



**ALASKA**

Organization and Status of Programs

1978

GEOLOGICAL SURVEY CIRCULAR 772-A

# The United States Geological Survey in Alaska: Organization and Status of Programs in 1978

Kathleen M. Johnson, Editor

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G E O L O G I C A L   S U R V E Y   C I R C U L A R   7 7 2 - A

1978

**United States Department of the Interior**  
CECIL D. ANDRUS, *Secretary*



**Geological Survey**  
W. A. Radlinski, *Acting Director*

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# The United States Geological Survey in Alaska: Organization and Status of Programs in 1978

Kathleen M. Johnson

## ABSTRACT

This report of the activities of the U.S. Geological Survey in Alaska is organized in four parts: (1) services and responsibilities of the U.S. Geological Survey; (2) organization of the U.S. Geological Survey; (3) current projects of the U.S. Geological Survey; and (4) cooperative projects with Federal, State, and local agencies.

## SERVICES AND RESPONSIBILITIES OF THE U.S. GEOLOGICAL SURVEY

### INTRODUCTION

For the many people and groups deeply interested in Alaska, a report on the Alaskan activities of the United States Geological Survey serves many purposes. For the professional geologist, hydrologist, or topographer, it contains up-to-date accounts of recent results. For various private groups, the business community, and other Federal and State agencies, there is news of investigations intended to assist them in their separate and important tasks. And for the citizen whose pleasure and livelihood are linked to the natural surroundings, the report is an introduction to Geological Survey studies of the land and water of the incomparable State of Alaska.

To reach such a complex audience, this circular is organized into four chapters. In this introductory chapter, the services and responsibilities of the Geological Survey are discussed. The second chapter presents the organizational structure of the Survey, as well as a discussion of the organizational segments serving Alaska. The next two chapters together constitute a comprehensive description of Alaskan projects active during 1978, with the third describing Survey projects and the fourth detailing cooperative projects between the Survey and other Federal and Alaskan State and local agencies.

## SERVICES

The U.S. Geological Survey serves the needs of the citizens and their government for information on the land and water of the United States. This information is obtained and analyzed by U.S.G.S. scientists and distributed to the public in the form of maps and reports. Most Survey maps and reports are published by the Federal government and announced by means of monthly notices, "New Publications of the Geological Survey," free on application to the Geological Survey, Reston, Va. 22092. Reports referred to as book publications may be ordered from:

Branch of Distribution  
U.S. Geological Survey  
1200 South Eads Street  
Arlington, Va. 22202

Maps may be ordered from the following places:

Branch of Distribution, Central Region  
U.S. Geological Survey  
Box 25286  
Federal Center  
Denver, Colo. 80225

Alaska Distribution Section  
U.S. Geological Survey  
Federal Building, Box 12  
101 12th Avenue  
Fairbanks, Alaska 99701

Maps and book publications on Alaska are available from the U.S. Geological Survey, Public Inquiries Office, 108 Skyline Building, 508 Second Avenue, Anchorage, Alaska 99501.

Some studies, in particular, those of high scientific merit, are published in professional journals;

these are available at university and college, industrial, and some major public libraries.

### RESPONSIBILITIES

In addition to obtaining and analyzing land and water-resources data, the Geological Survey supervises the extraction of valuable mineral commodities from many types of federal lands, including the offshore Outer Continental Shelf.

The Alaskan activities of the Geological Survey are carried out through all of its four main operating divisions and by a number of interdivisional programs, committees, and working groups, briefly described in the following sections.

### ORGANIZATION OF THE U.S. GEOLOGICAL SURVEY

The organization of the U.S. Geological Survey and its four main operating divisions is portrayed in figures 1 through 5.

The main structure of the Geological Survey (fig. 1) consists of four operating divisions—Geologic, Conservation, Water Resources, and Topographic—and three support divisions—Computer, Administrative, and Publications. Headquarters for all divisions are in Reston, Va.

Investigations of the geology of the United States and certain other countries are mainly conducted in the Geologic Division (fig. 2), comprising seven operating offices supported by an

Office of Scientific Publications. The headquarters of the offices are located in Reston, Va.

The Conservation Division supervises oil, gas, and other mineral-extraction activities on certain federal lands. The regional responsibilities of the Division are vested in four operational offices. The Alaskan activities of the Conservation Division, detailed in figure 3, are supervised by the Western Region Office in Menlo Park, Calif.

The organization of the Water Resources Division of the Geological Survey is shown in figure 4 (with Alaskan activities emphasized). The main operating units are located under four regional subdivisions supported by Assistant Chief Hydrologist Offices for Scientific Publications and Data Management, Operations, and Research and Technical Coordination.

Topographic and other special-purpose geographic maps are prepared by the Topographic Division (fig. 5). The principal work responsibilities are met by four regional mapping centers under the supervision of the Chief of the Topographic Division.

### ORGANIZATIONAL SEGMENTS SERVING ALASKA

All four operational Divisions of the Geological Survey—Conservation, Geologic, Topographic, and Water Resources—function in Alaska and are supported by the Administrative, Publications, and Computer divisions as well as other organizational entities of lower than Division rank.

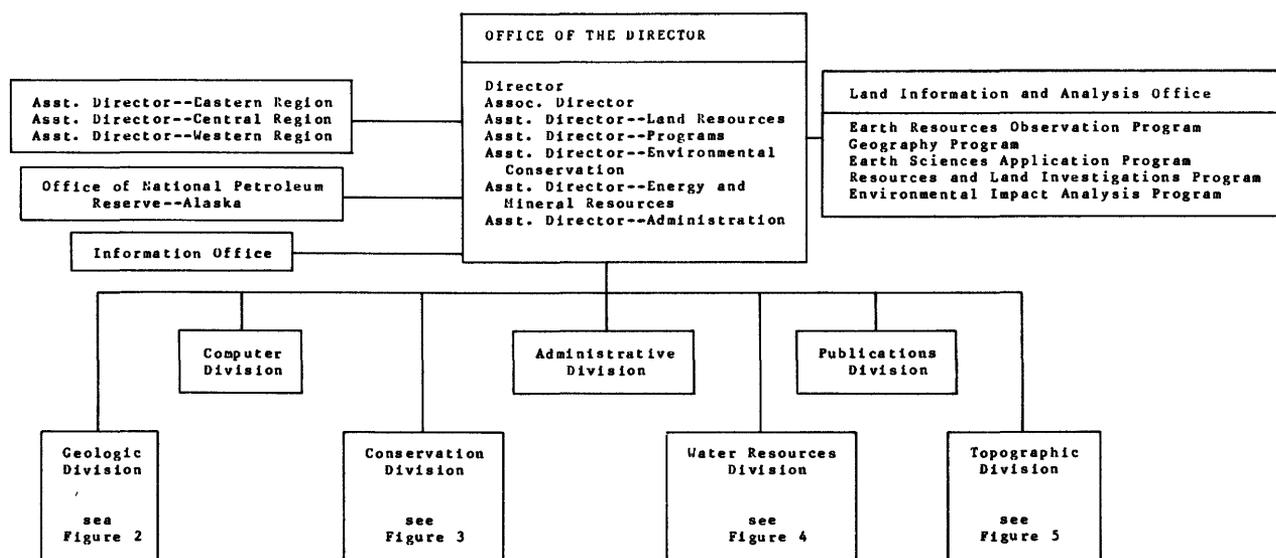


FIGURE 1.—Organization of the U.S. Geological Survey.

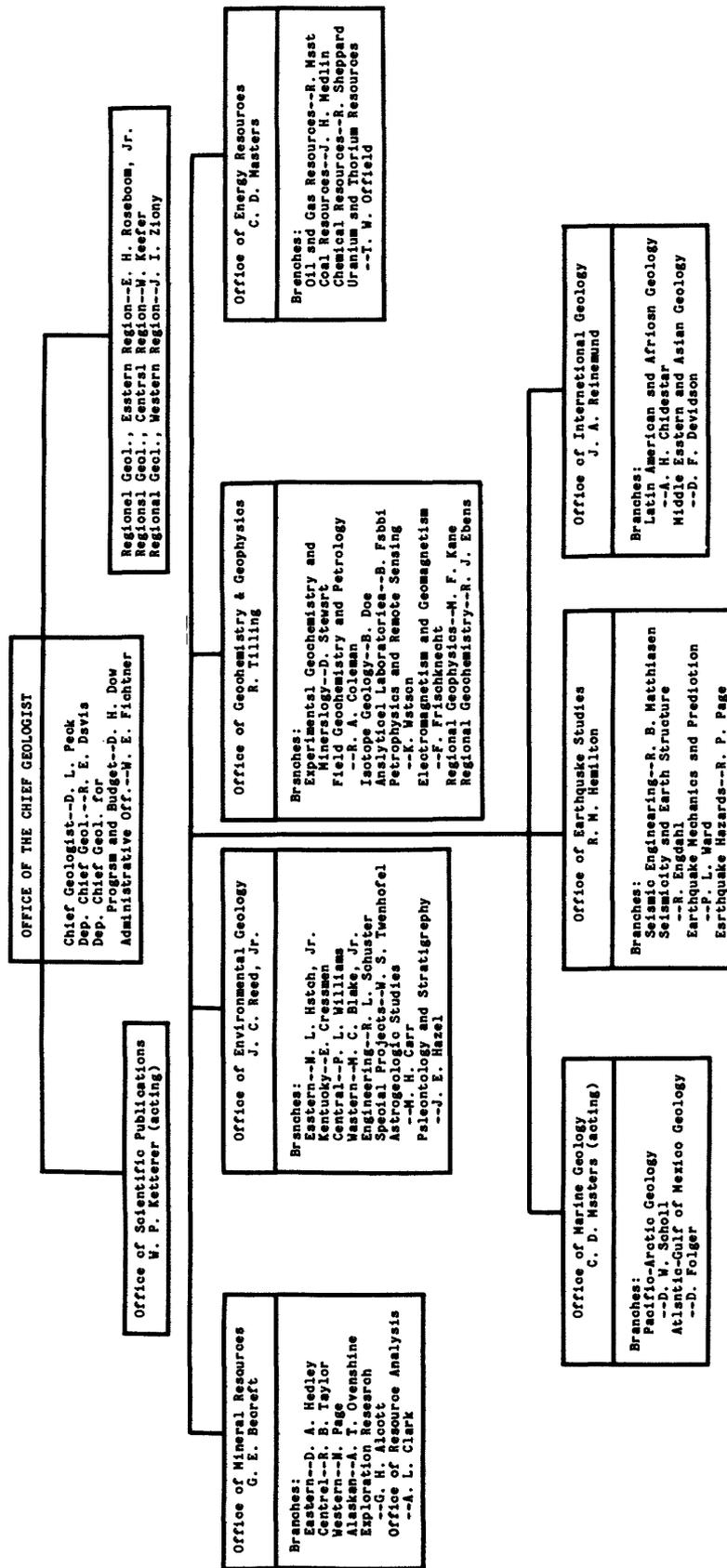


FIGURE 2.—Organization of the Geologic Division.

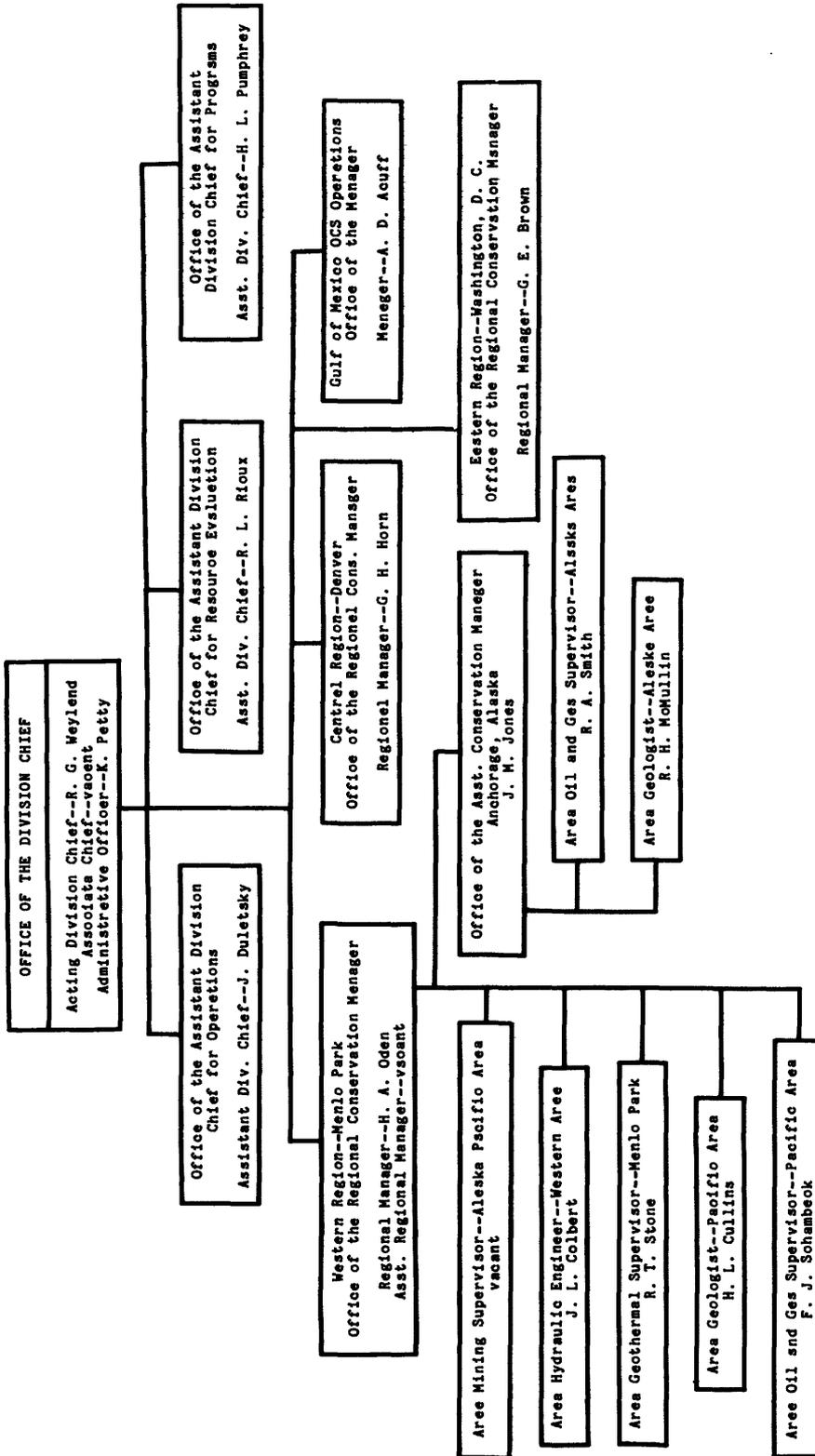


FIGURE 3.—Organization of the Conservation Division.

