cultural Resources:** Research and investigation of cultural resources as they pertain to historic places in National Parks. The Shared Beringian Heritage Program promotes international cooperation in multidisciplinary studies of Beringia.
- **Natural Ecology:** Research to monitor and understand natural resources in National Parks.

Bureau of Indian Affairs

- **Cultural:** Research and investigation of learned and shared behaviors as they pertain to historic places and cemetery sites applied for under the provisions of the Alaska Native Claims Settlement Act (P.L. 92-203).
- **Subsistence:** Research on the customary and traditional uses of fish, game, and plant resources.

National Science Foundation

- **Arctic Natural Sciences:** Research in atmospheric, space, ocean, biological, earth sciences, and glaciology that is primarily investigator-initiated; this is basic research that is concerned with processes and phenomena in the entire Arctic region, including Alaska, Canada, Greenland, Svalbard, Russia, the Arctic Ocean and adjacent seas, and the upper atmosphere and near space.
- **Arctic System Science (ARCSS):** An interdisciplinary program that examines the interactions within and between the climatic, geologic, biologic, and socioeconomic subsystems of the Arctic. ARCSS is a regional component within the U.S. Global Change Research Program.
- **Arctic Social Science:** A multidisciplinary and interdisciplinary program focused on issues

of human–environment interactions, rapid social change, and community viability.

- Arctic Science Support: Support for Intergovernmental Personnel Act (IPA) personnel assigned to the Arctic Sciences Section of the Office of Polar Programs (OPP), and scientific meeting, panel, and publication support.
- Arctic Data and Information, and Advisory and Coordination: Support for a program of Arctic data and information research and advisory services, including support for the Interagency Arctic Research Policy Committee, and conferences, workshops, and studies to further develop and implement Arctic research planning and policy.
- Arctic Research Commission: Support for the Commission staff and members. Funding for the Arctic Research Commission is included in the NSF budget for administrative convenience.
- Other Sciences: Research supported in divisions and programs outside the OPP in atmospheric, ocean, biological, earth sciences, and glaciology that is primarily investigator-initiated basic research.
- Engineering: Engineering research that is related to the Arctic.
- Education: Education research that is related to the Arctic.

National Aeronautics and Space Administration

- Cryosphere: This program is focused on the Arctic ice cover and its interactions with the oceans and atmosphere. The long-range goals are to significantly improve our ability to represent high-latitude processes in models of global climate and climate change and to understand the current and likely impact of changes in ice mass on sea level.
- Ecology: This program is focused on the function of high-latitude terrestrial ecosystems and their interactions with the atmosphere and hydrosphere, with particular emphasis on carbon cycling and land–atmosphere interactions.
- Solid Earth and Natural Hazards Science: This program is focused on improving our understanding of the earth’s gravity field, oscillations in the length of day and tilting of the axis of rotation, geodesy to determine the rate of past-glacial rebound of the lithosphere for ice mass and structural studies, the earth’s magnetic field to determine crustal structure,

and topography and topographic change of the Arctic and Antarctic regions. The program also contributes to other polar studies by providing a frame of reference with which to monitor changes such as the volume of the ice sheets.

- Arctic Ozone Studies: This program is supporting a number of tasks related to chemical and dynamical processes in the Arctic stratosphere, with the aim of measuring and understanding changes in Arctic stratospheric ozone in an atmosphere with increasing abundances of greenhouse gases.
- Arctic Data Systems: NASA provides support for two Distributed Active Archive Systems (DAACs) for high-latitude data: one at the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, and one at the Alaska SAR Facility (ASF) in Fairbanks, Alaska. The ASF is responsible for acquiring, processing, archiving, and distributing synthetic aperture radar (SAR) data from several non-U.S. spacecraft, and the NSIDC handles most other satellite data over the high latitudes. In addition, NASA supports the development of several high-latitude “Pathfinder” data sets, comprising higher-level information derived from various satellite data.
- Clouds and Radiation: NASA supports comprehensive studies of the impact of Arctic clouds and aerosols on the Arctic radiation balance and its impact on the global radiative balance. Studies supported include modeling and analysis of satellite cloud and aerosol data obtained over the polar regions. In addition, NASA supports missions to the Arctic (e.g. FIRE-ACE) that include ground, ship, and airborne sensors coordinated with satellite observations to study the processes that contribute to the evolution of cloud and aerosol distributions.
- Geospace Physics: NASA provides support for a vigorous program of experimental and theoretical studies of geospace phenomena originating in or affecting Arctic regions, including the mesosphere, thermosphere, ionosphere, and magnetosphere. It includes these programs listed in the NASA budget table: Sun-Earth Connection Theory Program, Fast Auroral SnapshoT Explorer spacecraft, Geospace Low Cost Access to Space (sub-orbital) program, and the Geospace Sciences Supporting Research and Technology program.

