ACTIVITIES OF THE ALASKA DISTRICT WATER RESOURCES DIVISION U. S. GEOLOGICAL SURVEY, 1992

Compiled by Elisabeth F. Snyder

U. S. GEOLOGICAL SURVEY

Open-File Report 92-479

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KENAI SOIL AND WATER CONSERVATION DISTRICT
CITY AND BOROUGH OF SITKA
UNIVERSITY OF ALASKA FAIRBANKS

Anchorage, Alaska
1992

U.S. DEPARTMENT OF THE INTERIOR

MANUAL LUJAN, JR., Secretary

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

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MESSAGE FROM THE DISTRICT CHIEF

The U.S. Geological Survey began describing the water resources of Alaska nearly 90 years ago. This early work was related to the gold rush and concurrent need for streamflow data. Following World War II, surface-water data collection activities expanded and ground-water studies were undertaken in the Anchorage, Fairbanks, and Juneau areas.

Construction of the Trans-Alaska Pipeline during the 1970's gave impetus to increased water-resources studies and data-collection activities. The Federal-State cooperative water-resources program was expanded during the early part of the decade. However, since the 1980's, Federal and State funding has declined for water-resources studies and data collection.

The quantity and quality of the water resources of Alaska remain relatively undescribed compared with those in the rest of the United States. Thousands of the State's streams have never been measured or sampled and, except for the few large population centers, information regarding ground-water resources is sparse. Only a relative handful of Alaska's thousands of lakes and glaciers have been adequately studied.

The need for accurate and timely water-resources information is as critical as ever, and as the development of Alaska's natural resources proceeds, the information needs will continue to expand.

Although these are difficult times for Federal, State and local governments, the Alaska District of the Survey's Water Resources Division will continue its efforts to provide information needed to wisely conserve, protect, and manage the State's water resources.

Philip J. Carpenter
District Chief
U.S. Geological Survey
Water Resources Division
Anchorage, Alaska
October 1992

Cover photograph: Adjusting time-lapse camera, Redoubt Volcano, February 15, 1990

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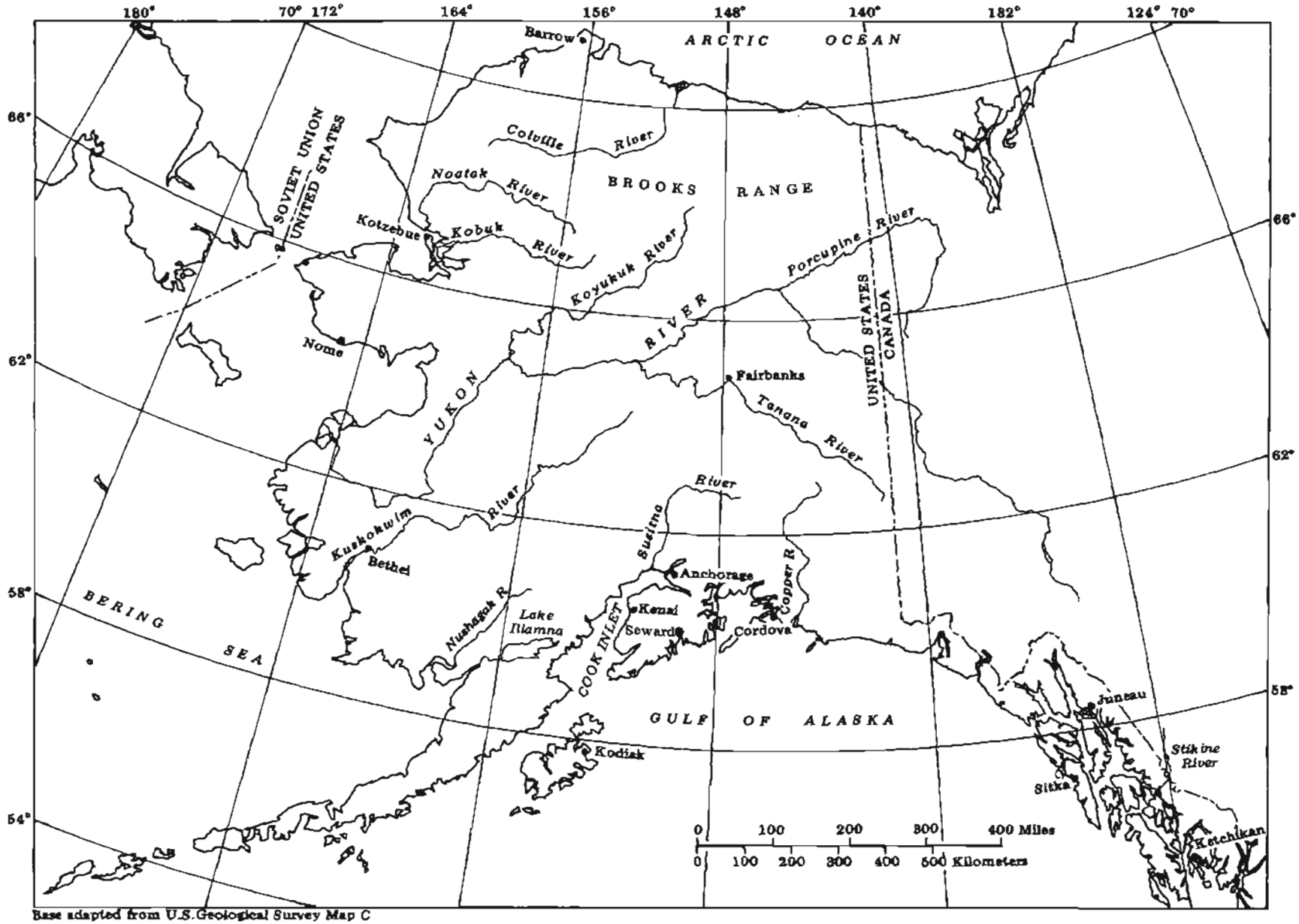