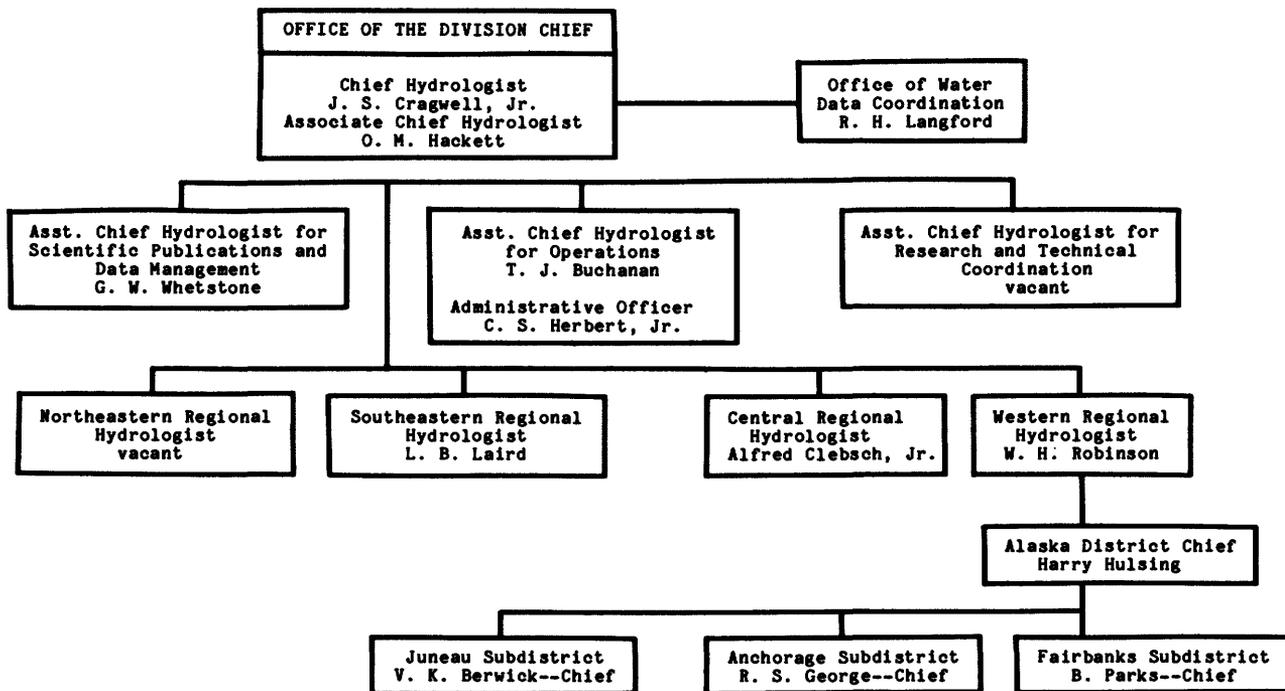


FIGURE 4.—Organization of the Water Resources Division.

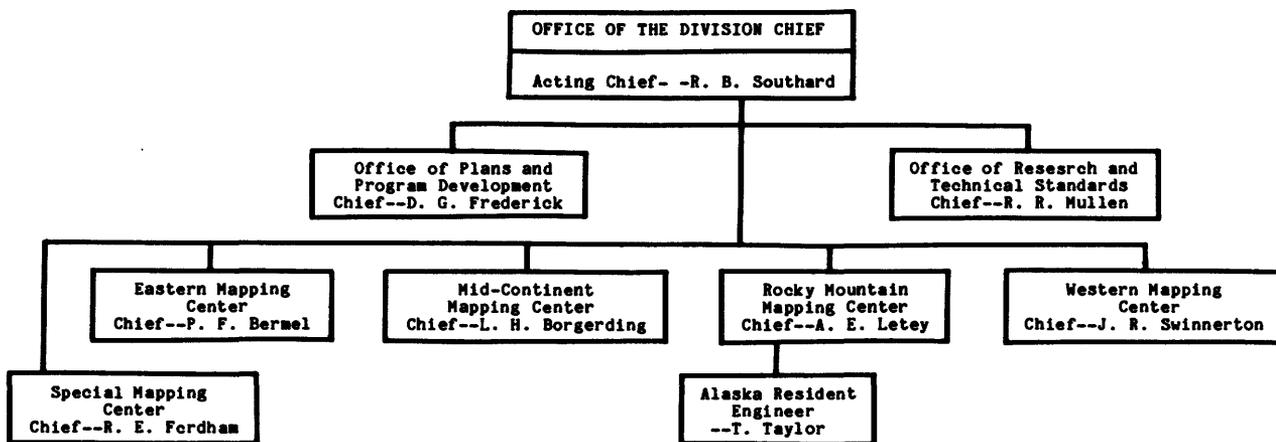


FIGURE 5.—Organization of the Topographic Division.

## CONSERVATION DIVISION

The Conservation Division examines and classifies federal lands as to their mineral character and waterpower and water-storage values; determines estimated resource values for onshore and offshore competitive lease sales; supervises exploration and development for leases on Federal, Indian, and certain Naval petroleum reserve land, and the offshore Outer Continental Shelf; and maintains accounts and collects rentals and royalties from related mineral production.

Consistent with the national concern for environmental protection, the Division's regulations and procedures are subject to frequent reappraisal and revision in order to avoid or mitigate consequences that may result from pollution incidents, surface damage from mining, geothermal, and petroleum operations, or other hazards that may be associated with mineral operations conducted under leases and prospecting permits.

All Alaskan activities are supervised by the Western Region Conservation Manager, 345 Middlefield Road, Menlo Park, Calif. 94025. The Office of the Alaska-Pacific Mining Supervisor is located at the Menlo Park address.

The Hydraulic Engineer for the Western Region is located at 830 N.E. Holladay, P. O. Box 3202, Portland, Oregon 97208, and the Alaska waterpower evaluation program is a function of that office. The offices of both the Alaska Area Geologist, R. H. McMullin, and the Alaska Area Oil and Gas Supervisor, Rodney A. Smith, are located at 800 A Street, Anchorage, Alaska 99501.

## GEOLOGIC DIVISION

The current scientific investigations of the Geologic Division in Alaska include geologic mapping and mineral-resource evaluation, primarily at scales of 1:250,000 and 1:63,360; mineral district mapping and evaluation; mineral-resource appraisal; geochemical studies and sampling, particularly related to mineral deposits; petroleum-resource surveys; aeromagnetic and gravity surveys and interpretation; engineering-geology studies in urban areas and along transportation routes; earthquake studies; isotope age determination and interpretation; heat flow studies, and submarine sampling, sub-bottom profiling, and other geophysical studies of the ocean floor.

Activities in Alaska are the responsibility of several groups within the Geologic Division: the Branch of Alaskan Geology, the Office of Earthquake Studies, the Office of Energy Resources, and the Office of Marine Geology at the Pacific Coast Field Center, 345 Middlefield Road, Menlo Park, Calif. 94025; the Branches of Regional Geophysics, Electromagnetism and Geomagnetism, Exploration Research, Isotope Geology, and Engineering Geology at the Rocky Mountain Field Center, Denver, Colo. 80225; and the Branch of Paleontology and Stratigraphy at the National Center in Reston, Va. 22092. Several other branches in the Geologic Division provide services or conduct research in cooperation with these units. The Branch of Alaskan Geology maintains two offices in Alaska: the main one at 1209 Orca Street, Anchorage, Alaska 99501; (907) 272-8228, with Thomas P. Miller as geologist in charge, and the other at the University of Alaska, P. O. Box 80586, Fairbanks, Alaska 99708; (907) 479-7245, with Florence R. Weber in charge. The Branch of Electromagnetism and Geomagnetism maintains observatories at Fairbanks (College), Barrow, and Sitka. The College and Barrow observatories are under the direction of J. B. Townshend, Yukon Drive on West Ridge, Fairbanks, Alaska 99701; (907) 479-6146. The Sitka Observatory is directed by Willis Osbakken, P.O. Box 158, Sitka, Alaska 99835; (907) 747-3332.

In its study of Alaskan geology, the Survey supports and cooperates with several universities and other public agencies, including the State of Alaska Division of Geological and Geophysical Surveys.

## WATER RESOURCES DIVISION

The Alaskan water resources program includes the collection, analysis, and interpretation of data on the availability and quality of surface and ground water and includes special studies and research that seek to evaluate and increase the effective use of water resources data in the State. These basic water data provide a broad base to support the proper management of the State's water and related land resources.

Investigations in the western United States, including Alaska, are under the jurisdiction of the Western Region office and are the responsibility of W. H. Robinson, Regional Hydrologist, 345

Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2337. The Anchorage District office is in the Skyline Building, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526, under the supervision of Harry Hulsing, District Chief. This office is operated on a year-round basis and is responsible for planning and supervising Alaskan activities.

The field activities of the Alaska District are a function of the three Subdistrict offices: Anchorage, Fairbanks, and Juneau. The Anchorage Subdistrict office is responsible for operations in south-central and western Alaska and is under the supervision of Raymond S. George. It is located at 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563. The Juneau Subdistrict office, which is responsible for operations in southeastern Alaska, is under the supervision of Vernon K. Berwick, and is located at 441 Federal Building, P.O. Box 1568, Juneau, Alaska 99801; (907) 586-7216. The Fairbanks Subdistrict office is responsible for operations in northern Alaska and is under the supervision of James P. Meckel. It is located at 310 First Avenue, Fairbanks, Alaska 99701; (907) 452-1951, ext. 176.

#### TOPOGRAPHIC DIVISION

The main task of the Topographic Division is the preparation of the various series of maps of the National Mapping Program, which includes all of the quadrangle maps covering the 50 States of the Nation. The National Mapping Program of the Geological Survey is under the direction of R. B. Southard, Acting Chief, Topographic Division. Doyle G. Frederick is Chief of the Office of Plans and Program Development, which is responsible for initiating and controlling the work of the Division.

Mapping operations in Alaska are the responsibility of A. E. Letey, Chief, Rocky Mountain Mapping Center, who directs the operational functions of the Mapping Center, including all field and office operations. He may be consulted at the Federal Center, Denver, Colo. 80225; (303) 234-2351.

The Resident Engineer in Alaska is Thomas E. Taylor, who serves as the Topographic Division's representative in that state. He may be contacted at 218 E Street, Anchorage, Alaska 99501; (907) 279-5812.

#### PUBLICATIONS DIVISION

The Publications Division edits manuscripts of scientific papers and technical reports; reproduces topographic, geologic, and other maps; prepares exhibits and visual aids; disseminates general Survey program and publications information and distributes maps to the public. The Division maintains two offices in Alaska for the customers' convenience in obtaining maps, book reports, and other material prepared by the U.S. Geological Survey.

The Alaska Distribution Section at Federal Building, Box 12, 101 12th Avenue, Fairbanks, Alaska 99701; (907) 456-7535, supervised by Natalie A. Cornforth under the direction of the Publications Division, Western Region, Menlo Park, Calif., distributes maps and map-related publications by mail and over the counter to the public, to 30 commercial dealers in Alaska, and to Federal and State agencies. A schedule of map prices and discounts is available on request.

A Public Inquiries Office, at 108 Skyline Building, 508 Second Ave., Anchorage, Alaska 99501; (907) 277-0577, supervised by Margaret I. Erwin under the direction of the Office of Public Inquiries, Publications Division, National Center, Reston, Va., maintains a stock of Alaska topographic and geologic maps for over-the-counter sale, and, as an agent of the Superintendent of Documents, sells Geological Survey book reports on Alaska. It serves as a public contact point for Survey activities in the State and has a complete library of all Survey publications. The office is a depository for Alaska open-file reports and maintains a browse file containing microfilms of Landsat (satellite) images. Itineraries and personnel lists of all field parties are prepared as early in each year as possible and are available at the Public Inquiries Office for consultation.

#### ADMINISTRATIVE DIVISION

The Alaska Field Office of the Administrative Division is located at 204 Skyline Building, 218 E Street, Anchorage, Alaska 99501. This office, supervised by Betty J. McIntire, provides service and supply support to U.S. Geological Survey offices and personnel in Alaska; telephone number is FTS 265-4494, -5297 or commercial (907) 277-0569. A warehouse at Anchorage under

the immediate supervision of Harvey Haynes is located about 5 miles east of downtown Anchorage, just inside the boundary of Elmendorf Air Force Base, telephone (907) 752-3834. The address is: 5500 Oilwell Road, Elmendorf Air Force Base, Anchorage, Alaska 99506. A warehouse for the Fairbanks area located at Ft. Wainwright is staffed only if warranted by the level of field activity. The telephone number at Ft. Wainwright is (907) 353-4219.

#### EMERGENCY SEARCH AND RESCUE

To initiate search and rescue in cases of emergency, contact the Air Rescue Coordination Center at Anchorage at any time during the day or night. Communications can be made directly to the center, telephone (907) 277-2131, 752-2426, 752-3437, through the Alaska Field Office, either telephone or radio (see section on "Radio Network"), nearest FAA Flight Service Station, military installation, or State Troopers. To the extent possible, specify location and nature of emergency, time of the accident, number of people involved, and the nature of possible injuries.

For the purpose of notifying headquarters and family of any emergency as soon as possible, contact Betty McIntire at FTS 265-4494 or commercial (907) 277-0569. Outside of office hours contact her at (907) 272-5398.

#### ALASKA SURVEY COMMITTEE

The Alaska Survey Committee provides a means for discussion and coordination of Alaska activities; all divisions of the Geological Survey operating in Alaska are represented on the Committee. Thomas E. Taylor, Topographic Division, chairs the group for 1978; other members are Harry Hulsing, Water Resources Division; Margaret I. Erwin, Publications Division; Thomas P. Miller, Geologic Division; Joseph Jones, Conservation Division; George Gryc, Office of National Petroleum Reserve in Alaska; and Betty J. McIntire, Administrative Division.