Department of Commerce

National Oceanic and Atmospheric Administration

- **Atmospheric Trace Constituents:** Continuous and discrete measurements of atmospheric trace constituents (for example, greenhouse gases) that are important to understanding global change.
- **Marine Fisheries Assessment:** Assessment by the National Marine Fisheries Service (NMFS) of U.S. living marine resources in Arctic waters.
- **Marine Fisheries Research:** NOAA's Pacific Marine Environmental Laboratory (PMEL) and Alaska Fisheries Science Center (AFSC) conduct the Fisheries Oceanography Coordinated Investigations (FOCI) program in the Bering Sea and North Pacific. FOCI is concerned with understanding and predicting the impacts of interannual variability and decade-scale climate change on commercially valuable fish species.
- **Marine Mammal Assessment:** Long-term research by NMFS's National Marine Mammal Laboratory on the population biology and ecology of Arctic marine mammals. NMFS also participates in the Marine Mammal Health and Stranding Response Program, which oversees the Arctic Marine Mammal Tissue Archival Program (AMMTAP) in collaboration with the Department of the Interior (FWS, BRD, and MMS) and the National Institute of Standards and Technology (NIST). The AMMTAP collects, analyzes, and archives tissues for contaminants and health indices to provide a database on contaminants and health in marine mammal populations in the Arctic.
- **Coastal Hazards:** Activities directed towards developing a better understanding of the effects of tsunami propagation and run-up.
- **Ocean Assessment:** A wide range of programs and activities directed toward NOAA's environmental stewardship responsibilities, including environmental monitoring and assessment, technology transfer, and education and outreach. Ocean assessment includes the National Status and Trends Program, the Coastal Ocean Program, and other pertinent activities of the recently formed National Centers for Coastal Ocean Science (NCCOS), National Ocean Service.
- **Stratospheric Ozone:** A program that is developing an understanding of the dynamics and chemistry of Arctic ozone depletion, as part of activities directed to understanding the global depletion of stratospheric ozone.
- **Satellites/Data Management:** Research addressing NOAA's responsibilities for collecting, archiving, processing, and disseminating environmental data and providing specialized data analyses and interpretations.
- **Remote Sensing:** A substantial program (jointly with NASA, NSF, and DOE) for developing, testing, and using ground-based remote sensors for Arctic meteorological research. The emphasis is on prototypes for future operational systems that can operate in the Arctic with minimal attention. The scientific issues include boundary layer turbulence and structure, cloud macro- and micro-physical properties, and cloud-radiative coupling relevant to Arctic climate.
- **Aircraft/Vessels:** Platform support from the Office of Marine and Aviation Operations (OMAO) to conduct the research and observations associated with NOAA's Arctic research program.
- **Climate and Global Change:** Studies that are assessing Arctic processes as forcing functions of climate and global change and as "barometers" of global change. NOAA's Arctic Research Office chairs the Interagency Working Group on the Study of Environmental Arctic Change (SEARCH).
- **Arctic Ice:** The National Ice Center, jointly operated by NOAA, the U.S. Navy, and the U.S. Coast Guard, provides analyses and forecasts of ice conditions in all seas of the polar regions, the Great Lakes, and Chesapeake Bay. The National Snow and Ice Data Center (NSIDC), affiliated with NOAA's National Geophysical Data Center (NGDC), archives many new and rescued ice data sets.
- **Arctic Weather:** Research primarily addresses four concerns: 1) Forecasting snow in mountainous terrain for real-time use and for climate-related information; 2) Remote sensing for detecting clouds and for developing cloud phase techniques; 3) Improving the numerical modeling of weather over both the short and long term in complex terrain such as Alaska; and 4) Locating and understanding the dynamics of the Arctic Front.
- **Boreal Forest Fires and the Arctic:** Modeling, research, and observations to understand the influence of Northern Hemisphere boreal forest fires on atmospheric chemistry in the Arc-

tic, especially focusing on the production of surface-level ozone and other pollutants and the atmospheric and climate effects of the input of soot.

- Arctic Research Initiative: The Arctic Research Office was formed in FY 00 to administer the Arctic Research Initiative and to build a NOAA program focused on Arctic science issues of national importance. For this purpose, the “Arctic” is defined loosely as the northern hemisphere land area underlain by permanent or discontinuous permafrost, and ocean areas subject to permanent or annual sea ice cover. Consideration of watersheds and airsheds that flow to the Arctic can extend the geographic boundaries significantly, as can consideration of impacts of Arctic processes on hemispheric weather and climate. In FY 03, newly appropriated funds are available to initiate a NOAA contribution to the interagency Study of Environmental Arctic Change (SEARCH). Under the overall guidance of the NOAA Strategic Plan, the ARO has formulated more specific goals that relate to its specific mission. These goals are:
 - Characterize poorly known high-latitude marine habitats, and understand and model factors controlling the populations of key marine species in the Arctic and sub-Arctic;
 - Understand ecosystem impacts of critical contaminants and human uses in the Arctic; and
 - Understand causes and impacts of atmospheric, oceanic, and climate variability and change in the Arctic.

Several projects are planned over the next few years to address these goals and contribute to the SEARCH Science Plan. These projects are: a) Retrospective Analysis of Ocean Climate and Populations of Key Living Marine Resources; b) A collaborative, international program of Arctic exploration; c) Bering Sea Ecosystem Study; d) Atmospheric and Cryospheric Change in the Arctic; e) Arctic/Sub-Arctic Ocean Fluxes; f) Arctic System Reanalysis; g) Arctic Climate Impact Assessment; h) Environmental Sources, Fate, and Impact of Mercury and Persistent Organic Pollutants in the Arctic; I) Assessment of Environmental and Economic Impacts of Oil and Gas in the Arctic; j) Development of an updated AMAP Strategic Plan.

Department of Energy

- Climate-Related Atmospheric Radiation Research: Continued operation of an Atmospheric Radiation Measurement (ARM) research (“testbed”) site on the North Slope of Alaska to improve mathematical simulations of cloud and radiative transfer processes in general circulation models (GCMs).
- Neighborhood Environmental Watch Network (NEWNET): Continued operation of an Alaskan network (Fairbanks, Kotzebue, Nome, Point Hope, and Seward) of public-accessible environmental gamma-radioactivity monitoring stations and data storage/processing systems, based on concepts developed by the DOE for the Community Monitoring Program at the Nevada Test Site (NTS) Nuclear Testing Facility.
- Joint Coordinating Committee for Environmental Management (JCCEM) Contaminant Transport Studies: Continuing assessment of the hydrogeologic framework and radioactivity contamination status of the West Siberian Basin from past and ongoing releases of commercial and defense-related nuclear and hazardous waste disposal operations at the former Soviet Union’s Mayak, Tomsk, and Krasnoyarsk sites. (This program was terminated in FY 03.)
- Ecosystem Changes in Alaska: DOE’s National Institute for Global Environmental Change (NIGEC) supports two projects (one continuing and one to begin in FY 03) that document recent changes in selected ecosystems in Alaska. The research is aimed at determining whether recent climatic changes in Alaska are affecting, or are likely to affect in the future, Alaskan forests and the goods and services they provide to society.
- Alaska Fossil Fuels: The DOE’s Office of Natural Gas and Petroleum Technology continues to be involved in several projects related to the occurrence of methane hydrate deposits in the North Slope of Alaska.
- Wind Activities in Alaska: To better understand the role that wind energy can play, the DOE’s Wind Energy Program continues to be engaged in collaborative efforts with Alaskan organizations at the state and local levels to explore ways in which wind can make a greater contribution in the production of electric power. Efforts are particularly focused on smaller rural communities, where the cost of

diesel-generated electricity is very high. Current Alaskan locations include Kotzebue, Wales, Nome, Nightmute, Nunapitchuk, Selawik, and Unalakleet.

Department of Health and Human Services

National Institutes of Health

- Basic and applied research that relates primarily in the areas of rheumatic diseases, cancer, drug and alcohol abuse, and coronary heart disease that affect Arctic residents.