Base adapted from U.S. Geological Survey Map C

ACTIVITIES OF THE ALASKA DISTRICT WATER RESOURCES DIVISION, U.S. GEOLOGICAL SURVEY, 1992

Compiled by Elisabeth F. Snyder

INTRODUCTION

The overall mission of the U.S. Geological Survey's Water Resources Division is to provide the hydrologic information and understanding needed for wise use and management of the Nation's water resources. For about 90 years, the U.S. Geological Survey has studied the occurrence, quantity, quality, distribution, and movement of the surface and underground water that composes the Nation's water resources. As the principal Federal water-data agency, the Geological Survey collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. This nationwide program, which is carried out through the Water Resources Division's 48 District offices and 4 Regional offices, includes the collection, analysis, and dissemination of hydrologic data and water-use information, areal resource appraisals and other interpretive studies, and research projects. Much of this work is a cooperative effort in which planning and financial support are shared by State and local governments and other Federal agencies.

ACTIVITIES

The Water Resources Division's activities in Alaska are divided into three broad categories. One category is the collection of hydrologic data required for the planning and conduct of hydrologic appraisals and (or) hydrologic research. In 1992, this type of work constitutes the major part of the Division's efforts in Alaska. A second category is the conduct of hydrologic appraisals. These appraisals include: studies of water resources in areas likely to be or being affected by mineral, energy, fisheries, coastal zone, or urban development; investigations of potential hydrologic hazards; and studies of ground- and surface-water contamination on Federal lands. The third category is the conduct of basic and applied research in hydrologic topics unique to cold climates. Subjects being studied include: quantity and quality of surface and ground water; hydrologic instrumentation; glacier and snow and ice dynamics; and limnology.

ALASKA'S WATER RESOURCES

Glaciers cover nearly 30,000 square miles in Alaska, about 5 percent of the total area of the State. However, snow forms a veneer on most of Alaska for one-half to three-quarters of the year, and the freezing and thawing of water affect virtually all of the State to some extent.

Surface Water

Surface waters of Alaska include many large rivers. The Yukon River ranks fifth in size in the United States, and six Alaskan rivers (Yukon, Copper, Stikine, Susitna, Kuskokwim, and Tanana) are among the 30 largest U.S. rivers. Glacial sources for most Alaskan rivers cause important hydrologic consequences in addition to the heavy loads of glacier-derived silt carried by the glacial streams. Even a small glacier-covered area in a drainage basin can have a significant effect on the amount and timing of runoff.