#### RADIO NETWORK

Radio officer for Alaska is Florence Weber, Geologic Division, Fairbanks, Alaska 99708; (907) 479-7245. Two frequencies 5380 (5381.5) kHz and 3211.0 (3212.5) kHz (both upper SSB) are the official frequencies for U.S.G.S. personnel. For the

1978 field season the U.S.G.S. base station in Anchorage, KWA 351, will monitor the above two frequencies during working hours. Alaska Public Fixed frequency 5167.5 (5168.9) kHz will be monitored by commercial stations WKD 22 in Anchorage and KGA 85 "Broadmoor" in Fairbanks from 6:00 a.m. through 9:00 p.m. and 7:00 a.m. through 10:00 p.m., respectively.

The sunspot cycle minimum lasted longer than usual, but we are now about one-third of the way up the new cycle and rising rapidly. Both 3 and 5 mHz frequencies ought to be good for communications locally in Alaska during the day for the summer of 1978. Operators may find that 5 mHz is slightly better because of less ionospheric absorption.

#### ALASKA CORE LIBRARY

The Alaska Core Library is housed in three frame buildings located at the corner of Boyd and Manor Streets, Government Hill, in Anchorage. The library is managed by the Branch of Alaskan Geology on behalf of a user board that includes Branch of Alaskan Geology, Branch of Oil and Gas Resources, Conservation Division, and Office of National Petroleum Reserve in Alaska.

The nucleus of the library is about 25,000 feet of cores taken in the late 1940's and early 1950's during exploration of Naval Petroleum Reserve No. 4 (NPR-4), now known as National Petroleum Reserve in Alaska (NPRA). The library also includes some cores and a large amount of ditch cuttings from wells drilled on Federal land in other parts of Alaska. During the next few years a considerable addition of cores and cuttings is expected from U.S.G.S. exploration programs in NPRA.

#### LAND INFORMATION AND ANALYSIS OFFICE EROS PROGRAM

The EROS (Earth Resources Observation Systems) Program was established by the U.S. Department of the Interior in 1966 to assist in realizing the practical benefits in earth resource and environment inventory and monitoring that can be obtained by use of photography and other remotely sensed data acquired by aircraft and space craft, particularly the Landsat satellite. The EROS Program is managed by the U.S. Geological Survey and directed by John N. DeNoyer, with headquarters at EROS Program, U.S. Geological

Survey, 1925 Isaac Newton Square East, Reston, Va. 22092; (703) 860-7881 to -7885.

EROS Data Center, Sioux Falls, S. Dak. 57198; (605) 594-6511, is responsible for distributing Landsat imagery and other remotely sensed data to users throughout the world as well as developing techniques of application of remote sensing to various resource problems and assisting users in employing these techniques. A large staff of specialists in a variety of disciplines is available to assist in the development of new applications. Inquiries on specific problems or other matters, including future training opportunities, may be directed to the Branch of Applications at the Data Center.

In November 1974, an EROS Applications Assistance Facility was established in Alaska to improve the availability of technical assistance to Alaskan users. This facility, located at the Geophysical Institute, University of Alaska, Fairbanks, Alaska 99708; (907) 479-7487, was initially established by NASA to provide assistance to Alaskan ERTS-1 investigators and is now being operated under contract to the EROS Program to provide assistance to the Alaskan user community. The facility is supervised by Albert E. Belon, under the general direction of John M. Miller. Both manual and digital interpretation equipment, including a color additive viewer and minicomputer enhancer, is available. In addition, files are maintained of selected Landsat images, NASA and other aerial photographs, and other remotely sensed data on various parts of Alaska.

A Landsat browse file is maintained at the University of Alaska's Arctic Environmental Information and Data Center (AEIDC), located at 707 A Street, Anchorage, Alaska 99501; (907) 279-4523. Visitors may view black and white imagery (scale 1:1,000,000) which represents the best coverage of all areas of Alaska. Complete U.S. and non-U.S. coverage is available on microfilm.

Alaskan Landsat imagery is also available for inspection at the Public Inquiries Office, U.S. Geological Survey, Rm. 108, Skyline Building, 508 Second Ave., Anchorage, Alaska 99501.

#### GEOGRAPHY PROGRAM

The Geography Program applies knowledge from the geographic profession to activities of the Geological Survey. Specifically, the Program is

responsible for (a) developing and maintaining a data base on current land use and land cover nationwide with map and statistical output formats; (b) establishing standards and providing technical assistance to users; (c) developing new procedures for acquiring and processing remotely sensed data on land use and land cover; and (d) performing analyses involving these land use data. The program serves as a bridge between the physical and social sciences.

The Geography Program is in the fourth year of activity related to the nationwide mapping of land use and land cover on a systematic and comprehensive basis. The classification system developed by the Geological Survey in conjunction with other Federal and State agencies is being used in this mapping (Anderson, J. R., Hardy, E. E., Roach, J. T., and Witmer, R. E., 1976, A land use and land cover classification system for use with remote sensor data: U.S. Geological Survey Prof. Paper 964, 28 p.). A Geographic Information Retrieval and Analysis System has been developed (Mitchell, W. B., Guptill, S. C., Anderson, K. E., Fegeas, R. C., and Hallam, C. A., 1977, GIRAS; A Geographic Information Retrieval and Analysis System for Handling Land Use and Land Cover Data: U.S. Geological Survey Prof. Paper 1059, 16 p.) and is being applied to the data extracted from the land use/land cover and associated maps (political units, hydrologic units, census county subdivisions, Federal land ownership, and in some cases, State land ownership) being produced by the Geography Program.

Research efforts are underway in the Geography Program to develop techniques for producing land-use and land-cover data and maps from Landsat computer-compatible tape digital data. Landsat data are first classified by computer processing. Sites of typical land-use and land-cover are identified in the field and then spectrally and geographically related to the Landsat data.

#### ALASKAN PROJECTS OF THE U.S. GEOLOGICAL SURVEY

Much of the work of the Geological Survey is organized and accomplished in projects in which the investigations of one or more scientists, engineers, and technicians are directed by a project chief. Some of the projects are statewide in scope,

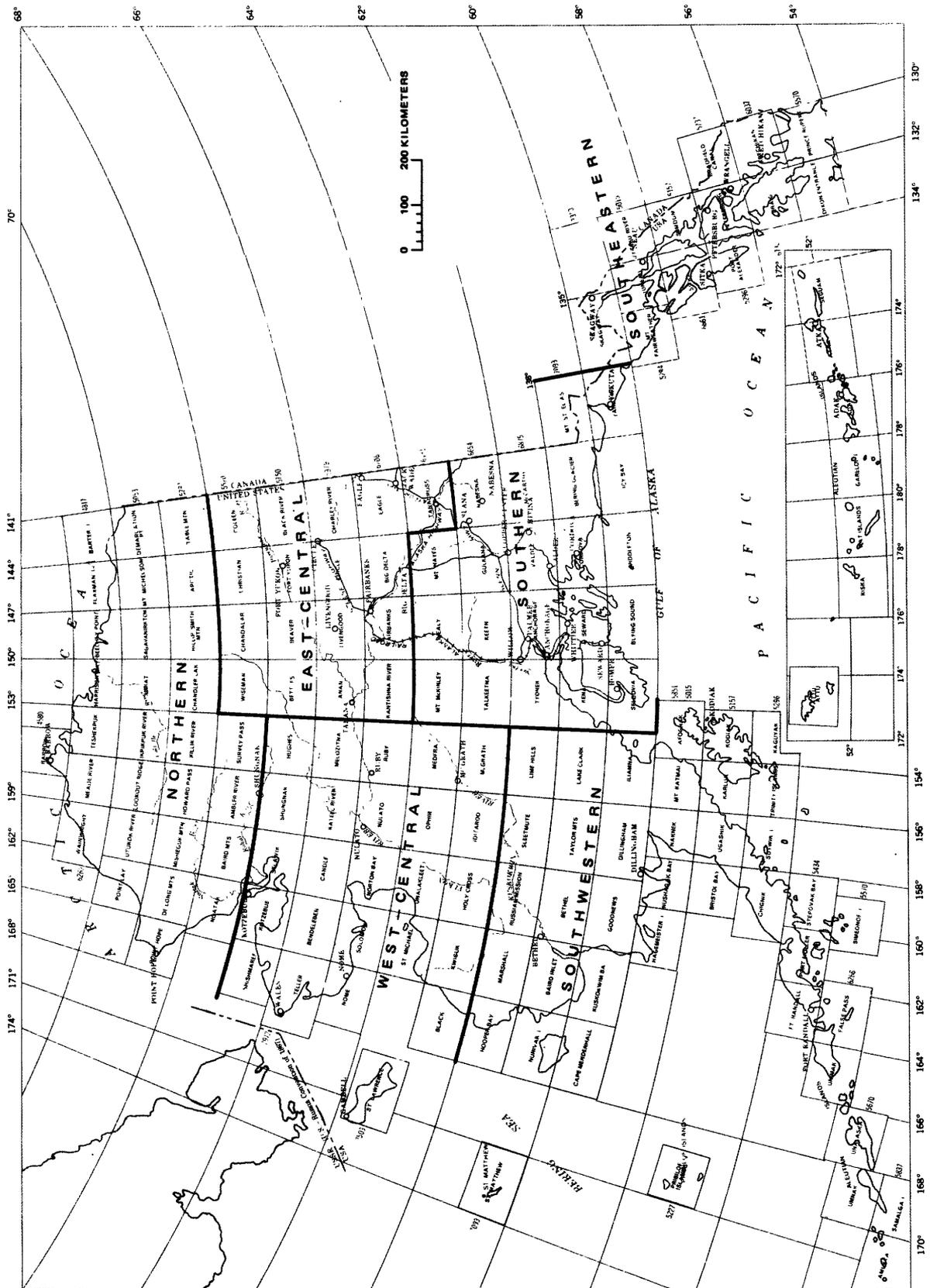


Figure 6.—Regions of Alaska used in this report.

but most focus on one or more aspects of topography, hydrology, or geology in particular parts of Alaska. The regions into which Alaska is divided for this report are shown in figure 6; project locations are shown in figures 7-16. This chapter summarizes statewide and regional Survey projects active during 1978. Summarized in a later part are projects undertaken in cooperation with various other Federal, State of Alaska, and local agencies. Projects in more than one region, but not statewide in scope, are shown on maps and tables for all regions covered, with summary given in the primary region.

#### STATEWIDE PROJECTS

*Project:* Mineral resources of Alaska.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Edward H. Cobb, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2483.

*Project objectives:* As a continuing project, office studies of mineral occurrence data are kept current and special-purpose maps, reports, and reference lists are prepared whenever the need arises. Most data are organized so they are amenable to entry into computerized storage and retrieval banks.

*Project status:* As this is a continuing project, no percentage-of-completion data are applicable. Records are now current as of December 31, 1976, and will be current as of December 31, 1977, early in 1978.

*Project:* Technical Data Unit.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Mary E. Tailleir, U. S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2342.

*Project objectives:* The Technical Data Unit aims to provide prompt, complete, and up-to-date listings of all geologic data published on Alaska by the U. S. Geological Survey, the U. S. Bureau of Mines, and the State of Alaska Division of Geological and Geophysical Surveys. In

addition, the unit serves as a source of maps and U.S.G.S. publications for geologists of the Alaskan Branch and other Menlo Park U. S. Geological Survey Branches doing research in Alaska.

*Project status:* As this is a continuing project, no percentage-of-completion data are applicable. Requests for information are filled as received.

*Project:* Alaskan information processing studies.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Elizabeth Yount, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2477.

*Project objectives:* This is an on-going project aimed at providing computer-based technical data files, maintaining contact with other agencies that compile or create files of Alaskan geologic or resource data, and providing training, assistance, and documentation on running computer programs.

*Project status:* As this is a continuing project, no percentage-of-completion data are applicable.

*Project:* Alaska core library.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* W. L. Adkison, 2525 C Street, Suite 400, Anchorage, Alaska 99501; (907) 276-7422, ext. 275; Core library (907) 274-1345.

*Project objectives:* The main objective of the core library is to preserve and make available for study the Survey's large collection of Alaskan well cores. Most of these cores are from the National Petroleum Reserve in Alaska (NPRA), formerly known as Naval Petroleum Reserve No. 4. During the next few years, the library will expedite the handling and storing of new cores and samples from the Survey's present exploration program in NPRA.

*Project status:* This is a continuing project. Repairs and renovation of the buildings were largely completed in late 1977, and the library was organized and functioning early in 1978.

*Project:* Alaska Mineral Resource Assessment Program (AMRAP).