Centers for Disease Control and Prevention

- A research program designed to evaluate infectious disease prevention and control strategies in the Arctic and sub-Arctic, with a special focus on diseases of high incidence and concern among the indigenous peoples of the circumpolar region.
- An occupational injury research program focusing on the Nation's geographic area with the highest risk of occupational-related injury.
- Research on human exposure to environmental persistent organic pollutants in the Arctic.

Agency for Toxic Substances and Disease Registry

- A research program to identify and reduce risks from exposure to environmental contaminants while maintaining the benefits of the subsistence lifestyle.

Smithsonian Institution

- Anthropology: Research and interpretation of Arctic cultures and natural history; training of Arctic residents and Natives in museum studies, collections care, conservation, and cultural heritage programs; studies of the origin and history of northern cultures and their interactions with their environment and with European cultures are central features of this research.
- Arctic Biology: Basic research on biological and evolutionary studies in botany, zoology, and other natural history fields. Interactions of Arctic flora and fauna with human cultures are emphasized.

Department of Homeland Security

U.S. Coast Guard

- Arctic Science/Logistics Support: The costs

of providing and maintaining polar icebreakers for use in the Arctic.

- Test and Evaluation: The cost of tests designed to evaluate polar icebreakers in the performance of Arctic missions. (Previously, unreimbursed Arctic science mission costs were included in this category.)
- Extramural Science Support: Funding provided to other agencies for Arctic science studies, research, or vessel availability studies.

Environmental Protection Agency

- Research and Development: Intramural and extramural basic and applied research founded on the risk assessment and risk management paradigm. EPA research interests in the Arctic include water quality, watershed cumulative effects, air quality, land use, bioremediation and the combined impact of contaminants, climate change, and resource use on freshwater and marine ecosystems. Research efforts address issues of long-range transport and transformation of contaminants to the Arctic and the status and trends of contaminants such as persistent organic pollutants and heavy metals within the Arctic environment.
- Regional Activities: Activities of EPA's Region 10 (Pacific Northwest and Alaska office) are conducted in partnership with tribes, the state, and local communities to resolve key issues in rural sanitation, clean drinking water, clean-up of formerly used defense sites, regulation of local industry, and other issues key to protecting human health and the unique Arctic and sub-Arctic environments.

Department of Agriculture

Forest Service

- Research directed toward improving the understanding, use, and management of Alaska's natural resources, especially the northern boreal forest. Research centers on the dynamics of mixed stands and the cumulative effects of management activities on hydrology, soils, vegetation, wildlife, carbon reserves, insects, and fire in boreal ecosystems.
- Important portions of the boreal ecosystems research are conducted at the Bonanza Creek Long-Term Ecological Research Site near Fairbanks, Alaska.

Natural Resources Conservation Service

- Research in support of the National Cooperative Soil Survey program addressing permafrost, soil cryogenic processes, soil reduction and oxidation properties, temperature, water status and gas flux in wetlands, reindeer and caribou grazing needs, and vegetation trends.
- Establishment of a network of climatic stations in both the Arctic and Antarctic as well in other areas with soils affected by permafrost, allowing for studies of changes in the active layer and providing data for many other users. They are linked to sites established by NSF-funded projects, all of the sites have complete soil characterization data, and all of the data collected are provided to NSIDC.
- Research on vegetation, landform, carbon sequestration, and other greenhouse gas relationships in support of the Global Change Research Program.
- Research in support of the snow survey program. Snowfall measurement techniques are being studied to support the snow survey, which continues to be used to predict snowmelt, water availability, river breakup timing, and wildlife movements.
- Research conducted jointly with scientists from Russia and other countries to look at active layer dynamics and soil genesis, classification, and formation.
- Establishment of climatic stations, with both below- and above-ground sensors, in much of

Alaska, with comparable sites in the permafrost regions of China as well as in Antarctica.

Agricultural Research Service

- Research on plant sciences emphasizing germplasm preservation to protect native and Russian plant species with emphasis on medicinal value and utility for erosion control.
- Research in animal sciences to investigate Alaska fisheries byproduct use (especially for feed stocks), integrated pest management for grasshopper control in Alaska's central basin, and the biosystematics of Holarctic ruminant parasites to assess pathogen distribution in food resources of northern communities.

Department of State

- Coordination of U.S. involvement in the Arctic Council and its working groups, including the Arctic Monitoring and Assessment Program; Conservation of Arctic Flora and Fauna, which the U.S. vice-chairs; Emergency Prevention, Preparedness, and Response; Protection of the Arctic Marine Environment, which the U.S. chairs; Sustainable Development; and the Arctic Council Action Plan to Eliminate Pollution of the Arctic.
- Chairmanship of regular meetings of the interagency Arctic Policy Group and overall responsibility for the coordination and formulation of U.S. policy in the Arctic.

Appendix E: Arctic Research and Policy Act, As Amended

PUBLIC LAW 98-373 - July 31, 1984; amended as
PUBLIC LAW 101-609 - November 16, 1990

An Act

To provide for a comprehensive national policy dealing with national research needs and objectives in the Arctic, for a National Critical Materials Council, for development of a continuing and comprehensive national materials policy, for programs necessary to carry out that policy, including Federal programs of advanced materials research and technology, and for innovation in basic materials industries, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

TITLE I-ARCTIC RESEARCH AND POLICY

SHORT TITLE

SEC. 101. This title may be cited as the “Arctic Research and Policy Act of 1984, as amended”.

FINDINGS AND PURPOSES

SEC. 102.(a) The Congress finds and declares that—

- (1) the Arctic, onshore and offshore, contains vital energy resources that can reduce the Nation’s dependence on foreign oil and improve the national balance of payments;
- (2) as the Nation’s only common border with the Soviet Union, the Arctic is critical to national defense;
- (3) the renewable resources of the Arctic, specifically fish and other seafood, represent one of the Nation’s greatest commercial assets;
- (4) Arctic conditions directly affect global weather patterns and must be understood in order to promote better agricultural management throughout the United States;
- (5) industrial pollution not originating in the Arctic region collects in the polar air mass, has the potential to disrupt global weather patterns, and must be controlled through international cooperation and consultation;
- (6) the Arctic is a natural laboratory for research into human health and adaptation, physical and psychological, to climates of extreme cold and isolation and may provide information crucial for future defense needs;
- (7) atmospheric conditions peculiar to the Arctic make the Arctic a unique testing ground for research into high latitude communications, which is likely to be crucial for future defense needs;
- (8) Arctic marine technology is critical to cost-effective recovery, and transportation of energy resources and to the national defense;