Alaskan lakes are so numerous they are essentially uncounted. Lake Iliamna, Alaska's largest, has a surface area of 1,000 square miles. Springs occur throughout the State -- as innumerable small seeps and as warm or mineral waters that support recreational centers. On the North Slope, flows from large springs produce widespread icings in winter.

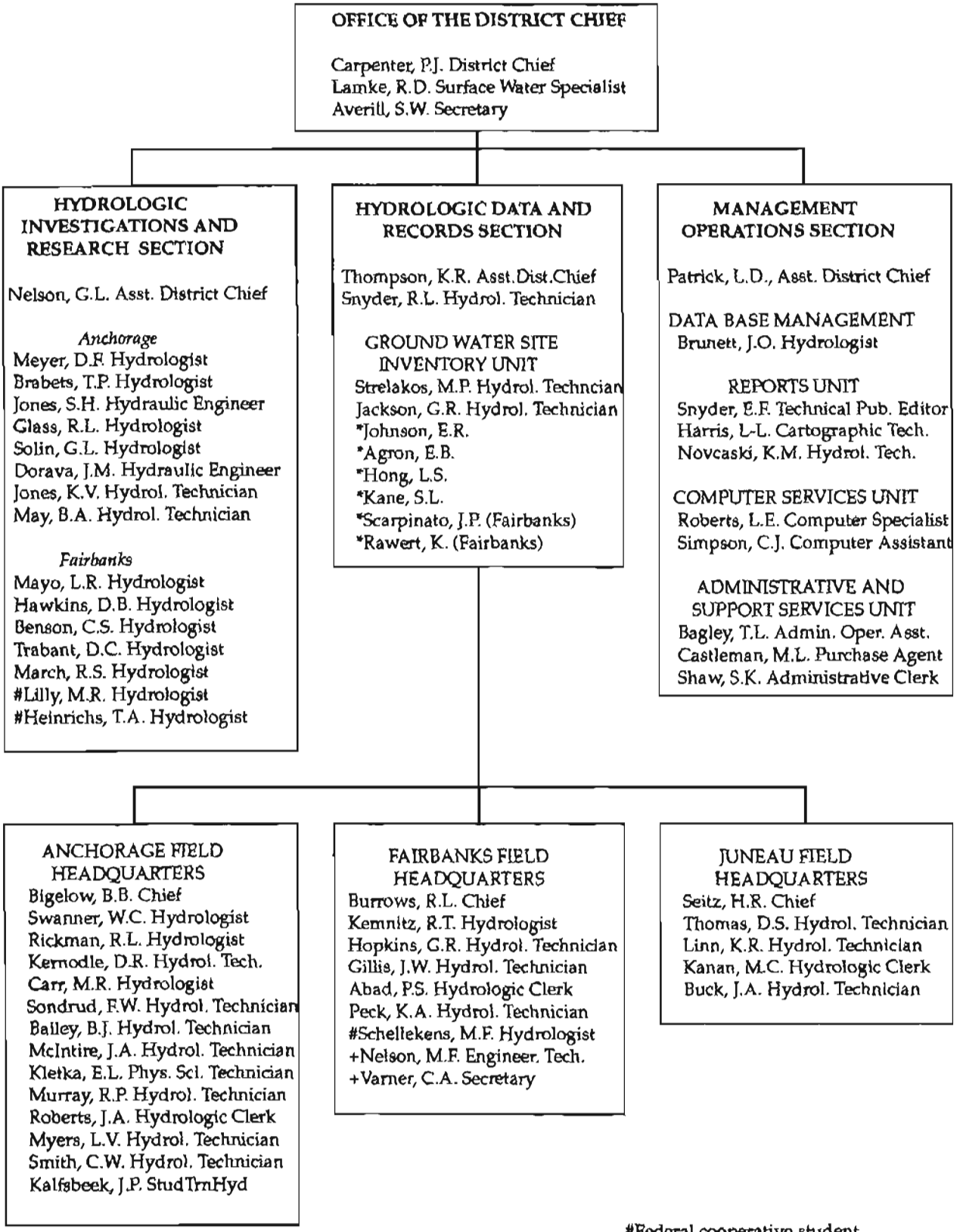
Ground Water

Ground water is an untested resource in most of Alaska, and in many areas potential development of the resource far exceeds current use. Ground-water conditions are diverse: major aquifers are present in the alluvium of large river valleys (Yukon, Tanana, Kuskokwim, Susitna), in glacial outwash deposits under coastal basins (Cook Inlet) and valleys (Seward and Juneau), and in carbonate bedrock of the Brooks Range. In many areas, however, the fine-grained material of glacial and glacial-lake deposits and poorly permeable consolidated rocks offer a much less promising ground-water potential. In addition, the recharge, discharge, movement, and thus the availability of ground water over much of the interior, western, and northern parts of the State and on the flanks of the Alaska Range are restricted by permafrost -- permanently frozen ground.

Water Quality

The quality of Alaskan waters is generally acceptable for most uses. However, available data do indicate naturally occurring problems such as suspended sediment in glacier-fed streams, and salt-water intrusion and undesirable concentrations of iron or arsenic in ground water at various locations. Local pollution from septic tank leakage has occurred in several locations, and an increasing number of cases of ground-water contamination by gasoline or other petroleum products have been reported in the past few years.

U.S. GEOLOGICAL SURVEY - WATER RESOURCES DIVISION - ALASKA DISTRICT



October 1992

#Federal cooperative student
+Joint appointment with Geologic Division
*State of Alaska Division of Water employee

Inquiries regarding projects described in this report may be directed to the following ofices:

District Office	4230 University Drive Suite 201 Anchorage, Alaska 99508-4664	(907)786-7100
Anchorage Field Headquarters	1209 Orca Street Anchorage, Alaska 99501	(907)786-7100
Fairbanks Field Headquarters	800 Yukon Drive Fairbanks, Alaska 99775-5170	(907)479-5645
Juneau Field Headquarters	P.O. Box 21568 Juneau, Alaska 99802	(907)586-7216

SURFACE WATER STATIONS

Period of Project:
Continuous since July 1948

Chief:
Kendall R. Thompson
Anchorage

Funding:
U.S. Geological Survey
U.S. Army Corps of Engineers
U.S.D.A. Forest Service
National Park Service
Bureau of Land Management
Alaska Department of Natural Resources