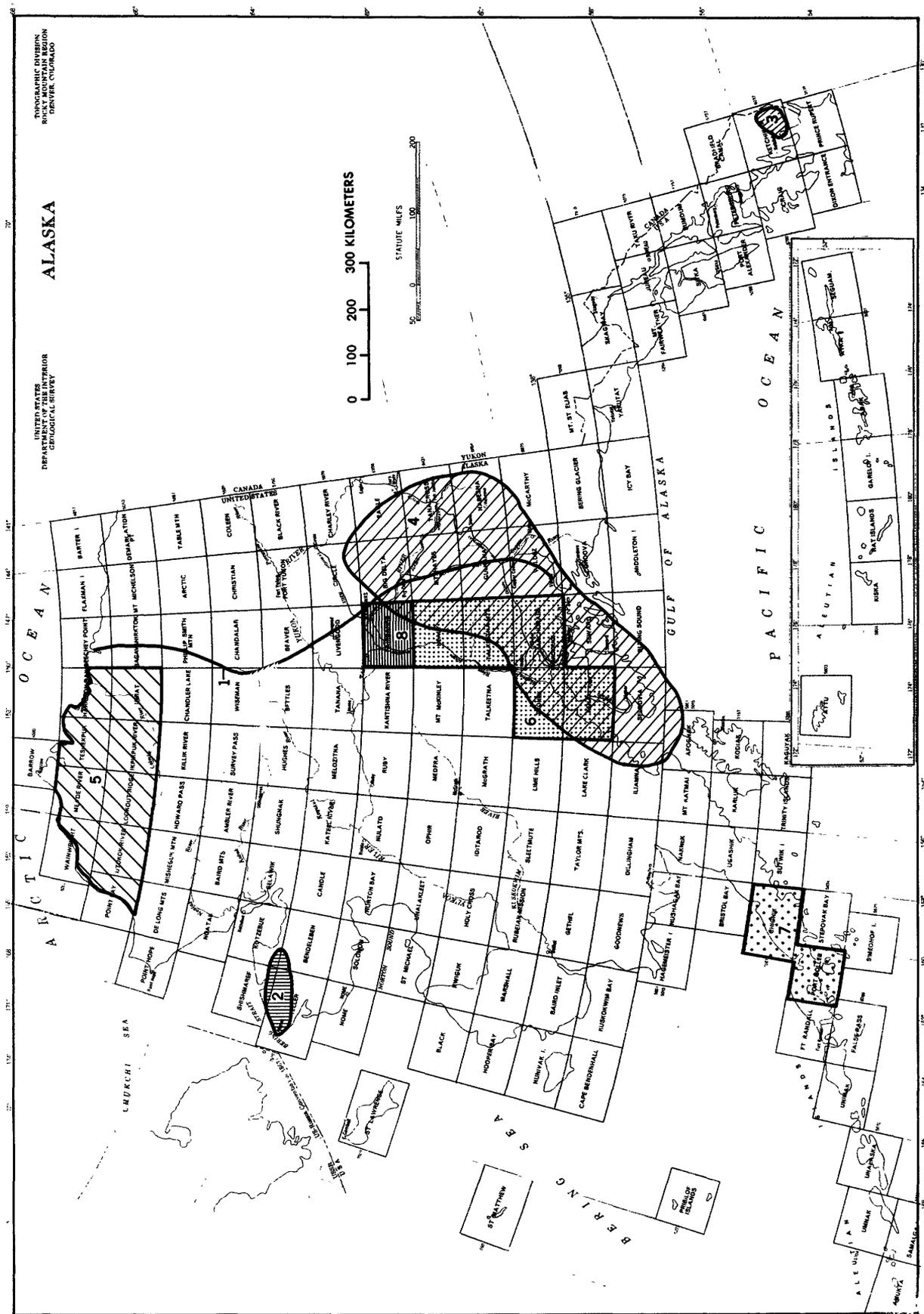


Figure 7.—Locations of statewide projects.

TABLE 1.—Statewide projects

Name of Project; map key	Personnel	Type of work	Area
Mineral resources of Alaska	E.H.Cobb	Office studies, compilation	Statewide
Technical Data Unit	M.E.Tailleux, Ellen White	Supply data to Geological Survey personnel and to general public	Statewide
Alaskan Branch information processing	Elizabeth Yount	Creation, maintenance and promulgation of computer banks of geologic data	Statewide
Alaska core library	W.L.Adkison	Store Alaskan well cores and make them available for study	Statewide
Alaska Mineral Resource Assessment Program (AMRAP)	H.C.Berg and other Geologic Division personnel	Appraisal of mineral resources through geologic mapping and geophysical and geochemical analyses	Statewide
Landsat imagery and applications in Alaska (AMRAP)	N.R.D.Albert, W.C.Steele, J.R.LeCompte, and Topographic Division personnel	Interpretation of Landsat imagery in support of AMRAP systematic and synoptic objectives	Statewide
Geochronology and geochemistry of igneous rocks and related ore deposits	M.L.Silberman, C.L.Connor	Geochronology, geochemical sampling, geochemical data processing	Statewide
Arctic Environmental Studies Program	O.J.Ferrians, Jr. and other Geologic and Water Resources Division personnel	Field and office collection and use of geotechnical data related to transportation corridors and other areas of development	Statewide
Arctic engineering geology (TAPS); fig. 7 (area 1)	A.T.Ovenshine and other Geologic and Water Resources Division personnel	Collection of basic data and report preparation	Trans-Alaska pipeline corridor, Prudhoe Bay to Valdez
Hydrologic environment of the trans-Alaska pipeline system (TAPS); fig. 7 (1)	J.M.Childrens	Operation of basic-data network of stream-gages and water-quality monitoring sites, studies of hydrologic hazards such as glaciers, icings, floods, and channel erosion, assessment of impact on hydrology	Trans-Alaska pipeline corridor, Prudhoe Bay to Valdez
Alaska earthquake hazards	George Plafker	Evaluation of risk from tectonic displacement, seismic shaking and secondary geologic effects	Statewide
Alaska geothermal reconnaissance	T.P.Miller, R.L.Smith	Geologic mapping, petrologic studies	Interior Alaska, Aleutian Islands, Alaska Peninsula, Wrangell Mountains
Tin, tungsten, and molybdenum deposits in Alaska; fig. 7 (2), (3)	Travis Hudson	Petrology and geochemistry	Western Seward Peninsula, Ketchikan quadrangle
Environmental geology of Alaska coal lands	H.R.Schmoll, L.A.Yehle, A.F.Chleborad, A.D.Pasch	Fieldwork and serial-photographic mapping, primarily of surficial deposits, with environmental interpretations	Statewide, with present emphasis in southern Alaska

TABLE 1.—Statewide projects—Continued

Name of Project; map key	Personnel	Type of work	Area
Alaska gravity surveys	D.F. Barnes	Gravity surveys in support of AMRAP and Wilderness Area projects	Statewide
Uranium potential of Tertiary basins, Alaska; fig. 7 (area 4)	K.A. Dickinson, J.A. Campbell	Stratigraphic studies, geochemical analyses	Statewide, with present emphasis in Cook Inlet, Susitna Lowlands, Matanuska Valley, and Copper River basin
Coal resources of Alaska; fig. 7 (5), (6), (7)	To be assigned	Coal resource assessment	Statewide
Paleozoic paleontology and stratigraphy of Alaska	J.T. Dutro, Jr., A.K. Armstrong, and other Paleontology and Stratigraphy Branch personnel	Field and laboratory paleontologic and biostratigraphic studies	Statewide
Geothermal studies	A.H. Lachenbruch, L.A. Lawver, R.J. Munroe, J.H. Sass	Thermal gradient measurements in boreholes and collection of samples	Statewide
Land-use/land-cover mapping and data compilation; fig. 7 (8)	G.L. Loelkes	Land-use and land-cover mapping	Statewide, with present emphasis in Fairbanks quadrangle
Arctic water resources and environmental studies	J.M. Childers	Investigations of arctic Alaska water resources, hydrologic hazards to development and potential impacts on water resources resulting from potential development	Arctic and subarctic Alaska

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Program manager:* Henry C. Berg, U. S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2266.

*Project objectives:* The major objectives of the AMRAP program are (1) assessment of mineral endowment of Alaska lands having resource potential, and (2) assessment of mineral resources of areas selected for classification as national interest (d-2) lands under the Alaska Native Claims Settlement Act.

*Project status:* Studies for objective 1 (above) are being completed at 1:250,000 scale. Final reports have been published for three quadrangles, studies are in progress in twelve areas, and seven projects are scheduled to start fieldwork in 1978.

Reports and maps at 1:1,000,000-scale are being prepared for objective 2. They will be completed and published in early 1978.

*Project:* Landsat imagery and applications in Alaska (AMRAP).

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Nairn R. D. Albert, U. S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2025.

*Project objectives:* The principal objectives of this project are: (1) to furnish AMRAP team leaders and principal investigators with state-of-the-art Landsat materials for reconnaissance purposes; (2) to provide unique geologic, structural, and tectonic information relevant to mineral-resource assessment for each AMRAP quadrangle; and (3) to construct a controlled 1:1,000,000-scale Lambert conformal false-color Landsat mosaic of Alaska.

The types of Landsat products used are: (1) black and white, single-band Landsat mosaic of Alaska; (2) computer-enhanced false color, color ratio, simulated color and first-

derivative black and white images; and (3) interactive computer displays allowing detailed analysis of specific areas.

*Project status:* The Nabesna, McCarthy, and Tanacross quadrangle studies have been completed and published. The Talkeetna and Chandalar quadrangle manuscripts are in review. Computer compatible tapes for Chignik, Sutwik Island, Lake Clark, Medfra, and Valdez quadrangles are being ordered and will be processed at the EROS Data Center in Sioux Falls, South Dakota, or by a local commercial digital processing facility. Images for the Philip Smith Mountains, Goodnews, Hagemester Island, Ambler River, Survey Pass, Big Delta, Ketchikan, Prince Rupert, Seward, Blying Sound, and Talkeetna Mountains quadrangles have been processed by the Computer Center Division, Flagstaff, Arizona and are being analyzed.

Over 130 false-color images to be used in the 1:1,000,000-scale mosaic have been generated by a commercial photographic laboratory. Photogrammetric control has been established for all images and rectification of images in the northern region was necessary. Actual construction of the mosaic of most of Alaska (excluding St. Lawrence Island, the Aleutians, and southeastern Alaska) is ready to begin. Recent decisions call for the later addition of southeastern Alaska to the mosaic.

*Project:* Geochronology and geochemistry of igneous rocks and related ore deposits in Alaska.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* M. L. Silberman, U. S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2267.

*Project objectives:* The objective is to study, within Alaska, both mineralized and unmineralized plutons, stocks, and related volcanic rocks in mining districts and AMRAP project areas to ascertain: (1) the chemical and mineralogic nature of the igneous rocks; (2) the origin of the igneous rocks; (3) the relations in space and time between the igneous rocks and associated ore deposits that bear on the genesis of the ore deposits; and (4) the regional history

of Paleozoic, Mesozoic, and Cenozoic magmatism. Accomplishment of these basic objectives will lead to development of criteria for exploration to locate new ore deposits. Recognition of areas favorable for location of new ore deposits and evaluation of mineral potential of areas known to have them are hampered by lack of knowledge of how and why ore deposits form. Knowledge of the role of igneous rocks in ore-forming processes is vital to understanding ore genesis. Spatial association alone suggests an important causative relation that should be evaluated.

*Project status:* Work on geochemical anomalies in the Willow Creek mining district has been completed, and some progress has been made on isotopic age investigations of the mineralization. Final reports on the Willow Creek area are expected to be completed by March, 1978.

Potassium-argon age studies have been completed in various areas in the Brooks Range, and in the Seward and Blying Sound quadrangles. The resulting data will be included in the AMRAP reports for these areas. The results of work in the McCarthy area has been reported by MacKevett and others in U.S. Geological Survey Circular 739.

In 1977, fieldwork and sampling for rubidium-strontium and potassium-argon geochronology were begun in the Ruby and Medfra quadrangles of interior Alaska and in the Survey Pass quadrangle in northern Alaska. Completion of the analytical work on the present sample suite is estimated for January 1979. Additional fieldwork is planned for 1978 in Medfra.

*Project:* Arctic Environmental Studies Program.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Program manager:* Oscar J. Ferriars, Jr., U. S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2247.

*Project objectives:* Objectives are: (1) to investigate energy-related transportation corridors and other areas of development in Alaska in order to obtain base-line geotechnical data needed to aid in planning, designing, operating,

and maintaining engineering structures so that adverse environmental impacts will be minimized; to evaluate feasibility of proposed projects; and to prepare comprehensive Environmental Impact Statements; (2) to collect and synthesize pertinent engineering-geologic data made available during construction of the trans-Alaska oil pipeline, particularly emphasizing the character and distribution of surficial deposits and permafrost, Pleistocene and Holocene stratigraphy, glacial chronology, periglacial features, seismic phenomena, and geologic processes that are either unique to or are especially active in the arctic environment; and (3) to observe and record geotechnical maintenance and environmental problems that arise during the operation of the trans-Alaska oil pipeline in order to determine the location, character, and extent of these problems and their relation to geologic conditions and processes. These observations will allow an evaluation of the adequacy of the technical stipulations in controlling adverse environmental impacts and make it possible to improve stipulations for future engineering projects that would have a significant impact on the environment.

*Project status:* Major activities of the program during 1977 included: (1) continuing compilation of engineering-geologic maps of the Arctic Coastal Plain between Prudhoe Bay and the Canadian border, which covers the route of the proposed 312-km-long Alaskan Arctic Gas Pipeline; (2) continuing engineering-geologic mapping of the Tanana Valley transportation/development corridor between Fairbanks and the Canadian border, which covers the route of the proposed Alcan Gas Pipeline between Fairbanks and the Canadian border; (3) publication of surficial geologic maps of the Philip Smith Mountains and Chandalar quadrangles and continuing surficial geologic mapping of the Chandler Lake and Wiseman quadrangles, as well as parts of the Killik River, Survey Pass, Hughes, and Bettles quadrangles, all in the central Brooks Range; (4) publication of a summary report describing a seismic study of northern Alaska, which showed that during a 1-year recording period, 69 earthquakes of magnitudes 1 to 4 were recorded in a region that was previously considered to be aseismic;

(5) continuing exchange program with Soviet scientists and engineers on pipelines, permafrost, and environmental protection; and (6) collection of geotechnical data made available during the construction of the trans-Alaska oil pipeline.

*Project:* Arctic Engineering Geology (TAPS).

*Region and map key:* Statewide; fig. 7 (1).

*Organization designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* A. T. Ovenshine, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2231.

*Project objectives:* The principal objectives of this project include: (1) for the Technical Advisory Board to the Department of the Interior Task Force on Oil Development and for the Federal Task Force on Alaskan Oil Development, review reports and proposals concerning the trans-Alaska Pipeline System (TAPS) in terms of their accuracy and merit, prepare (in collaboration with other government agencies) an Environmental Impact Statement, prepare and review environmental and technical stipulations controlling the planning, construction, and operation of the proposed pipeline, and make recommendations in regard to possible alignment changes and special engineering-geologic problems; (2) collect, synthesize, and prepare for publication engineering-geologic data that will aid in determining the proper route, design, construction, and maintenance of TAPS and that will provide similar aid to other engineering activities generated by the petroleum-related development of northern Alaska; (3) collect and synthesize basic geologic data concerning the character and distribution of permafrost, surficial deposits, and bedrock along the pipeline route; and (4) evaluate new techniques, such as remote sensing, that will aid in the rapid determination of the distribution and character of permafrost and other geologic-environmental features and consequently will facilitate solving engineering-geologic problems.

*Project status:* Most of the objectives of this project have been accomplished, and the project will be terminated at the end of fiscal year 1978. More than 50 reports have been published in-

cluding the Environmental Impact Statement, Environmental and Technical Stipulations, and preliminary engineering-geologic maps of the entire pipeline route. Current activities emphasize the collection of basic geologic, seismic, and hydrologic data that are important to the proper construction and safe operation of the pipeline.