(9) the United States has important security, economic, and environmental interests in developing and maintaining a fleet of icebreaking vessels capable of operating effectively in the heavy ice regions of the Arctic;

(10) most Arctic-rim countries, particularly the Soviet Union, possess Arctic technologies far more advanced than those currently available in the United States;

(11) Federal Arctic research is fragmented and uncoordinated at the present time, leading to the neglect of certain areas of research and to unnecessary duplication of effort in other areas of research;

(12) improved logistical coordination and support for Arctic research and better dissemination of research data and information is necessary to increase the efficiency and utility of national Arctic research efforts;

(13) a comprehensive national policy and program plan to organize and fund currently neglected scientific research with respect to the Arctic is necessary to fulfill national objectives in Arctic research;

(14) the Federal Government, in cooperation with State and local governments, should focus its efforts on the collection and characterization of basic data related to biological, materials, geophysical, social, and behavioral phenomena in the Arctic;

(15) research into the long-range health, environmental, and social effects of development in the Arctic is necessary to mitigate the adverse consequences of that development to the land and its residents;

(16) Arctic research expands knowledge of the Arctic, which can enhance the lives of Arctic residents, increase opportunities for international cooperation among Arctic-rim countries, and facilitate the formulation of national policy for the Arctic; and

(17) the Alaskan Arctic provides an essential habitat for marine mammals, migratory waterfowl, and other forms of wildlife which are important to the Nation and which are essential to Arctic residents.

(b) The purposes of this title are—

(1) to establish national policy, priorities, and goals and to provide a Federal program plan for basic and applied scientific research with respect to the Arctic, including natural resources and materials, physical, biological and health sciences, and social and behavioral sciences;

(2) to establish an Arctic Research Commission to promote Arctic research and to recommend Arctic research policy,

(3) to designate the National Science Foundation as the lead agency responsible for implementing Arctic research policy, and

(4) to establish an Interagency Arctic Research Policy Committee to develop a national Arctic research policy and a five year plan to implement that policy.

ARCTIC RESEARCH COMMISSION

SEC. 103. (a) The President shall establish an Arctic Research Commission (hereinafter referred to as the "Commission").

(b)(1) The Commission shall be composed of seven members appointed by the President, with the Director of the National Science Foundation serving as a nonvoting, ex officio member. The members appointed by the President shall include—

(A) four members appointed from among individuals from academic or other research institutions with expertise in areas of research relating to the Arctic, including the physical, biological, health, environmental, social and behavioral sciences;

(B) one member appointed from among indigenous residents of the Arctic who are representative of the needs and interests of Arctic residents and who live in areas directly affected by Arctic resource development; and

(C) two members appointed from among individuals familiar with the Arctic and representative of the needs and interests of private industry undertaking resource development in the Arctic.

(2) The President shall designate one of the appointed members of the Commission to be chairperson of the Commission.

(c)(1) Except as provided in paragraph (2) of this subsection, the term of office of each member of the Commission appointed under subsection (b)(1) shall be four years.

(2) Of the members of the Commission originally appointed under subsection (b)(1)—

(A) one shall be appointed for a term of two years;

(B) two shall be appointed for a term of three years; and

(C) two shall be appointed for a term of four years.

(3) Any vacancy occurring in the membership of the Commission shall be filled, after notice of the vacancy is published in the Federal Register, in the manner provided by the preceding provisions of this section, for the remainder of the unexpired term.

(4) A member may serve after the expiration of the member's term of office until the President appoints a successor.

(5) A member may serve consecutive terms beyond the member's original appointment.

(d)(1) Members of the Commission may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code. A member of the Commission not presently employed for compensation shall be compensated at a rate equal to the daily equivalent of the rate for GS-18 of the General Schedule under section 5332 of title 5, United States Code, for each day the member is engaged in the actual performance of his duties as a member of the Commission, not to exceed 90 days of service each year. Except for the purposes of chapter 81 of title 5 (relating to compensation for work injuries) and chapter 171 of title 28 (relating to tort claims), a member of the Commission shall not be considered an employee of the United States for any purpose.

(2) The Commission shall meet at the call of its Chairman or a majority of its members.

(3) Each Federal agency referred to in section 107(b) may designate a representative to participate as an observer with the Commission. These representatives shall report to and advise the Commission on the activities relating to Arctic research of their agencies.

(4) The Commission shall conduct at least one public meeting in the State of Alaska annually.

DUTIES OF THE COMMISSION

SEC. 104. (a) The Commission shall—

(1) develop and recommend an integrated national Arctic research policy;

(2) in cooperation with the Interagency Arctic Research Policy Committee established under section 107, assist in establishing a national Arctic research program plan to implement the Arctic research policy;

(3) facilitate cooperation between the Federal Government and State and local governments with respect to Arctic research;

(4) review Federal research programs in the Arctic and recommend improvements in coordination among programs;

(5) recommend methods to improve logistical planning and support for Arctic research as may be appropriate and in accordance with the findings and purposes of this title;

(6) recommend methods for improving efficient sharing and dissemination of data and information on the Arctic among interested public and private institutions;

(7) offer other recommendations and advice to the Interagency Committee established under section 107 as it may find appropriate;

(8) cooperate with the Governor of the State of Alaska and with agencies and organizations of that State which the Governor may designate with respect to the formulation of Arctic research policy;

(9) recommend to the Interagency Committee the means for developing international scientific cooperation in the Arctic; and

(10) not later than January 31, 1991, and every 2 years thereafter, publish a statement of goals and objectives with respect to Arctic research to guide the Interagency Committee established under section 107 in the performance of its duties.

(b) Not later than January 31 of each year, the Commission shall submit to the President and to the Congress a report describing the activities and accomplishments of the Commission during the immediately preceding fiscal year.

COOPERATION WITH THE COMMISSION

SEC. 105. (a)(1) The Commission may acquire from the head of any Federal agency unclassified data, reports, and other nonproprietary information with respect to Arctic research in the possession of the agency which the Commission considers useful in the discharge of its duties.

(2) Each agency shall cooperate with the Commission and furnish all data, reports, and other information requested by the Commission to the extent permitted by law; except that no agency need furnish any information which it is permitted to withhold under section 522 of title 5, United States Code.