Alaska Department of Fish and Game
Alaska Department of Transportation and Public Facilities
Alaska Energy Authority
Alaska Power Administration
Alaska Industrial Development and Export Authority
Municipality of Anchorage
City of Cordova
Kenai Peninsula Borough
City and Borough of Juneau
City and Borough of Sitka
University of Alaska, Fairbanks

Purpose:
To provide a surface-water data base through collection, analysis, and publication of records for gaging stations and for selected sites along streams and lakes throughout Alaska. The gaging-station network is operated in cooperation with other Federal, State, and local agencies. The surface-water data base provides information for research purposes of surveillance, planning, design, hazards warning, accounting systems, operation, and management in various water-related fields.

Status:
The ongoing data-collection effort and processing continues. During 1992, the U.S. Geological Survey is operating 106 gaging stations and 64 crest-stage gages in Alaska.

Reports:
Data are published in the U.S. Geological Survey annual report "Water Resources Data for Alaska."

GROUND WATER STATIONS

Period of Project:

Continuous since June 1947

Chief:

Kendall R. Thompson
Anchorage

Funding:

U.S. Geological Survey
U.S.D.A. Forest Service
Alaska Department of Natural Resources
Municipality of Anchorage
Kenai Peninsula Borough

Purpose:

Ground water is an important source of water supply for many Alaskan communities. Thus, it is essential to observe the effects on ground-water quantity and quality exerted by such factors as climatic variations and withdrawal patterns. Water-level data are collected to provide a base against which short- and long-term fluctuations can be compared for proper planning and management.

Status:

During 1992, about 90 wells are being monitored for water levels. Of these, 23 are equipped with recorders that record water levels on a continuous basis. Water levels in other wells are measured from 2 to 12 times per year.

Reports:

Data are published in the U.S. Geological Survey annual report "Water Resources Data for Alaska."

QUALITY OF WATER STATIONS

Period of Project:

Continuous since June 1949

Chief:

Kendall R. Thompson
Anchorage

Funding:

U.S. Geological Survey
U.S.D.A Forest Service
National Park Service
Alaska Department of Transportation and Public Facilities
Alaska Energy Authority
City and Borough of Juneau

Purpose:

To collect, analyze, and publish water-quality data for selected sites in Alaska. In addition to serving needs of cooperating agencies, the records contribute to a national water-quality data base requisite to nationwide and regional planning and action programs.