**Project:** Hydrologic environment of the trans-Alaska pipeline system (TAPS).

**Region and map key:** Statewide; fig. 7 (1).

**Organizational designation:** Water Resources Division, Alaska District Office.

**Project chief:** J. M. Childers, U.S. Geological Survey, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526.

**Project objectives:** This project assesses the hydrologic impact of the trans-Alaska pipeline system (TAPS). A basic-data network of stream-gaging and water-quality monitoring stations will be maintained and operated to provide records of hydrologic conditions along the TAPS route throughout the life of the pipeline. Hydrologic hazards including floods, icings, glaciers, and channel erosion and their interactions with TAPS will be studied. Stream, lake, spring, and aquifer characteristics will be evaluated for assessing potential development impacts associated with TAPS. The studies will provide technical information on interactions of hydrologic processes, some of which are identified by the National Academy of Sciences, Committee on Permafrost and reported in "Opportunities for Permafrost-related Research Associated with the Trans-Alaska Pipeline System," published in 1975.

**Project status:** This project, begun in 1970, is planned for continuation through the early operation phases of TAPS. Basic water data are published in the Alaska District annual basic-data reports. The project has published 25 reports, including 4 in 1977.

**Project:** Alaska geologic earthquake hazards.

**Region:** Statewide.

**Organizational designation:** Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

**Project chief:** George Plafker, U. S. Geological Survey, 345 Middlefield Road, Menlo Park,

Calif 94025; (415) 323-8111, ext. 2201.

**Project objectives:** The overall objective of this project is to study and evaluate risk in Alaska from tectonic displacement, seismic shaking, and secondary geologic effects. A more general goal is to gain insight into tectonic processes within the seismically active zones of Alaska, with special emphasis on south-central Alaska.

**Project status:** The project was originally a 5-year field program, but has been extended to 8 years. Fieldwork to date has resulted in detailed strip mapping and reconnaissance studies of virtually all known or suspected active faults that are exposed on land in Alaska. During 1977 fieldwork focused on study and evaluation of faults on the Seward Peninsula, northern Koyukuk Basin, southern Brooks Range, Yukon-Tanana upland, and northern Alaska Range. Several reports on active faults and an active fault map of Alaska are in preparation. During 1978, the offshore continuation of the Fairweather fault and the submarine Chatham Strait fault will be investigated using the R/V *Sea Sounder*.

**Project:** Alaska geothermal reconnaissance.

**Region:** Statewide.

**Organizational designation:** Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

**Project chief:** Thomas P. Miller, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 272-8228.

**Project objectives:** The objective is to evaluate the geothermal resources of Alaska through geologic, geochemical, and geophysical studies of hot springs and volcanic areas.

**Project status:** Fieldwork is complete, and final reports are in preparation.

**Project:** Selected studies of tin, tungsten, and molybdenum deposits in Alaska.

**Region and map key:** Statewide; fig. 7 (2), (3).

**Project chief:** Travis Hudson, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2134.

**Project objectives:** The primary objectives are to determine the age, petrology, geochemistry, and origin of the tin-granite complex of the Serpentine Hot Springs area, Seward Peninsula, and its relation to the associated

mineralization. In addition, the project is to identify the general nature of tungsten and molybdenum deposits throughout Alaska.

*Project status:* Fieldwork on the tin-granites of western Seward Peninsula and on intrusive rocks associated with molybdenum deposits in the Ketchikan area has been completed. A preliminary report on the tin-granite complex at Serpentine Hot Springs has been prepared; chemical, age, and isotopic studies of this and other tin-granite complexes of western Seward Peninsula are planned. Petrologic, chemical, and isotopic studies of intrusive rocks associated with molybdenite deposits in the Ketchikan area are continuing; two preliminary reports have been prepared.

*Project:* Environmental geology of Alaska coal lands.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Environmental Geology, Engineering Geology Branch.

*Project chiefs:* Henry R. Schmoll and Lynn A. Yehle, U.S. Geological Survey, Mail Stop 903 KCG, Box 25046, Denver, Colo. 80225; (303) 234-3290 and 234-2999, respectively.

*Project objectives:* The objectives of the project are to provide an understanding of the nature, location, and extent of general environmental concerns and potential problems caused by response of geologic materials, both surficial deposits and bedrock, to surface and underground coal mining, energy conversion, facility siting, and accompanying land utilization for associated development (including transportation routes and urban development) throughout Alaska. There are two phases of the project: (1) an overview to delineate all areas of the State where there is a reasonable potential for coal-mining activity or intense exploration, and to outline in general terms the environmental-geologic aspects of each; and (2) more detailed studies in selected areas most likely to be sites of major development in the foreseeable future.

*Project status:* To date most effort has been devoted to phase (2) above. Field investigations, comprising helicopter, fixed-wing, and foot traverses, were begun in the Capps Glacier-Tyonek region about 100 km west of Anchorage, where strip mining of coal is anticipated

within the next several years. Compilation of surficial geology of about five 1:63,360-scale quadrangles from aerial photographs is underway. Compilation of the surficial geology map of Anchorage at the same scale is continuing, and parts of the map are nearly ready for open-file release.

*Project:* Alaskan gravity surveys.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Geochemistry and Geophysics, Branch of Regional Geophysics.

*Project chief:* David F. Barnes, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2249.

*Project objectives:* In the past the prime objectives of Alaskan gravity surveys have been the completion of a 1:2,500,000-scale map of the State and the location of basins of sedimentary rocks beneath large areas of alluvial cover. Now the emphasis is shifting to provide data suitable for a few 1:250,000-scale maps to study some of the anomalies that seem to be associated with mineralization and to provide background data for land-use decisions in cooperation with the Alaska Mineral Resources Assessment Program (AMRAP) and the Wilderness Area studies in Alaska.

*Project status:* Aircraft support obtained through cooperation of geochemical and geological field parties is providing coverage of 100 to 600 stations in a few 1:250,000 quadrangles that are being systematically studied as areas of high economic mineral potential. Station density is good enough in a few of these quadrangles to justify terrain corrections and the preparation of complete Bouguer anomaly maps. In some quadrangles the preparation of such complete Bouguer anomaly maps has been greatly aided by receipt of digital terrain data on magnetic tapes supplied by the Department of Defense. These data provided the basis for such a map of the lower elevation part of the McCarthy quadrangle, which is now in preparation. During the past summer, field gravity data to support equivalent or better maps were obtained for the Talkeetna Mountains, Big Delta, Chignik, Sutwik Island and Lake Clark quadrangles, and additional new data were obtained in the

Yukon-Kuskokwim Delta and Gulf of Alaska coastal areas.

*Project:* Uranium potential of Tertiary basins, Alaska.

*Region and map key:* Statewide; fig. 7 (4).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Uranium and Thorium Resources.

*Project chief:* Kendall A. Dickinson, U.S. Geological Survey, P.O. Box 25046, Mail Stop 916, Denver Federal Center, Lakewood, Colo. 80225; (303) 234-5667.

*Project objectives:* Project objectives are to determine the potential for uranium resources in the Tertiary sedimentary rocks of Alaska.

*Project status:* Fieldwork in the Cook Inlet, Matanuska Valley, and Copper River basin areas is complete. Laboratory analyses are about 50 percent complete.

*Project:* Coal resources of Alaska.

*Region and map key:* Statewide; fig. 7 (5), (6), (7).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Coal Resources.

*Project chiefs:* Jack H. Medlin, U.S. Geological Survey, 956 National Center, Reston, Va. 22092; (703) 860-7734; E. R. Landis, U.S. Geological Survey, Mail Stop 972, Denver Federal Center, Lakewood, Colo. 80225; (303) 234-3578.

*Project objectives:* This project has four major objectives: (1) to evaluate coal resources in the NPRA and AMRAP areas of Alaska by geologic mapping, drill core data, and geophysical methods; (2) to prepare cross sections showing coal bed correlations and coal distribution in the NPRA and AMRAP areas; (3) to provide resource estimates by area and bed for selected parts of these areas; and (4) to assess coal quality by use of Btu values, sulfur and ash content, and major-, minor-, and trace-element concentrations. Coal samples will be collected from drill sites and other acceptable locations and analyzed by U.S.G.S. laboratories.

*Project status:* 1978 is the first year of project operations. The work will be coordinated with the Office of National Petroleum Reserve in Alaska and the Branch of Alaskan Geology and concen-

trated in those areas presently being investigated by these groups.

*Project:* Paleozoic paleontology and stratigraphy of Alaska.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Environmental Geology, Branch of Paleontology and Stratigraphy.

*Project chief:* J. Thomas Dutro, Jr., U.S. Geological Survey, Rm E-316, Museum of Natural History, Washington, D.C. 20560; (202) 343-3222.

*Project objectives:* Principal objectives are: (1) field and laboratory studies of Paleozoic biostratigraphy of Alaska, with emphasis on the upper Paleozoic of the Brooks Range; (2) systematic description of invertebrate faunas, relating their distribution in space and time to the geologic development of Alaska and the Arctic regions; and (3) inquiry into the paleogeographic and depositional implications of the faunal assemblages and carbonate petrography, and correlations with other Paleozoic sequences in the Arctic.

*Project status:* This is a lifetime project whose direction during any short-term period (2-5 years) is determined, in part, by the nature of cooperative work with other Survey geologists. Current work includes: Carboniferous of Alaska, Upper Devonian of Central Brooks Range, Paleozoic of Medfra quadrangle, microfacies of the Lisburne Group, carbonate petrography in the Bornite area, biostratigraphy of Calico Bluff Formation, and lower Paleozoic sedimentary rocks of the Dillinger River area in the Alaska Range.

*Project:* Geothermal studies.

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Earthquake Studies, Tectonophysics Branch.

*Project chief:* Arthur H. Lachenbruch, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2272.

*Project objectives:* The project objectives are: (1) to determine the regional distribution of heat flow and its relation to tectonic processes in Alaska; and (2) to determine the relations

among the thermal regime of permafrost, shoreline movements, and Pleistocene climatic history in the Arctic coastal regions.

*Project status:* We are making thermal observations, as opportunity permits, in holes drilled primarily in connection with exploration for petroleum and mineral resources. Holes must be at least 150 m deep, and representative core or cuttings are desirable.

*Project:* Land-use/land-cover mapping and data compilation.

*Region and map key:* Statewide; fig. 7 (8).

*Organizational designation:* Land Information and Analysis Office, Geography Program, Compilation and Interpretation Branch.

*Project chief:* George L. Loelkes, U.S. Geological Survey, Reston, Va. 22092; (703) 860-6256.

*Project objectives:* The Geography Program is providing land-use/land-cover and associated maps for the entire United States on a systematic and comprehensive basis. Initial coverage of the U.S. is expected to be completed by 1982. During the first few years of the program, emphasis has been on completing maps of coastal areas, energy-production areas, metropolitan regions, and states that have entered into cost-sharing cooperative agreements with the Geological Survey. After the maps are compiled, they are digitized and entered into a geographic information system. Statistics on land use and land cover are then made available by political units (counties, etc.), hydrologic units, census county subdivisions, and areas of Federal land ownership.

*Project status:* A draft copy of the land-use/land-cover map for the Fairbanks 1:250,000-scale (1° × 3°) quadrangle has been completed. A field check of the map during 1977 indicated that revision was necessary. More recent high-altitude photographs and satellite images will be used to recompile the map, which will be released in open file in 1978. The lack of suitable source materials for most of Alaska has limited planning for mapping the remainder of the State.

*Project:* Arctic water resources and environmental studies.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* J. M. Childers, U.S. Geological Survey, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526.

*Project objectives:* The project studies arctic Alaskan water resources to provide information for planning, design, and operation of development in Alaska. Hydrologic hazards including floods, icings, glaciers, and channel erosion are being evaluated in development areas. Stream, lake, spring, and aquifer characteristics are examined in order to assess potential development impacts. Selected sites are studied to determine causes, processes, and effects of development impacts on water resources. These studies include water-quality evaluation and attention to icings and acceleration of erosion. This project is designed to help develop Alaska's resources for the national need and concurrently to protect the environment in Alaska.

*Project status:* This study, begun in 1974, is a continuing project. Accomplishments include hydrologic surveys along the trans-Alaska pipeline system (TAPS) and throughout Alaska. Several technical reports are published or are being prepared. Most information from the project has been made available through open-file release for timely use in design and review of developments in northern Alaska.

## REGIONAL PROJECTS

A large part of the Geological Survey's Alaskan program consists of regional projects of less than statewide scope. Many projects are intensive investigations that require several years to complete. As with most technical studies, final formulation and publication of results are accomplished at the end of the investigation. For some projects, interim results and findings are compiled and presented in "Summary of Important Results," part of a companion circular (772-B). Interim accounts of continuing hydrologic investigations are prepared and published separately by the Water Resources Division. Inquiries on the status of the various projects should be directed to the project chiefs at the addresses listed in the project summaries.

## NORTHERN ALASKA

*Project:* Ambler River quadrangle (AMRAP).

*Region and map key:* Northern Alaska; fig. 8 (1).