(b) With the consent of the appropriate agency head, the Commission may utilize the facilities and services of any Federal agency to the extent that the facilities and services are needed for the establishment and development of an Arctic research policy, upon reimbursement to be agreed upon by the Commission and the agency head and taking every feasible step to avoid duplication of effort.

(c) All Federal agencies shall consult with the Commission before undertaking major Federal actions relating to Arctic research.

ADMINISTRATION OF THE COMMISSION

SEC. 106. The Commission may—

(1) in accordance with the civil service laws and subchapter III of chapter 53 of title 5, United States Code, appoint and fix the compensation of an Executive Director and necessary additional staff personnel, but not to exceed a total of seven compensated personnel;

(2) procure temporary and intermittent services as authorized by section 3109 of title 5, United States Code;

(3) enter into contracts and procure supplies, services and personal property;

(4) enter into agreements with the General Services Administration for the procurement of necessary financial and administrative services, for which payment shall be made by reimbursement from funds of the Commission in amounts to be agreed upon by the Commission and the Administrator of the General Services Administration; and

(5) appoint, and accept without compensation the services of, scientists and engineering specialists to be advisors to the Commission. Each advisor may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code. Except for the purposes of chapter 81 of title 5 (relating to compensation for work injuries) and chapter 171 of title 28 (relating to tort claims) of the United States Code, an advisor appointed under this paragraph shall not be considered an employee of the United States for any purpose.

LEAD AGENCY AND INTERAGENCY ARCTIC RESEARCH POLICY COMMITTEE

SEC. 107. (a) The National Science Foundation is designated as the lead agency responsible for implementing Arctic research policy, and the Director of the National Science Foundation shall insure that the requirements of section 108 are fulfilled.

(b)(1) The President shall establish an Interagency Arctic Research Policy Committee (hereinafter referred to as the "Interagency Committee").

(2) The Interagency Committee shall be composed of representatives of the following Federal agencies or offices:

(A) the National Science Foundation;

(B) the Department of Commerce;

(C) the Department of Defense;

(D) the Department of Energy;

(E) the Department of the Interior;

(F) the Department of State;

(G) the Department of Transportation;

(H) the Department of Health and Human Services;

(I) the National Aeronautics and Space Administration;

(J) the Environmental Protection Agency; and

(K) any other agency or office deemed appropriate.

(3) The representative of the National Science Foundation shall serve as the Chairperson of the Interagency Committee.

DUTIES OF THE INTERAGENCY COMMITTEE

SEC. 108. (a) The Interagency Committee shall—

(1) survey Arctic research conducted by Federal, State, and local agencies, universities, and other public and private institutions to help determine priorities for future Arctic research, including natural resources and materials, physical and biological sciences, and social and behavioral sciences;

(2) work with the Commission to develop and establish an integrated national Arctic research policy that will guide Federal agencies in developing and implementing their research programs in the Arctic;

(3) consult with the Commission on—

(A) the development of the national Arctic research policy and the 5-year plan implementing the policy;

(B) Arctic research programs of Federal agencies;

(C) recommendations of the Commission on future Arctic research; and

(D) guidelines for Federal agencies for awarding and administering Arctic research grants;

(4) develop a 5-year plan to implement the national policy, as provided in section 109;

(5) provide the necessary coordination, data, and assistance for the preparation of a single integrated, coherent, and multiagency budget request for Arctic research as provided for in section 110;

(6) facilitate cooperation between the Federal Government and State and local governments in Arctic research, and recommend the undertaking of neglected areas of research in accordance with the findings and purposes of this title;

(7) coordinate and promote cooperative Arctic scientific research programs with other nations, subject to the foreign policy guidance of the Secretary of State;

(8) cooperate with the Governor of the State of Alaska in fulfilling its responsibilities under this title;

(9) promote Federal interagency coordination of all Arctic research activities, including—

- (A) logistical planning and coordination; and
- (B) the sharing of data and information associated with Arctic research, subject to section 552 of title 5, United States Code; and

(10) provide public notice of its meetings and an opportunity for the public to participate in the development and implementation of national Arctic research policy.

(b) Not later than January 31, 1986, and biennially thereafter, the Interagency Committee shall submit to the Congress through the President, a brief, concise report containing-

- (1) a statement of the activities and accomplishments of the Interagency Committee since its last report; and
- (2) a statement detailing with particularity the recommendations of the Commission with respect to Federal interagency activities in Arctic research and the disposition and responses to those recommendations.

5-YEAR ARCTIC RESEARCH PLAN

SEC. 109. (a) The Interagency Committee, in consultation with the Commission, the Governor of the State of Alaska, the residents of the Arctic, the private sector, and public interest groups, shall prepare a comprehensive 5-year program plan (hereinafter referred to as the "Plan") for the overall Federal effort in Arctic research. The Plan shall be prepared and submitted to the President for transmittal to the Congress within one year after the enactment of this Act and shall be revised biennially thereafter.

(b) The Plan shall contain but need not be limited to the following elements:

- (1) an assessment of national needs and problems regarding the Arctic and the research necessary to address those needs or problems;
- (2) a statement of the goals and objectives of the Interagency Committee for national Arctic research;
- (3) a detailed listing of all existing Federal programs relating to Arctic research, including the existing goals, funding levels for each of the 5 following fiscal years, and the funds currently being expended to conduct the programs;
- (4) recommendations for necessary program changes and other proposals to meet the requirements of the policy and goals as set forth by the Commission and in the Plan as currently in effect; and
- (5) a description of the actions taken by the Interagency Committee to coordinate the budget review process in order to ensure interagency coordination and cooperation in (A) carrying out Federal Arctic research programs, and (B) eliminating unnecessary duplication of effort among these programs.

COORDINATION AND REVIEW OF BUDGET REQUESTS

SEC. 110. (a) The Office of Science and Technology Policy shall—

(1) review all agency and department budget requests related to the Arctic transmitted pursuant to section 108(a)(5), in accordance with the national Arctic research policy and the 5-year program under section 108(a)(2) and section 109, respectively; and

(2) consult closely with the Interagency Committee and the Commission to guide the Office of Technology Policy's efforts.

(b)(1) The Office of Management and Budget shall consider all Federal agency requests for research related to the Arctic as one integrated, coherent, and multiagency request, which shall be reviewed by the Office of Management and Budget prior to submission of the President's annual budget request for its adherence to the Plan. The Commission shall, after submission of the President's annual budget request, review the request and report to Congress on adherence to the Plan.