Status:

Water-quality data collection is continuing at about 30 surface-water stations and several miscellaneous surface-water or ground-water sites. Water-quality data may consist of chemical or biological constituents, sediment concentration, or temperature monitoring. Included are five National Stream Quality Accounting Network stations. One hydrologic benchmark station provides data for a basin in which the hydrologic regimen will likely be governed solely by natural conditions.

Reports:

Data are published in the U.S. Geological Survey annual report "Water Resources Data for Alaska."

SEDIMENT STATIONS

Period of Project:

Continuous since July 1949

Chief:

Kendall R. Thompson
Anchorage

Funding:

U.S. Geological Survey
Alaska Department of Natural Resources
Municipality of Anchorage

Purpose:

To provide a data base needed to assess sediment transport characteristics of drainage areas required for water resources planning and management.

Status:

Collection of miscellaneous sediment data is continuing at five National Stream Quality Accounting Network stations, one benchmark station, and several other stations.

Reports:

Data are published in the U.S. Geological Survey annual report "Water Resources Data for Alaska."

ALASKA WATER USE DATA PROGRAM

Period of Project:

Continuous since April 1978

Chief:

Gary L. Solin
Anchorage

Funding:

U.S. Geological Survey
Alaska Department of Natural Resources

Purpose:

To continue an effective and coordinated program for collecting, storing, accessing, and disseminating water-use data. Information will help resolve critical water problems such as water-quality residuals, environmental impact, energy development, and resources allocation.

Status:

USGS personnel acquired and summarized information required for the "Estimated Use of Water in the United States" report which is published every 5 years by the U.S. Geological Survey. The Alaska Division of Water supplied the public-supply water use information for five principal areas; the USGS acquired the information for the other uses.

Planned Report:

Estimated use of water in the United States in 1990: U.S. Geological Survey Circular (in preparation).

HYDROLOGIC PROCESSES AND HAZARDS AT ALASKA VOLCANOS

Period of Project:

March 1988 to September 1993

Chief:

David F. Meyer
Anchorage

Funding:

U.S. Geological Survey

Purpose:

To identify and describe the hydrologic and hydraulic processes and hydrologic hazards posed by glacier-clad volcanoes, several of which are close enough to population centers to be considered potential threats to life and property.

Status:

Work documenting the hydrologic effects of the 1989-90 eruptions of Redoubt Volcano is nearly complete. Field work during 1990-92 at Redoubt included stream-channel surveys and aerial and terrestrial photography to monitor geomorphic response of the Drift River to the eruption-generated flows and deposits, field testing an experimental acoustic flow monitor, and surveying and otherwise monitoring Drift Glacier to determine its response to the eruptions. A long-term effort to monitor the rebuilding of Drift Glacier after its beheading in 1989 includes measuring accumulation rates and restoration of flow near the 1990 dome, measuring changes in ablation on the tephra-covered Piedmont lobe, documenting the meteorology and hydrology of the Drift River basin, and comparing the rebuilding to similar events that occurred following the 1966 eruption. Work to document effects of the June 27 and August 18, 1992 eruptions of Mount Spurr and the potential hazards from an eruption of Hayes Volcano is also ongoing.

HYDROLOGIC PROCESSES AND HAZARDS AT ALASKA VOLCANOS (Continued)

Published Reports and Abstracts:

Alaska Volcano Observatory Staff, 1990, The 1989-1990 eruption of Redoubt Volcano: Eos, Transactions, American Geophysical Union, v. 71, no. 7, p. 265-275.

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_____1991, Generalized stream channel evolution resulting from the 1989-90 eruptions of Redoubt Volcano, Alaska [abs.]: Eos, Transactions, American Geophysical Union, v. 72, no. 4, p. 214

_____1992, Geomorphic response to the 1989-90 eruptions of Redoubt Volcano, Alaska [abs.]: American Water Resources Association, Alaska Chapter, Proceedings of 1992 Annual Conference, April 9-10, 1992.