*Organizational designation:* Geologic Division,

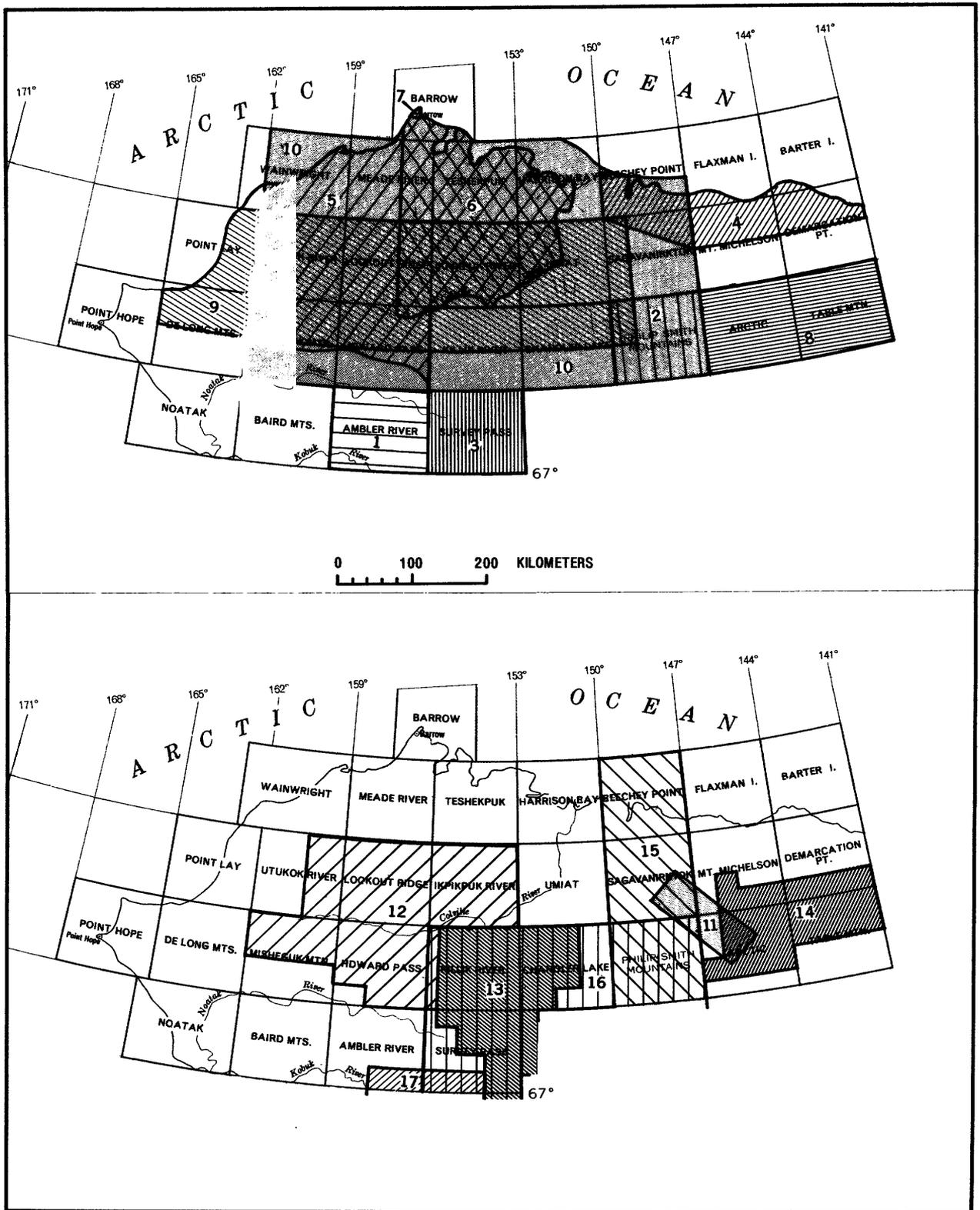


FIGURE 8.—Locations of projects, northern Alaska.

TABLE 2.—Regional projects, northern Alaska

Name of Project; map key	Personnel	Type of work	Area
Ambler River quadrangle (AMRAP); fig. 8 (area 1)	I.L.Tailleur, C.H.Mayfield, I.F.Ellersieck, S.H. Hackett, N.R.D.Albert	Geologic, geochemical, geophysical, and telegeologic surveys, mineral-resource assessment	Ambler River quadrangle
Philip Smith Mountains quadrangle (AMRAP); fig. 8 (2)	H.N.Reiser, W.P.Brosge, J.B.Cathrall, D.E.Detra, R.L.Detterman, J.T.Dutro, Jr., K.J.Bird, D.F.Barnes, J.H.DeYoung, Jr., John Cady, J.R.LeCompte	Geologic mapping, geochemical sampling, geophysical survey, mineral-resource assessment	Philip Smith Mountains quadrangle
Survey Pass quadrangle (AMRAP); fig. 8 (3)	Donald Grybeck, S.W.Nelson, J.B.Cathrall, D.A.Brew, Peter Coney, M.L.Silberman	Geologic mapping, geochemical sampling, mineral-resource assessment	Survey Pass quadrangle
Arctic Coastal Plain (Arctic Environmental Studies Program); fig. 8 (4)	O.J.Ferriars, Jr.	Reconnaissance engineering geologic studies, geologic mapping	Northeastern Alaska
North Slope Petroleum Program	K.J.Bird and other Geologic Division personnel	Appraisal of petroleum potential by means of surface and subsurface geological, geophysical, and geochemical studies	North Slope
Engineering geologic studies in National Petroleum Reserve in Alaska; fig. 8 (5)	Reuben Kachadoorian	Engineering geologic studies	National Petroleum Reserve in Alaska (NPRA)
Land-use/land-cover mapping in Alaska; fig. 8 (5)	Leonard Gaydos	Land-use and land-cover mapping from Landsat digital data	NPRA
NPRA oil and gas source rock study; fig. 8 (5)	L.B.Magoon, G.E.Claypool	Data collection and analysis	NPRA
Geophysical exploration of the National Petroleum Reserve in Alaska; fig. 8 (5)	J.K.Kienzle	Geophysical exploration to locate drill sites and to aid in assessing petroleum potential	NPRA
NPRA hydrology; fig. 8 (5)	C.E.Sloan and other Water Resources Division personnel	Hydrologic assessment	NPRA
NPRA Cenozoic paleontology, eastern half; fig. 8 (6)	C.A.Repenning, L.N. Marinovich, J.E.Hazel, R.A.Spicer	Paleontology and stratigraphy	Eastern NPRA
Development and operation of gas fields in the Point Barrow area; fig. 8 (7)	R.D.Carter, R.J.Lantz	Subsurface petroleum exploration and evaluation, gas field operation	Point Barrow
Southeastern Brooks Range; fig. 8 (8)	W.P.Brosge, H.N.Reiser,	Geologic mapping, geochemical sampling	Arctic and Table Mountain quadrangles
Lower Cretaceous Nanushuk Group, Northern Alaska; fig. 8 (9)	T.S.Ahlbrandt and other Geologic Division personnel	Stratigraphic, paleontologic and economic studies	Northern Alaska
Reservoir study of Lisburne Group; structural and stratigraphic studies (North Slope Petroleum Program); fig. 8 (10)	K.J.Bird	Petrographic studies of cores and samples; detailed well-log correlations; structural/stratigraphic profiles integrating geologic and geophysical data	Eastern part of North Slope

TABLE 2.—Regional projects, northern Alaska—Continued

Name of Project; map key	Personnel	Type of work	Area
Geologic-geophysical profile across the Brooks Range front; fig. 8 (ares 11)	K.J.Bird	Gravity and magnetic surveys, data reduction and compilation	Northeastern Alaska
National Petroleum Reserve; fig. 8 (12)	A.E.Letey and Topographic Division personnel	Topographic mapping	Northern Alaska
Coal resource area; fig. 8 (13), fig. 9 (6), fig. 10 (6)	A.E.Letey and Topographic Division personnel	Topographic mapping	Northern Alaska
Eastern Brooks Range; fig. 8 (14)	A.E.Letey and Topographic Division personnel	Topographic mapping	Northern Alaska
Pipeline revision; fig. 8 (15), fig. 9 (7)	R.E.Fordham and Topographic Division personnel	Revision of topographic maps	Northern Alaska
Surficial geology, central Brooks Range (Arctic Environmental Studies Program); fig. 8 (16), fig. 9 (4)	See table 3 and section entitled "Regional projects, east-central Alaska."		
Hughes-Shungnak area; fig. 8 (17), fig. 10 (5)	See table 4 and section entitled "Regional projects, west-central Alaska."		

Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* C. F. Mayfield, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2147.

*Project objectives:* Reconnaissance geologic, geochemical, geophysical, and telegeologic mapping is being used to produce a resource assessment of the quadrangle. The final report will consist of a series of components including: (1) a geologic map at 1:250,000 scale; (2) a geochemical survey showing high concentrations of selected elements; (3) an aeromagnetic map with lineaments and anomalies; (4) a telegeologic map with lineaments and anomalies; and (5) a mineral occurrences and resources map.

*Project status:* Fieldwork was completed in 1976. Compilation of the various components of the project is continuing; they will be released as an open-file series early in 1978. Regional gravity data collected during field studies will be included if time permits.

*Project:* Philip Smith Mountains quadrangle (AMRAP).

*Region and map key:* Northern Alaska; fig. 8 (2).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology and Branch of Exploration Research.

*Project chiefs:* John B. Cathrall (party chief), U.S. Geological Survey, Building 53, Federal Center, Denver, Colo. 80225; (303) 234-3131, ext. 4813; Hillard N. Reiser and William P. Brosgé (team leaders), U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2387 and 2316, respectively.

*Project objectives:* Reconnaissance geologic, geochemical, geophysical, and telegeologic mapping will provide the data for a rapid assessment of the mineral resources of the quadrangle. Fieldwork included: (1) geologic mapping at 1:250,000 scale, study of the Sadlerochit Group, and reconnaissance study of the Devonian rocks; (2) a geochemical survey; (3) completion of the regional gravity survey; (4) an aeromagnetic survey; (5) analysis of hydrocarbon potential of shales and reservoir potential of Mississippian carbonate rocks; and (6) mapping of surficial geology, done as part of the Arctic Environmental Studies Program.

*Project status:* All fieldwork and about 40 percent of the preparation of reports have been com-

pleted. A fence diagram of the Sadlerochit Group by R. L. Detterman was published in 1976 (MF-744), and a generalized geologic map was placed in open file in 1977. Thomas D. Hamilton has completed the surficial geologic map. Geochemical data from stream sediments and panned concentrates and a report on an occurrence of sphalerite were placed in open file in 1977. Results of the aeromagnetic survey made late in 1976 were placed in open file in 1977 and will be interpreted by John Cady. J. R. LeCompte has made preliminary telegeologic maps from Landsat imagery. The new gravity data have been reduced by David F. Barnes and will be used in making the resource assessment. All maps and reports should be completed by July 1978.

*Project:* Survey Pass quadrangle (AMRAP).

*Region and map key:* Northern Alaska; fig. 8 (3).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Donald Grybeck, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 272-8228.

*Project objectives:* Project objectives are reconnaissance geologic, geochemical, geophysical, and telegeologic mapping to provide data for assessment of mineral resources in the Survey Pass quadrangle. Fieldwork consists primarily of: (1) geologic mapping at 1:250,000 scale; (2) geochemical investigations primarily through the use of stream-sediment, panned-concentrate, and altered or mineralized rock samples to delineate areas of metal concentrations; and (3) regional geophysical surveys.

*Project status:* Geologic mapping and geochemical sampling for this two-year project began in 1977. A previously completed preliminary geologic map by W. P. Brosgé (U.S.G.S.) and G. H. Pessel (Alaska Division of Geological and Geophysical Surveys) was published in 1977 and provided the geologic framework on which this year's mapping was based. Approximately 50 percent of the quadrangle was mapped during the summer of 1977. Geochemical sampling of 75 percent of the quadrangle was completed this summer. The Alaska Division of Geological and Geophysical Surveys has open filed stream-sediment surveys of the remaining 25

percent of the quadrangle; these studies were completed in 1975. Chemical analyses, including uranium and thorium content of 40 samples of orthogneiss and granite of the Arrigetch Peaks and Mount Igikpak plutons, are in progress. Samples for geochronologic studies of part of the southwest Brooks Range mineral belt and the Arrigetch Peaks and Mount Igikpak plutons are also in progress. Twenty-eight fossil collections out of the 33 collected have been identified and have provided critical data to refine the stratigraphy and facies interpretation of sedimentary rocks in the northern one-third of the quadrangle.

*Project:* Arctic Coastal Plain, northeastern Alaska (Arctic Environmental Studies Program).

*Region and map key:* Northern Alaska; fig. 8 (4).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Oscar J. Ferrians, Jr., U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-11, ext. 2247.

*Project objectives:* The major objective is to complete reconnaissance engineering-geologic investigations that will provide base-line geotechnical data needed in planning, designing, operating, and maintaining engineering structures in this region. Planned fieldwork includes engineering-geologic mapping at a scale of 1:250,000. Studies of permafrost conditions, geomorphic features, permafrost-related processes, and other geologic processes important to arctic engineering will be emphasized. Potential geotechnical problems that require special consideration include: slope stability, drainage conditions, frost action, thawing of permafrost, availability of natural construction materials, swelling soils, earthquake effects, erosion, flooding, and icings.

*Project status:* Enough data have been collected during 5 weeks of helicopter-supported fieldwork to prepare preliminary engineering-geologic maps of the entire region. After these maps have been prepared, 3 to 4 weeks of fieldwork will be required to prepare the final maps. Preliminary engineering-geologic maps will be completed for open files or the Miscellaneous Field Studies Map Series in 1978.

**Project:** North Slope Petroleum Program.

**Region:** Northern Alaska.

**Organizational designation:** Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

**Program manager:** Kenneth J. Bird, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2116.

**Project objectives:** Objectives are to determine, map, and describe, on the surface and in the subsurface, by geologic, geophysical, and geochemical methods: (1) the structural framework and regional structural trends in the Brooks Range and North Slope; (2) depositional environments and lateral relations of Paleozoic, Mesozoic, and Cenozoic facies; (3) possible hydrocarbon reservoirs and their regional trends; (4) paleontologic, lithologic, and electric log correlations across the North Slope; (5) the thermal history, hydrocarbon source potential, and relations of extracted hydrocarbons to known North Slope oils; and (6) the geologic history of the basin as it relates to potential reservoirs, source and seal rocks, hydrocarbon formation and migration, and present structural trends.

**Project status:** Most of the projects listed below are being done on a cooperative basis with the Office of National Petroleum Reserve in Alaska (ONPRA). Individual projects and active personnel include a reservoir study of the Lisburne Group, K. J. Bird; a subsurface, seismic, gravity, magnetic, and stratigraphic study of the structural style of the eastern Brooks Range foothills, K. J. Bird, D. M. Giovannetti; a comprehensive reservoir study of the Cretaceous Nanushuk Group, T. Ahlbrandt, K. Bird, J. Fox, K. Huffman, F. May, G. Mull, I. Pasternak, R. Scott, W. Sliter, S. Bartsch-Winkler; a geochemistry study of NPRA to assess petroleum source rock potential, L. Magoon, G. Claypool; and helium "sniffer" survey in NPRA and Prudhoe Bay areas to determine the effectiveness of the technique in the Arctic, A. Roberts.

**Project:** Engineering-geologic studies in National Petroleum Reserve in Alaska.

**Region and map key:** Northern Alaska; fig. 8 (5).

**Organizational designation:** Geologic Division,

Office of Mineral Resources, Branch of Alaskan Geology.