(2) The Office of Management and Budget shall seek to facilitate planning for the design, procurement, maintenance, deployment and operations of icebreakers needed to provide a platform for Arctic research by allocating all funds necessary to support icebreaking operations, except for recurring incremental costs associated with specific projects, to the Coast Guard.

AUTHORIZATION OF APPROPRIATIONS; NEW SPENDING AUTHORITY

SEC. 111. (a) There are authorized to be appropriated such sums as may be necessary for carrying out this title.

(b) Any new spending authority (within the meaning of section 401 of the Congressional Budget Act of 1974) which is provided under this title shall be effective for any fiscal year only to such extent or in such amounts as may be provided in appropriation Acts.

DEFINITION

SEC. 112. As used in this title, the term "Arctic" means all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian chain.

Appendix F: Principles for the Conduct of Research in the Arctic

Introduction

All researchers working in the North have an ethical responsibility toward the people of the North, their cultures, and the environment. The following principles have been formulated to provide guidance for researchers in the physical, biological, behavioral, health, economic, political, and social sciences and in the humanities. These principles are to be observed when carrying out or sponsoring research in Arctic and northern regions or when applying the results of this research.

This statement addresses the need to promote mutual respect and communication between scientists and northern residents. Cooperation is needed at all stages of research planning and implementation in projects that directly affect northern people. Cooperation will contribute to a better understanding of the potential benefits of Arctic research for northern residents and will contribute to the development of northern science through traditional knowledge and experience.

These “Principles for the Conduct of Research in the Arctic” were prepared by the Interagency Social Science Task Force in response to a recommendation by the Polar Research Board of the National Academy of Sciences and at the direction of the Interagency Arctic Research Policy Committee. This statement is not intended to replace other existing Federal, State, or professional guidelines, but rather to emphasize their relevance for the whole scientific community. Examples of similar guidelines used by professional organizations and agencies in the United States and in other countries are listed in the publications.

Implementation

All scientific investigations in the Arctic should be assessed in terms of potential human impact and interest. Social science research, particularly studies of human subjects, requires special consideration, as do studies of resources of economic, cultural, and social value to Native people. In all instances, it is the responsibility of the principal investigator on each project to implement the following recommendations:

1. The researcher should inform appropriate

community authorities of planned research on lands, waters, or territories used or occupied by them. Research directly involving northern people or communities should not proceed without their clear and informed consent. When informing the community and/or obtaining informed consent, the researcher should identify—

- a. all sponsors and sources of financial support;
 - b. the person in charge and all investigators involved in the research, as well as any anticipated need for consultants, guides, or interpreters;
 - c. the purposes, goals, and time frame of the research;
 - d. data-gathering techniques (tape and video recordings, photographs, physiological measurements, and so on) and the uses to which they will be put; and
 - e. foreseeable positive and negative implications and impacts of the research.
2. The duty of researchers to inform communities continues after approval has been obtained. Ongoing projects should be explained in terms understandable to the local community.
 3. Researchers should consult with and, where applicable, include northern communities in project planning and implementation. Reasonable opportunities should be provided for the communities to express their interests and to participate in the research.
 4. Research results should be explained in nontechnical terms and, where feasible, should be communicated by means of study materials that can be used by local teachers or displays that can be shown in local community centers or museums.
 5. Copies of research reports, data descriptions, and other relevant materials should be provided to the local community. Special efforts must be made to communicate results that are responsive to local concerns.
 6. Subject to the requirements for anonymity, publications should always refer to the informed consent of participants and give credit to those contributing to the research project.

7. The researcher must respect local cultural traditions, languages, and values. The researcher should, where practicable, incorporate the following elements in the research design:
 - a. Use of local and traditional knowledge and experience.
 - b. Use of the languages of the local people.
 - c. Translation of research results, particularly those of local concern, into the languages of the people affected by the research.
8. When possible, research projects should anticipate and provide meaningful experience and training for young people.
9. In cases where individuals or groups provide information of a confidential nature, their anonymity must be guaranteed in both the original use of data and in its deposition for future use.
10. Research on humans should only be undertaken in a manner that respects their privacy and dignity:
 - a. Research subjects must remain anonymous unless they have agreed to be identified. If anonymity cannot be guaranteed, the subjects must be informed of the possible consequences of becoming involved in the research.
 - b. In cases where individuals or groups provide information of a confidential or personal nature, this confidentiality must be guaranteed in both the original use of data and in its deposition for future use.
 - c. The rights of children must be respected. All research involving children must be fully justified in terms of goals and objectives and never undertaken without the consent of the children and their parents or legal guardians.
 - d. Participation of subjects, including the use of photography in research, should always be based on informed consent.
 - e. The use and disposition of human tissue samples should always be based on the informed consent of the subjects or next of kin.
11. The researcher is accountable for all project decisions that affect the community, including decisions made by subordinates.
12. All relevant Federal, State, and local regulations and policies pertaining to cultural, environmental, and health protection must be strictly observed.
13. Sacred sites, cultural materials, and cultural property cannot be disturbed or removed without community and/or individual consent and in accordance with Federal and State laws and regulations.

In implementing these principles, researchers may find additional guidance in the publications listed below. In addition, a number of Alaska Native and municipal organizations can be contacted for general information, obtaining informed consent, and matters relating to research proposals and coordination with Native and local interests. A separate list is available from NSF's Office of Polar Programs.

Publications

- Arctic Social Science: An Agenda for Action.* National Academy of Sciences, Washington, D.C., 1989.
- Draft Principles for an Arctic Policy.* Inuit Circumpolar Conference, Kotzebue, 1986.
- Ethics.* Social Sciences and Humanities Research Council of Canada, Ottawa, 1977.
- Nordic Statement of Principles and Priorities in Arctic Research.* Center for Arctic Cultural Research, Umea, Sweden, 1989.
- Policy on Research Ethics.* Alaska Department of Fish and Game, Juneau, 1984.
- Principles of Professional Responsibility.* Council of the American Anthropological Association, Washington, D.C., 1971, rev. 1989.
- The Ethical Principles for the Conduct of Research in the North.* The Canadian Universities for Northern Studies, Ottawa, 1982.
- The National Arctic Health Science Policy.* American Public Health Association, Washington, D.C., 1984.
- Protocol for Centers for Disease Control/Indian Health Service Serum Bank.* Prepared by Arctic Investigations Program (CDC) and Alaska Area Native Health Service, 1990. (Available through Alaska Area Native Health Service, 255 Gambell Street, Anchorage, AK 99501.)
- Indian Health Manual.* Indian Health Service, U.S. Public Health Service, Rockville, Maryland, 1987.
- Human Experimentation.* Code of Ethics of the World Medical Association (Declaration of Helsinki). Published in *British Medical Journal*, 2:177, 1964.
- Protection of Human Subjects.* Code of Federal Regulations 45 CFR 46, 1974, rev. 1983.