Trabant, D.C., and Brabets, T.P., 1990, Estimates of the snow and ice volumes directly influenced by the 1989-90 eruption of Redoubt Volcano [abs.]: Eos, Transactions, American Geophysical Union, v. 71, no. 43, p. 1705.

Trabant, D.C., and Meyer, D.F., in press, Flood generation and destruction of Drift Glacier by the 1989-90 eruption of Redoubt Volcano, Alaska: Annals of Glaciology.

Waitt, R.B., Miller, T.P., and Trabant, D.C., 1990, Effects of eruptions of Redoubt Volcano, Alaska between December 1989 and April 1990 on Drift Glacier [abs.]: Eos, Transactions, American Geophysical Union, v. 71, p. 1705.

Planned Reports and Abstracts:

Dorava, J.M., and Meyer, D.F., Hydrologic hazards in the lower Drift River basin associated with the 1989-90 eruptions of Redoubt Volcano, Alaska: Journal of Volcanology and Geothermal Research.

Dorava J.M. and others, Drift River geomorphic data base: U.S. Geological Survey Open-File Report.

McGimsey, R.G., and Dorava, J.M., Eruption of Mount Spurr Volcano, Alaska, August 18, 1992: Video coverage [abs.]: Eos, Transactions, American Geophysical Union.

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Meyer, D.F., and Trabant, D.C., Lahar-producing events and non lahar-producing events at glacier-clad Cook Inlet volcanoes [abs]: Eos, Transactions, American Geophysical Union.

Meyer, D.F., May, B.A., and Trabant, D.C., Methods to quickly assess volume of glaciers on Alaska volcanoes (Journal article).

Trabant, D.C., and Benson, C.S., Drift Glacier motion: (Journal article).

Trabant, D.C., Major, J.J., and Waitt, R.B., Disruption of Drift Glacier and origin of floods during the 1989-90 eruptions of Redoubt Volcano: Journal of Volcanology and Geothermal Research.

GLOBAL CHANGE HYDROLOGY: EVALUATION OF RESPONSE OF GLACIERS TO CHANGES IN CLIMATE, RUNOFF, AND MASS BALANCE AT GULKANA AND WOLVERINE GLACIERS, ALASKA

Period of Project:

October 1989 to September 1993

Chief:

Dennis C. Trabant
Fairbanks

Funding:

U.S. Geological Survey

Purpose:

To establish "benchmark" glacier basins for long-term mass balance, climate, runoff, and glacier flow observations as part of an international effort to assess the natural water resource and improve understanding of how climate change may affect water stored as glacier ice and influence the global hydrologic cycle.

Status:

Photogrammetric analysis of volume change of Gulkana Glacier is in progress. Mass balances on Gulkana and Wolverine Glaciers are being measured quarterly.

Planned Reports:

Annual data reports are being prepared.

WATER-QUALITY CHARACTERISTICS OF AQUIFERS ON THE KENAI PENINSULA

Period of Project:

October 1990 to September 1993

Chief:

Roy L. Glass
Anchorage

Funding:

U.S. Geological Survey
Alaska Department of Natural Resources
Kenai Soil and Water Conservation District

Purpose:

To assess water quality and directions of ground-water flow throughout water-supply aquifers on the Kenai Peninsula.

Status:

During 1991-92, water samples from 70 wells were analyzed for major ions and trace metals. Water-quality analyses from USGS and other agencies were reviewed. Data from nearly 1,300 wells were entered into the Ground-Water Site Inventory data base.

Planned Reports:

Glass, R.L., Water-quality characteristics of aquifers, Kenai Peninsula, Alaska: U.S. Geological Survey Water-Resources Investigations Report.

Bailey, B.J., Lake levels, north Kenai Peninsula, Alaska: U.S. Geological Survey Open-File Report.