**Project chief:** Reuben Kachadoorian, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2262.

**Project objectives:** The primary objective is to make engineering-geologic investigations to provide geotechnical analyses needed for petroleum exploration of NPRA. Investigations include, but are not limited to, (a) determining sources of construction materials, and (b) evaluating site locations of such facilities as airstrips, roads, drill sites, and construction camps. Also project personnel will consult with participants in the NPRA program on (a) engineering geology and permafrost-related engineering problems, and (b) engineering-geologic effects of exploration activities in the Reserve.

**Project status:** The project provides engineering-geologic expertise needed to fulfill responsibilities assigned to the Geological Survey through provisions of the "Naval Petroleum Reserves Production Act of 1976." Therefore, the project will continue until the responsibilities of the Geological Survey are fulfilled in accordance with the Act.

**Project:** Land-use and land-cover mapping in Alaska based on Landsat digital data.

**Region and map key:** Northern Alaska; fig. 8 (5).

**Organizational designation:** Land Information and Analysis Office, Geography Program, Research and Analysis Branch.

**Project chief:** Leonard Gaydos, U.S. Geological Survey, NASA-Ames Research Center, Moffett Field, Calif. 94035; (415) 965-6368.

**Project objectives:** The Geography Program is undertaking land-use and land-cover mapping in certain parts of Alaska by computer classification of digital data acquired by scanners aboard the Landsat satellites. A data base comparable to that being constructed for the rest of the Nation is being established but from source material that was originally in digital form. This project demonstrates the flexibility of the data base for attaining the maximum possible information using digital scanner data which can be aggregated for different purposes. The objective of the project during 1977 and 1978 is to map land cover and vegetation within

the 38,000 square miles of the National Petroleum Reserve in Alaska (NPRA).

*Project status:* Landsat data for NPRA were acquired and pre-processed during 1977, and unsupervised classifications were created. The preliminary maps were field checked during the summer of 1977, and the field data are being incorporated into refinements of the preliminary classifications. Revised classifications will be completed by spring of 1978 and will be incorporated into the environmental assessment of NPRA being conducted by the Geological Survey and the land-use study being conducted by the Task Force composed of various agencies of the Department of the Interior, coordinated by the Bureau of Land Management.

*Project:* NPRA oil and gas source rock study.

*Region and map key:* Northern Alaska; fig. 8 (5).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

*Project chief:* Leslie B. Magoon, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2979.

*Project objectives:* The objective of this study is to provide the data and interpretations necessary to assess the oil and gas source potential of various potential hydrocarbon source horizons in the National Petroleum Reserve in Alaska. Interim reports will help evaluate the present drilling program and determine the location of new drill sites as required. A final report will be written by January 1980 to be submitted to Congress.

*Project status:* Analytical data needed for this study will be provided by Geochem Research, Inc., Houston, and Global Geochemistry, Los Angeles. To date over 2,000 analyses have been completed. Petroleum Information, Denver, is building and maintaining the data file of these analyses and implementing graphical displays.

*Project:* Geophysical exploration of the National Petroleum Reserve in Alaska.

*Region and map key:* Northern Alaska; fig. 8 (5).

*Organizational designation:* Office of National Petroleum Reserve in Alaska (ONPRA).

*Project chief:* J. K. Kienzle, ONPRA, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2116.

*Project objectives:* The objective is to acquire and interpret common depth point seismic, gravity, and aeromagnetic data for use in locating drilling sites for exploratory wells and to aid in assessing the petroleum potential of NPRA.

*Project status:* This project originated on June 1, 1977, when management of Naval Petroleum Reserve No. 4 was transferred from the Department of the Navy to the Department of the Interior. The project is scheduled to be completed in fiscal year 1980. Through Husky Oil Operations, Inc., the contractor to ONPRA, and Geophysical Service, Inc., a subcontractor to Husky Oil, approximately 3,200 km of CDP seismic and gravity data will be acquired in NPRA in 1978. The gravity and seismic data will be processed by GSI, and the interpretation will be done by Tetra Tech, a subcontractor to Husky Oil, and by ONPRA. Also in 1978 ONPRA plans to purchase a proprietary gradient and total field aeromagnetic survey and interpretation from Aero Service Corporation. This survey was flown north of 70° N. latitude in NPRA and will include approximately 12,200 line miles of vertical gradient data and 10,950 line miles of total field data.

*Project:* Geologic section of Environmental Impact Assessment of NPRA.

*Region and map key:* Northern Alaska; fig. 8 (5).

*Organizational designation:* Land Information and Analysis Office, Environmental Impact Analysis Program.

*Project chief:* Warren Yeend, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2541.

*Project objectives:* The project objective is to gather data to permit compilation of the geologic sections of the Environmental Impact Assessment of NPRA, with particular emphasis on the effects of petroleum development.

*Project status:* The project is in the data gathering and map compilation stage.

*Project:* NPRA hydrology.

*Region and map key:* Northern Alaska; fig. 8 (5).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* Charles E. Sloan, U.S. Geological Survey, 218 E Street, Skyline Building, Anchorage, Alaska 99501; (907) 277-5526.

*Project objectives:* This project is to gather hydrologic information including streamflow characteristics, flood risk zones, lake and stream limnology, ground-water occurrence, and snow hydrology to provide data for an environmental assessment and a land-use study of NPRA.

*Project status:* Field studies were done in 1977. A reconnaissance snow survey was made in April; a reconnaissance water quality assessment of lakes and streams was made in June and July; indirect measurements of flood flows were made in August; and streamflow was monitored at four locations from breakup in early June until September. The field data have been compiled and submitted to the land-use study team.

*Project:* NPRA Cenozoic Paleontology, eastern half.

*Region and map key:* Northern Alaska; fig. 8 (6).

*Organizational designation:* Geologic Division, Office of Environmental Geology, Branch of Paleontology and Stratigraphy.

*Project chief:* C. A. Repenning, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2366.

*Project objectives:* This project aims to obtain evidence of the age of thin but complex Pleistocene cover and the underlying Prince Creek Formation (and intertonguing marine units) previously considered to be of Cretaceous age but now believed to include Tertiary deposits. This evidence will provide a basis for a better interpretation of the geologic history of the area, of value in interpreting the history of structural activity, times of hydrocarbon accumulation, and correlation with Tertiary hydrocarbon horizons to the east and Cretaceous deposits to the west. Considerable work will be devoted to modern evaluation of old paleobotanical collections.

*Project status:* The project began this year. A 4-day reconnaissance was made in August 1977 to evaluate project potential. Sufficient new information was obtained to indicate good prospects for further study.

*Project:* Development and operation of gas fields in the Point Barrow area.

*Region and map key:* Northern Alaska; fig. 8 (7).

*Organizational designation:* Office of National Petroleum Reserve in Alaska.

*Project chiefs:* Robert D. Carter and Robert J. Lantz, ONPRA, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2116.

*Project objectives:* Project objectives are to explore the Barrow, Alaska, area by geologic and geophysical methods, to determine the presence or absence of hydrocarbon accumulations, especially gas, by drilling wells, to determine the reserves of known or newly discovered fields, and to develop and maintain such fields. All these activities are undertaken in an attempt to assure an adequate supply of energy for the North Slope in the vicinity of Point Barrow for the reasonably foreseeable future.

*Project status:* The South Barrow gas field presently supplies gas to the village of Barrow and to various government installations nearby. According to a recent engineering study, gas reserves are sufficient to meet demand requirements only through 1986. A dry hole drilled in the field in 1977 may suggest a revision of this estimate. Considerable work is indicated to increase gas production and to upgrade field facilities and the transmission system.

Wells drilled in 1974 and 1977 east of the present producing area indicate another gas, and possibly oil, accumulation. Further drilling will be necessary to confirm this deposit and its size and to explore other possible gas-bearing structures in the area. Exploratory and developmental drilling will probably continue for a number of years in order to prove or disprove the existence of gas reserves sufficient for the needs of the Barrow area.

*Project:* Southeastern Brooks Range geology.

*Region and map key:* Northern Alaska; fig. 8 (8).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* William P. Brosgé, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2316.

*Project objectives:* Objectives are: (1) geologic field mapping at 1:250,000 scale of the unmapped two-thirds of Arctic and Table Mountain quadrangles; (2) biostratigraphic and lithofacies studies of the Carboniferous Lisburne and Permian and Triassic Sadlerochit Groups; and

(3) reconnaissance geochemical sampling and study of mineralized areas for resource assessment.

*Project status:* Fieldwork on the project has not begun. A preliminary geologic map of the Table Mountain quadrangle based on the previously available field data and photointerpretation was placed on open file in 1976. Some geochemical sampling and mineral investigation have also been done previously; the results have been outlined in a preliminary report on the mineral resource potential of the Arctic National Wildlife Range placed on open file in 1976. Stream-sediment geochemical data in an area of lead mineralization were placed on open file in 1977.

*Project:* Cretaceous Nanushuk Group, North Slope, Alaska.

*Region and map key:* Northern Alaska; fig. 8 (9).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

*Project chief:* Thomas S. Ahlbrandt, U.S. Geological Survey, Denver Federal Center, MS 940, Lakewood, Colo. 80225; (303) 234-4642.

*Project objectives:* The objective is to assess the petroleum potential of the Cretaceous Nanushuk Group in and adjacent to the National Petroleum Reserve in Alaska (NPR). Outcrop, subsurface, and paleontologic studies are being integrated to provide a depositional and biostratigraphic framework for such an evaluation.

*Project status:* Twenty-two sections, which include approximately 19,090 m of strata in the Nanushuk Group, were measured during the 1977 field season, and 1,500 geochemical, paleontologic, and petrographic samples were collected. A study of well logs and cores from NPR wells that penetrate the Nanushuk Group is underway. Studies in progress include biostratigraphic zonation of the Nanushuk by pollen, dinoflagellates, and foraminifers, uranium and thorium assessment of the sequence, source rock analysis, and sandstone diagenesis, provenance, and depositional environment studies. Preliminary results of these investigations will be summarized in Circular 772-B to be published in the spring of 1978. The 1978 summer field program will conclude the outcrop investigations for the project.

*Project:* Reservoir study of Lisburne Group (North Slope Petroleum Program).

*Region and map key:* Northern Alaska; fig. 8 (10).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

*Project chief:* Kenneth J. Bird, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2116.

*Project objectives:* The goal is to map reservoir trends by determining the relation of reservoir characteristics to lithofacies, and then to construct a series of lithofacies maps. Analysis of Lisburne well logs and selective study of well samples and thin sections are designed to determine reservoir characteristics and mapable lithofacies.

*Project status:* A comprehensive report on the reservoir properties of the Lisburne Group has been published in the American Association of Petroleum Geologists Bulletin (September 1977). Additional well and outcrop data will allow extension of the study into NPR and will provide information for the construction of lithofacies maps.

*Project:* Geologic-geophysical profile across the Brooks Range front, northeastern Alaska.

*Region and map key:* Northern Alaska; fig. 8 (11).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

*Project chief:* Kenneth J. Bird, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2116.

*Project objectives:* The objective is to determine the structural style of the Brooks Range front and its relation to the petroleum potential of this general area by studying a strip about 16 km wide by 64 km long extending from the Shaviovik anticline in the foothills to Wahoo Lake in the range. This area is uniquely suited to a study of this type because of the variety of geologic and geophysical data available and the presence of the Kemik gas field. The data consist of surface geologic maps, four wells, several seismic lines, gravity and magnetic measurements, and rock samples.

*Project status:* Gravity and magnetic readings from 50 stations along this profile have been reduced and analyzed by D. M. Giovannetti. Rock samples from wells and outcrop have been

measured for their density and magnetic susceptibility. This information is being released in open file. A stratigraphic summary of four wells and numerous outcrop sections along the profile is nearly complete. Geochemical and paleontologic analyses of selected samples have been completed. Synthetic seismograms have been constructed from digitized acoustic logs. Review and updating of the surface geology by means of aerial photographs are in progress. Data will be released in open file as soon as each phase of the study is completed. Final publication will be as a Bulletin.

*Project:* National Petroleum Reserve.

*Region and map key:* Northern Alaska; fig. 8 (12).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project will provide new 1:50,000-scale topographic maps for that part of the National Petroleum Reserve presently mapped only at 1:250,000 scale.

*Project status:* The project consists of 82 quadrangles to be mapped at 1:50,000 scale with metric contours. Control has been generated using special aerotriangulation techniques. It is planned to have this project compiled and advance manuscript copy available by the end of FY 1978.

*Project:* Coal resource area.

*Region and map key:* Northern, east-central, and west-central Alaska; fig. 8 (13), fig. 9 (6), fig. 10 (6).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The objective is to provide new 1:50,000-scale topographic maps for an area presently mapped only at 1:250,000 scale.

*Project status:* The project consists of 45 quadrangles to be mapped at 1:50,000 scale with metric contours. Control will be generated in FY 1978 using special aerotriangulation techniques. Advance manuscript copy should be available in FY 1979.

*Project:* Eastern Brooks Range.

*Region and map key:* Northern Alaska; fig. 8 (14).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project aims to provide new 1:63,360-scale topographic maps in an area previously unmapped at this scale.

*Project status:* There are 33 quadrangles remaining to be compiled in this area. This work has been deferred because of higher priority requirements in the National Petroleum Reserve and Coal Resource area. The present schedule calls for advance manuscript copy to be available for these quadrangles in about 1980.

*Project:* Pipeline revision.

*Region and map key:* Northern and east-central Alaska; fig. 8 (15), fig. 9 (7).

*Organizational designation:* Topographic Division, Special Mapping Center.

*Project chief:* Roy E. Fordham, Chief, Special Mapping Center, 1925 Newton Square East, Reston, Va. 22090; (703) 860-7760.

*Project objectives:* The project will revise forty 1:63,360-scale and nine 1:250,000-scale maps from Prudhoe Bay to the vicinity of Fairbanks to show the trans-Alaska pipeline, service road, and other related features.

*Project status:* The 1:63,360-scale revision has been completed and the maps are either published or awaiting publication. The 1:250,000-scale revision is expected to be completed in FY 1978.

#### EAST-CENTRAL ALASKA

*Project:* Yukon-Tanana.

*Region and map key:* East-central Alaska; fig. 9 (1).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Helen L. Foster, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2331.