Appendix G: Acknowledgments

The following acknowledges the principal individuals responsible for this revision of the U. S. Arctic Research Plan.

The principal Federal agency contributors to this revision of the U.S. Arctic Research Plan were Charles E. Myers, Head, Interagency Arctic Staff, Office of Polar Programs, National Science Foundation; Sarah Brandel and Hale VanKoughnett, Department of State; CAPT Frank Garcia, Jr., Steven King, and David Cate, Department of Defense; Richard Cline, U.S. Forest Service; William Fitzhugh, Smithsonian Institution; James Devine, U.S. Geological Survey; John Calder and Tom Murray, National Oceanic and Atmospheric Administration; Merrill Heit, Department of Energy; Waleed Abdalati, National Aeronautics and Space Administration; Suzanne Marcy, Environmental Protection Agency; Jon Berkson and CDR George Dupree, U.S. Coast Guard; Philip S. Chen, Jr., National Institutes of Health, and Alan Parkinson, Centers for Disease Control and Prevention, Department of Health and Human Services; and John Haugh, Bureau of Land Management, Department of the Interior.

Section 2.2 was prepared in part by George L. Hunt, Jr., University of California, Irvine, and Suzanne Marcy, U.S. Environmental Protection Agency, and is based in part on the report of a workshop held in Laguna Beach, California, in Septem-

ber 2002 convened by George L. Hunt. Other workshop participants were Richard Beamish, Fisheries and Oceans Canada, Pacific Biological Station; Ken Drinkwater, Fisheries and Oceans Canada, Bedford Institute of Oceanography; Mikhail Vladimirovich Flint, P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences; Jackie Grebmeier, Department of Ecology and Evolutionary Biology, University of Tennessee; Roger Harris, Plymouth Marine Laboratory, United Kingdom; George L. Hunt, Jr., Department of Ecology and Evolutionary Biology, University of California, Irvine; Nina Karnovsky, Department of Ecology and Evolutionary Biology, University of California, Irvine; Harald Loeng, Havforskningstutttet/ Institute of Marine Research, Norway; James Morison, Polar Science Center, Applied Physics Lab, University of Washington; Jeff Napp, Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration; Brenda L. Norcross, Institute of Marine Science, University of Alaska Fairbanks; Geir Ottersen, Department of Biology, University of Norway; Clarence Pautzke, North Pacific Research Board; Naonobu Shiga, Marine Biodiversity Laboratory, Hokkaido University; Phyllis Stabeno, Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration; and Neil Swanberg, Office of Polar Programs, National Science Foundation.

Consistent with the provisions of the Arctic Research and Policy Act of 1984, as amended (15 U.S.C. 4108(a)), the President sent this eighth biennial revision (2004-2008) to the United States Arctic Research Plan to the Congress on May 20, 2004. The announcement is available at <http://www.whitehouse.gov/news/releases/2004/05/20040520-17.html>.

Report of Meeting

Interagency Arctic Research Policy Committee

Committee Members and Agency Representatives Present: Rita Colwell (Chair), Karl Erb, Charles E. Myers, Thomas Pyle, and Neil Swanberg, National Science Foundation; George Newton (ARC Chair) and Garrett Brass, Arctic Research Commission; Dennis Conlon, CAPT Frank Garcia, Jr. and Douglas Lamb, Department of Defense; Merrill Heit and Bernard Zak, Department of Energy; Peter Hartsock, Department of Health and Human Services; James Tate, Department of the Interior; James Devine, DOI, U.S. Geological Survey; John Haugh, DOI, Bureau of Land Management; Sarah K. Brandel, Margaret F. Hayes, and Hale Vankoughnett, Department of State; Jon Berkson and CDR Joseph Bodenstedt, Department of Transportation, U.S. Coast Guard; Suzanne Marcy (via phone), Joel Scheraga, and Lowell Smith, Environmental Protection Agency; Waleed Abdalati and Jack Kaye, National Aeronautics and Space Administration; Ronald Baird and John Calder, National Oceanic and Atmospheric Administration; William Fitzhugh, Smithsonian Institution; Richard Cline, Department of Agriculture; George Hunt, University of California–Irvine, Presenter.

17th Meeting: July 8, 2002

Dr. Rita Colwell, IARPC Chair and Director of the National Science Foundation, convened the meeting at the National Science Foundation in Arlington, Virginia.

Review of U.S. Arctic Policy/Arctic Council

Dr. Colwell called on Sarah Brandel, Department of State, to discuss Arctic Council activities during the past year. Ms. Brandel reminded the committee that the eight Arctic countries formed the Arctic Council in 1996. The Council now has five working groups:

- Arctic Monitoring and Assessment Program (AMAP);
- Conservation of Arctic Flora and Fauna (CAFF);
- Emergency Prevention, Preparedness, and Response (EPRP);
- Protection of the Arctic Marine Environment (PAME); and
- Sustainable Development Working Group (SDWG).

Finland is the chair of the Arctic Council for 2000–2002 and Iceland will chair the Council in 2002–2004. Ms. Brandel discussed U.S. leadership in council activities:

- NOAA/NSF are co-funding an Arctic Climate Impact Assessment (ACIA). This program will evaluate and synthesize knowledge on climate change, climate variability, and increased ultraviolet radiation and their consequences on the Arctic environment.
- NOAA chairs the PAME working group looking at land-based sources of pollutants in the Arctic.
- The Department of Interior, Fish and Wildlife Service contributed to the new publication *Flora and Fauna in the Arctic*.
- EPA was the lead author for the AMAP Phase II Heavy Metals chapter.
- The Centers for Disease Control (CDC) is working to build a circumpolar network of

public health centers and laboratories. The NIH National Library of Medicine is developing a health database for the Arctic and expects to link it with similar sites in other member states of the Arctic Council.

- The State of Alaska has helped with several of these initiatives, including telemedicine and ecotourism.

Ms. Brandel thanked the agencies for their active roles that help the U.S. maintain leadership in the Arctic Council.