_____Ground-water levels, Kenai Peninsula, Alaska: U.S. Geological Survey Open-File Report.

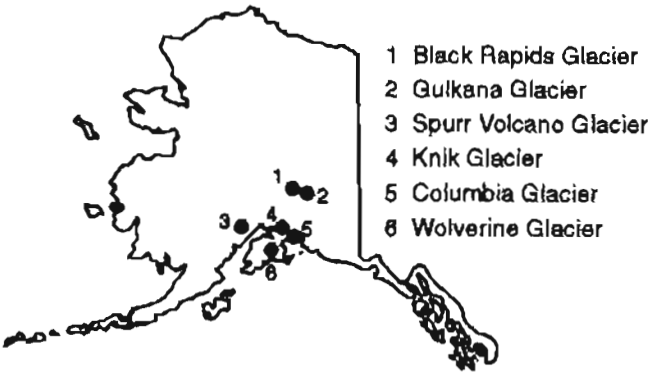
PUBLICATION OF ALASKAN GLACIER DATA SETS

Period of Project:

October 1990 to September 1995

Chief:

Lawrence R. Mayo
Fairbanks



Funding:

U.S. Geological Survey

Purpose:

To release systematic data through a series of USGS publications and scientific journals and interpret the climatic responses of study glaciers. To release data from Wolverine, Gulkana, Black Rapids, Columbia, Knik, and Spurr Volcano Glaciers in Alaska. Possibly release unpublished data from Maclure Glacier, California.

Status:

Two manuscripts are currently being prepared for publication as USGS reports: one describing methods of glacier mass balance observations and another on the ice volumes of Spurr Volcano. In addition, a journal paper is being written on internal melting of glaciers.

Published Report:

Mayo, L.R., March, R.S., and Trabant, D.C., 1992, Air temperature and precipitation data, 1967-88, Wolverine Glacier basin, Alaska: U.S. Geological Survey Open-File Report 91-246, 80 p.

GEOMORPHOLOGY OF THE LOWER COPPER RIVER, ALASKA

Period of Project:
October 1991 to September 1994

Chief:
Timothy P. Brabets
Anchorage

Funding:
U.S. Geological Survey
Alaska Department of Transportation and Public Facilities

Purpose:
To document the lateral migration and vertical scour of channels in the lower Copper River. To determine the ongoing geomorphic processes causing the lateral migration and vertical scour of these channels. To predict areas within the lower Copper River that will be subject to future erosion or deposition.

Status:
Discharge measurements, suspended-sediment samples, and bedload samples were collected at the Million Dollar Bridge and at the 11 bridges along the Copper River Highway from mile 27 to mile 38. Control has been set at 22 points along the highway using Global Positioning System techniques. Geophysical techniques have been used to detect a filled-in scour hole at Bridge 331, an old riverbed channel at Bridge 334, and a 70-foot scour hole off the spur dike at Bridge 342. Black and white, color, and color infrared aerial photographs taken from 1950 through 1991 are being digitized into an ARC/INFO database.

Published Report:
Brabets, T.P., 1992, Hydrologic data for the lower Copper River, Alaska, May to September 1991: U.S. Geological Survey Open-File Report 92-89, 15 p.

Planned Reports:
Brabets, T.P., Hydrologic data for the lower Copper River, Alaska, May to September 1992: U.S. Geological Survey Open-File Report.

_____Bridge scour characteristics at four bridges along the Copper River Highway, Alaska: U.S. Geological Survey Water-Resources Investigations Report.

_____Use of surface geophysical methods in a geomorphology study of the lower Copper River, Alaska: U.S. Geological Survey Water-Resources Investigations Report.

Glass, R.L. Glaciers along three proposed routes for the extension of the Copper River Highway in southcentral Alaska: U.S. Geological Survey Water-Resources Investigations Report.

IDENTIFICATION OF CONTAMINATION SITES AT CLEAR AIR FORCE STATION, ALASKA

Period of Project:

October 1991 to September 1992

Chief:

Gary L. Solin
Anchorage

Funding:

U.S. Geological Survey
U.S. Air Force

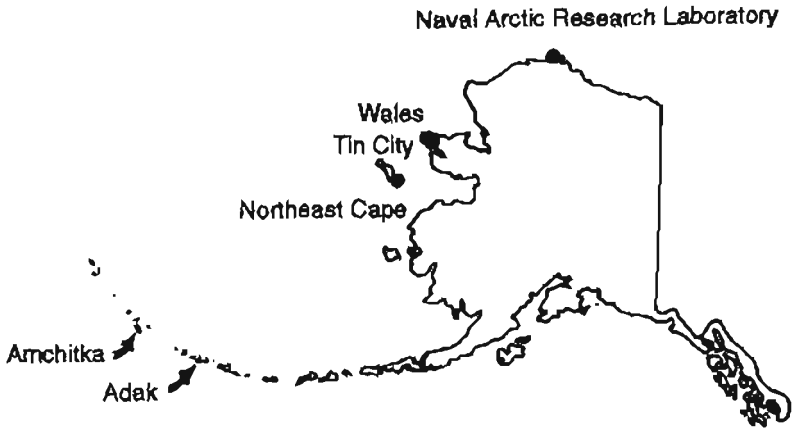
Purpose:

To identify the type and extent of contamination at six new sites not studied during a previous investigation during the Installation Restoration Program. To assist the Air Force with the construction of a bioremediation facility.

Status:

Initial sampling was done at the six sites. On the basis of the sampling, two sites require additional sampling, drilling of wells, and excavation of material. The bioremediation facility will be constructed to treat the excavated material.

HYDROLOGY OF NAVY SITES IN ALASKA



Period of Project:

June 1992 to September 1993

Chief:

Gordon L. Nelson
Anchorage

Funding:

U.S. Navy

Purpose:

To provide hydrologic overviews of varying, but appropriate complexity at six Navy sites in Alaska. The overviews will identify aquifers, hydrologic boundaries, surface-water bodies, wetlands, and other hydrologic features.

Status:

New project.

Planned Reports:

Nelson, G.L., Hydrology of Adak Naval Air Station, Alaska: U.S. Geological Survey Administrative Report.

_____Hydrology of a U.S. Navy site at Tin City, Alaska: U.S. Geological Survey Administrative Report.

_____Hydrology of a U.S. Navy site at Wales, Alaska: U.S. Geological Survey Administrative Report.

GROUND-WATER MAPPING AT THE UNIVERSITY OF ALASKA, FAIRBANKS

Period of Project:

June 1992 to May 1993

Chief:

Michael R. Lilly
Fairbanks

Funding:

U.S. Geological Survey
University of Alaska-Fairbanks

Purpose:

To define the seasonal variability of the water table both in terms of flow directions and vertical fluctuations. To assist the University of Alaska determine the source of benzene contamination in several university wells, two of which supply drinking water.

Status:

The project is being expanded to include new wells drilled for the Alaska Department of Transportation and Public Facilities and the Alaska Department of Environmental Conservation. Surface- and ground-water levels have been measured. Horizontal and vertical surveys have been completed.

Planned Reports:

Lilly, M.R., Ground-water mapping and geohydrology in the University of Alaska-Fairbanks area: U.S. Geological Survey Water-Resources Investigations Report.

_____Influence of river and slough systems on ground-water conditions: Journal article.

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Downey, J.S., and Sinton, P.O., 1990, Geohydrology and ground-water geochemistry at a sub-arctic landfill, Fairbanks, Alaska: U.S. Geological Survey Water-Resources Investigations Report 90-4022, 25 p.

Heinrichs, T.A., 1991, Black Rapids Glacier, Alaska--unexpected behavior during the quiescent phase of a surge-type glacier [abs.]: American Geophysical Union 1991 Fall Meeting Program and Abstracts, p. 158.

Lamke, R.D., 1991, Alaska floods and droughts, *in* U.S. Geological Survey, National water summary 1988-89--Hydrologic events and floods and droughts: U.S. Geological Survey Water-Supply Paper 2375, p. 171-180.

Lilly, M.R., 1991, Determination of fluid transport pathways and pore ice formation in frozen porous media [abs.]: American Geophysical Union 1991 Fall Meeting Program and Abstracts, p. 163.

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Lipscomb, S.W., 1991, Streamflow and sediment transport characteristics of the lower Campbell Creek basin, Anchorage, Alaska, 1986-88: U.S. Geological Survey Water-Resources Investigations Report 91-4074, 38 p.

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Seitz, H.R., 1991, Hydrologic conditions at Anaktuvuk Pass, Alaska, 1989: U.S. Geological Survey Open-File Report 90-591, 13 p.

Seitz, H.R., and Thomas, D.S., 1990, Fathometer data from Bart Lake and Lake Dorothy near Juneau, Alaska, 1988-89: U.S. Geological Survey Open-File Report 90-152, 14 p.

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