Margaret Hayes, Director of the Office of Oceans, State Department, provided some context for international issues. The U.S. continues to have problems gaining approval for vessels to visit the Russian Exclusive Economic Zone (EEZ) to conduct scientific research. This has hindered the development of other types of scientific partnerships. Russia has also submitted a claim that the Russian continental shelf extends beyond the 200-mile EEZ area. The U.S. has questioned the scientific basis for this claim.

Comments from the Arctic Research Commission

George Newton, Arctic Research Commission (ARC), provided an update on Commission accomplishments. Every two years the Commission publishes the *Report on Goals and Objectives for Arctic Research* and recommends major research policies, projects, and priorities to the President, Congress, and IARPC. A draft of the 2003 report will be provided to IARPC.

Major projects to be recommended include:

- The SEARCH program on Arctic climate change;
- A Comprehensive Study of the Bearing Sea Region, which goes beyond climate change to include the ecosystem, the fate of endangered species, the effect of various management regimes on fish stocks, and the economic and social effects of ecosystem changes on the region's inhabitants and other factors;
- A Coordinated and Comprehensive Study of Arctic Health, focusing on two areas: the

major causes of sickness and death, and health impacts of contaminants.

- Research on Permafrost and on Predicting the Changes in Permafrost Terrains. Roads, bridges, airfields, pipelines, and buildings are subject to the impacts of permafrost. As the climate changes, it will be essential to predict changes in permafrost terrains and develop techniques to cope with these changes.

Mr. Newton noted the Commission's concern about the decline in support for high-latitude research at the Office of Naval Research. The program has had a reduction in funding of over 90% in the last decade. The long-term requirement for a Navy presence in the Arctic is likely to expand, and with a reduction in research activities, there will be a reduced knowledge base for decision-making.

Bering Sea Science Research Priorities

Science Review. Dr. George Hunt, University of California-Irvine, discussed Research Priorities for the Bering Sea: Information for Understanding and Managing Resources in a Time of Global Change.

The Bering Sea area is an important region for research. The Bering Sea is one of the most productive high-latitude ocean systems.

Dr. Hunt shared data on changes in various fish populations, comparing the South and North Bering Sea. Changes in the sea include higher temperatures and declines in Steller's sea lion, fur seal, and bird populations. Other changes include a dramatic increase in the number of jellyfish.

Dr. Hunt suggested several priorities for Bering Sea Research:

- A program on biocomplexity in the Bering Sea that will study the linkages between physical drivers and the complex food web;
- A study of how climate variability affects the Bering Sea; and
- An investigation of the sources and fates of contaminants in the Bering Sea.

Action Item. Dr. Colwell requested that the group review a proposed action item to approve the following resolution:

RESOLVED, that the Interagency Arctic Research Policy Committee authorizes the staff to review and analyze the various existing Bering Sea plans, workshops, and programs and recommend to IARPC appropriate steps to achieve a coordinated inter-agency plan for Bering Sea Research; and to develop budget proposals for Bering Sea Research in response to the coordinated interagency plan.

In discussion it was noted that there is a need for long-term measurement programs (10-, 15-, 20-, and 100-year measurements) and for process studies. The Bering Sea Working Group has proposed an integrated assessment for a sustainable Bering Sea, and international collaboration is required. Several successful collaborative efforts are in place with Japan and Russia.

The Committee approved the resolution, and Dr. Colwell directed the IARPC staff to develop a plan for Bering Sea research to be included in the next revision of the U.S. Arctic Research Plan.

Report from Study of Environmental Arctic Change (SEARCH) Working Group

John Calder provided an update on activities of the SEARCH working group since the last meeting:

- Preparation of the SEARCH FY 03 Inter-agency Implementation Plan;
- Establishment of an International Science Steering Group to further development of the Arctic/Sub-Arctic Ocean Fluxes Program; an Implementation Plan was published in April 2002;
- Sponsorship of a workshop on Atmospheric and Cryospheric Change in the Arctic; the report and recommendations were published in February 2002.
- Development of "Terms of Reference" for the SEARCH Interagency Working Group describing how it will function when it reaches operational status; and
- Addition of members to the SEARCH Science Steering Committee (SSC) to enable planning for the full scope of SEARCH.

Detailed science planning for ecological and social aspects of SEARCH is required in parallel with the existing physical science planning.

The Interagency Working Group will focus on developing an approach for identifying ongoing activities across the agencies that are relevant to SEARCH and for providing first-draft answers to SEARCH science questions. The first SEARCH science symposium could be held in FY 04.

Information Item: Strategic and Policy Implications of an Ice-Diminished Arctic

Lt. Commander Douglas Lamb of the National Ice Center shared findings from the Navy symposium on global- and tactical-scale sea-ice analysis and forecasting. Participants in the symposium included individuals from various branches of the Navy and other Arctic experts.

Lt. Commander Lamb stated that climate change appears to be seriously affecting the Arctic region, and if it results in an ice-diminished Arctic, Navy operations would be affected. The Navy greatly values the efforts of the research community and IARPC. The strategy and policy implications of an ice-diminished Arctic include increased economic activity, increased need for law enforcement, and increased security needs.

The main conclusions from the symposium were:

- A concept of operations for maritime forces in the Arctic will be required, including the types of platforms and weapons systems needed for Arctic operations.
- There is a lack of meteorological prediction capability required for safe naval operations in a rapidly changing polar environment.
- Forward logistics infrastructure is inadequate for extended operations.
- The polar communications and intelligence infrastructure appears to be inadequate.

- There will be an increased reliance on unmanned vehicles.
- Development and funding of Arctic research is required to measure, map, model, monitor, and predict the Arctic environment.
- Future naval capabilities should be evaluated to include technologies relevant to an ice-diminished Arctic.

In concluding, Lt. Commander Lamb stated that the operational implications of extended Arctic operations resulting from increased access to the region are not well known or understood and are not well appreciated outside the oceanographic community.

Mr. Newton added that the ARC has been successful in working with the Navy to declassify data. The National Ice Center has a wealth of information to further identify trends and climate change in the Arctic. Interagency cooperation is a prime focus. Mr. Newton thanked Dr. Colwell and IARPC for helping to raise the issue.

Interagency Arctic Research Policy Committee Staff

The following individuals are the principal staff representatives for the Interagency Arctic Research Policy Committee. Additional staff support is provided by the Federal agencies for specific activities through working groups, as necessary.

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