*Project objectives:* Primary objectives are to complete geologic mapping and geochemical sampling, assess mineral resource potential, and

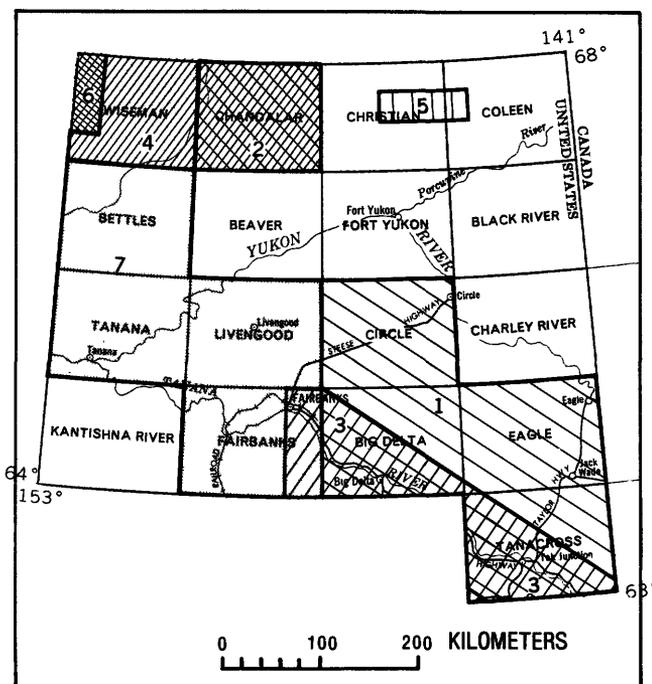


FIGURE 9.—Locations of projects, east-central Alaska.

carry on special geologic studies of the Yukon-Tanana upland. In the Tanacross and Big Delta quadrangles (AMRAP projects) a team approach is being used, and geologic, geochemical, geophysical, and Landsat data are being applied to geologic interpretation and mineral-resource assessment.

*Project status:* In the Tanacross quadrangle fieldwork has been completed, and most reports have been published. Fieldwork has been completed in the Eagle quadrangle, and most results have been published. A little work is continuing on the granitic and ultramafic rocks. These projects will be finished this year. In the Big Delta quadrangle fieldwork is complete, and compilation of maps, analysis of samples, and compilation of data are in progress. Preliminary data will be open filed in the spring of 1978. Fieldwork will begin in the Circle quadrangle in 1978.

*Project:* Chandalar quadrangle (AMRAP).

*Region and map key:* East-central Alaska; fig. 9 (2).

TABLE 3.—Regional projects, east-central Alaska

Name of Project; map key	Personnel	Type of work	Area
Yukon-Tanana; fig. 9 (area 1)	H.L.Foster, T.E.C.Keith, C.Dusel-Bacon, F.R.Weber, T.D.Hessin, and other Geologic Division personnel	Geologic mapping, geochemical sampling, mineral-resource assessment, special geologic studies	Eagle, Tanacross, Circle, and Big Delta quadrangles
Chandalar quadrangle (AMRAP); fig. 9 (2)	S.P.Marah, W.P.Brosge, H.N.Reiser, J.H.DeYoung, Jr., J.Cady, N.R.D.Albert	Geochemical sampling, geophysical survey, mineral-resource assessment	Chandalar quadrangle
Tanana Valley transportation-development corridor; Fairbanks to Canadian border (Arctic Environmental Studies Program); fig. 9 (3), fig. 12 (17)	L.D.Carter, J.P.Galloway	Geologic mapping of surficial deposits	Tanana Valley, Fairbanks to Canadian border
Surficial geology, central Brooks Range (Arctic Environmental Studies Program); fig. 9 (4), fig. 8 (16)	T.D.Hamilton	Surficial geologic mapping, stratigraphic studies	Philip Smith Mountains, Chandalar, Wiseman, Chandler Lake, Killik River, and Survey Pass quadrangles
Christian East; fig. 9 (5)	A.E.Letey and Topographic Division personnel	Topographic mapping	East-central Alaska
Coal resource area; fig. 9 (6), fig. 8 (13), fig. 10 (6)	See table 2 and section entitled "Regional projects, northern Alaska."		
Pipeline revision; fig. 9 (7), fig. 8 (15)	See table 2 and section entitled "Regional projects, northern Alaska."		

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology and Branch of Exploration Research.

*Project chiefs:* Sherman P. Marsh (party chief), U.S. Geological Survey, Building 25, Federal Center, Denver, Colo. 80225; (303) 234-3131, ext. 3283; William P. Brosgé and Hillard N. Reiser (team leaders), U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2316, 2387, respectively.

*Project objectives:* Geochemical, geophysical, telegeologic, surficial geologic and mineral-deposit mapping will be combined with the available geologic reconnaissance map and aeromagnetic survey to provide the data for a rapid assessment of the mineral resources. Fieldwork included a geochemical survey, study of selected mining claims, and mapping of surficial geology done as part of the Arctic Environmental Studies Program.

*Project status:* All fieldwork and about 90 percent of report preparation have been completed. The stream-sediment data were placed in open file in 1976, and the panned concentrate data in 1977; production of computer-generated maps and statistical data is in progress. The mineral-resource map has been prepared by John H. DeYoung, Jr., an aeromagnetic interpretation map by John Cady, and a surficial geology map by Thomas D. Hamilton. David F. Barnes has compiled a map of Alaska showing the regional gravity field in the quadrangle, but scarcity of data will preclude specific geologic interpretation. Interpretive maps of Landsat imagery are being prepared by Nairn R. D. Albert. All maps and reports should be completed in early 1978.

*Project:* Tanana Valley transportation-development corridor: Fairbanks to the Canadian border (Arctic Environmental Studies Program).

*Region and map key:* East-central and southern Alaska; fig. 9 (3), fig. 12 (17).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* L. David Carter, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2682.

*Project objectives:* The project objective is to compile a map showing the distribution of unconsolidated surficial deposits within the transportation-development corridor that extends southeastward up the Tanana Valley from Fairbanks to the Canadian border. Tables accompanying the map will include a description of lithology, topography, and geologic hazards in terms of the map units. Fieldwork includes geologic mapping at a scale of 1:125,000 in parts of the Fairbanks, Big Delta, Mount Hayes, Tanacross, and Nabesna quadrangles.

*Project status:* Existing geologic mapping has been compiled at a scale of 1:125,000. Field checking and additional geologic mapping were undertaken in 1976 and 1977. A strip map of the surficial deposits along the proposed route of the Alcan gas pipeline from Fairbanks to the Canadian border will be prepared in 1978, and a preliminary map of the surficial deposits of the project area will be prepared in 1979.

*Project:* Surficial geology of the central Brooks Range (Arctic Environmental Studies Program).

*Region and map key:* East-central and northern Alaska; fig. 9 (4), fig. 8 (16).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Thomas D. Hamilton, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2156.

*Project objectives:* The project will provide data essential for assessment of transportation corridors across the central Brooks Range and for other studies involving land-use analysis and land classification. This objective is being accomplished through preparation of 1:125,000-scale surficial geologic maps showing (1) character, age, and genesis of unconsolidated deposits, and (2) locations of landslides, debris flows, and other hazard zones. The maps are also of value to resource-oriented programs involving geochemical surveys or evaluation of construction materials. A general stratigraphic framework, based on measured sections, radiocarbon dates, soil analyses, and geomorphic age criteria, is also being developed for the

region. This framework which will tie together glacial and nonglacial deposits of the northern and southern Brooks Range, will provide a basic structure to which other Quaternary events in northern and north-central Alaska can be related.

*Project status:* Surficial geologic maps of the Philip Smith Mountains and Chandalar quadrangles are currently in press. Field mapping and ancillary studies of the Wiseman quadrangle were completed during the summer of 1977, and this map will be placed in open file early in 1978. Field mapping during the summer of 1978 will be carried out in the Chandler Lake quadrangle and parts of the Killik River, and Survey Pass quadrangles. Surficial geologic maps for the Chandler Lake and Wiseman quadrangles should be submitted for publication during the winter of 1978-79.

*Project:* Christian East.

*Region and map key:* East-central Alaska; fig. 9 (5).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The objective is to provide four new 1:63,360-scale quadrangle maps in an area previously unmapped at this scale.

*Project status:* Advance manuscript copy is presently available for the four quadrangles. They are expected to go to map reproduction for printing in FY 1979.

#### WEST-CENTRAL ALASKA

*Project:* Medfra quadrangle (AMRAP).

*Region and map key:* West-central Alaska; fig. 10 (1).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* William W. Patton, Jr., U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2248.

*Project objectives:* The primary objective is a detailed stratigraphic study of the Precambrian to

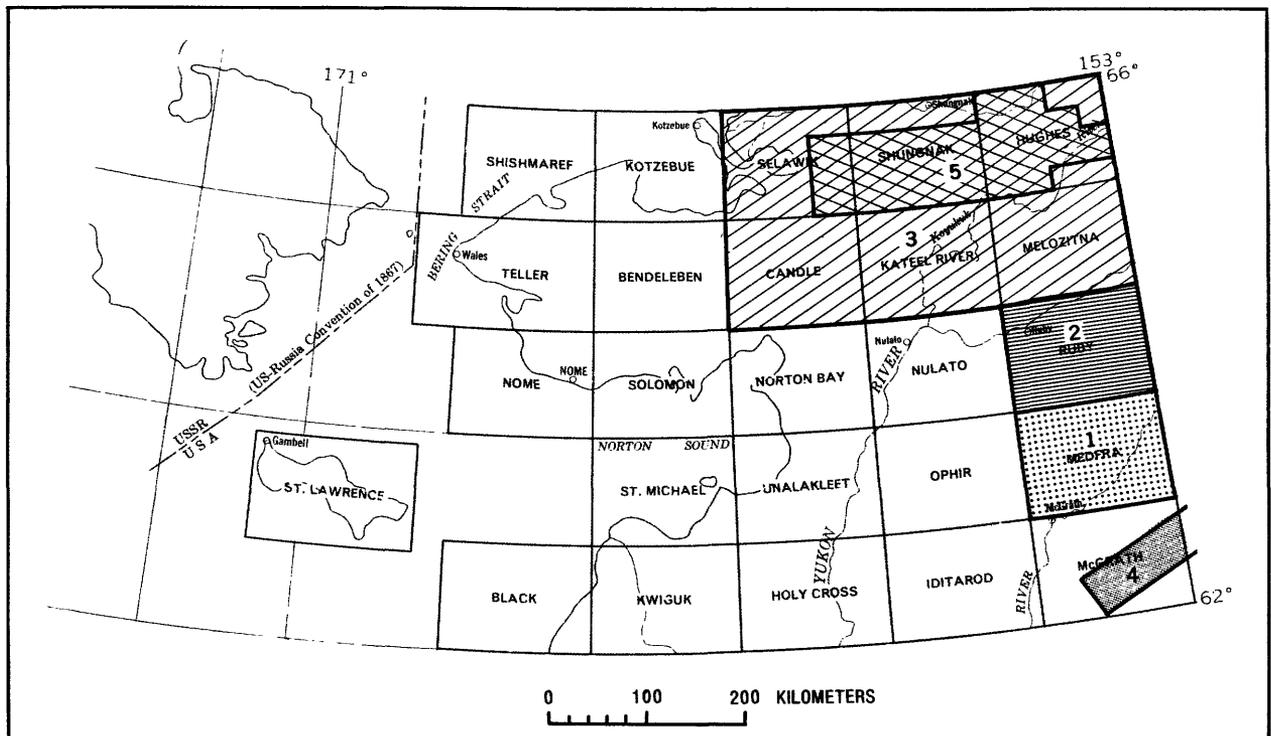


FIGURE 10.—Locations of projects, west-central Alaska.

TABLE 4.—Regional projects, west-central Alaska

Name of Project; map key	Personnel	Type of work	Area
Medfra quadrangle (AMRAP); fig. 10 (area 1)	W.W.Patton, Jr., J.T.Dutro, Jr., R.M.Chapman	Stratigraphic studies, reconnaissance geologic mapping	Medfra quadrangle
Arctic mineral resources; fig. 10 (2)	R.M.Chapman, W.W.Patton, Jr., M.L.Silberman	Reconnaissance geologic mapping, geochemical sampling	Ruby quadrangle
Western Alaska uranium; fig. 10 (3)	T.P.Miller, B.R.Johnson	Geologic mapping, detailed petrologic studies	Seward Peninsula; parts of Selawik, Shungnak, Hughes, Candle, Melozitna quadrangles
Preliminary investigation of coal outcrops near Farewell, Alaska; fig. 10 (4), fig. 12 (18)	Ernest Sloan, Gerald Shearer	Coal-resource assessment	McGrath and Talkeetna quadrangles
Hughes-Shungnak area; fig. 10 (5), fig. 8 (17)	A.E.Letey and Topographic Division personnel	Topographic mapping	Mostly in Hughes and Shungnak quadrangles
Coal resource area; fig. 10 (6), fig. 9 (6), fig. 8 (13)	See table 2 and section entitled "Regional projects, northern Alaska."		

Cenozoic rocks of the northern Kuskokwim Mountains. These studies are needed to provide a basic geologic framework for assessing the mineral potential of the Ruby geanticline and the petroleum possibilities of the Minchumina basin. The Nixon Fork region was selected for these initial investigations because it is one of the few areas with good bedrock exposures within the densely vegetated terrain of the Ruby geanticline. In addition to the stratigraphic studies, fieldwork includes reconnaissance mapping of the Medfra quadrangle.

*Project status:* Project objectives will be completed as a part of the Alaska Mineral Resource Assessment Program (AMRAP). Field stratigraphic studies and reconnaissance mapping are largely completed. Fieldwork in 1978 and 1979 will be focused primarily on geochemical sampling and mineral-resource investigations of the Medfra quadrangle. Completion of final reports is planned for 1980.

*Project:* Arctic mineral resources.

*Region and map key:* West-central Alaska; fig. 10 (2).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Robert M. Chapman, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2670.

*Project objectives:* Geologic mapping and related studies in the Ruby quadrangle are part of a program that will provide an adequate geologic base for assessments of mineral-resource potential, regional geologic interpretations, and land-use evaluations in central Alaska. This quadrangle includes a critical and heretofore incompletely mapped part of the Ruby geanticline, a major geologic feature in interior Alaska. Specific objectives are to identify the extent, ages, structures, and geochemical characteristics of the major rock units and to establish regional correlations of these units with those mapped elsewhere along the Ruby geanticline.

*Project status:* The geologic field mapping, begun in 1975, was completed in 1977 by R. M. Chapman and W. W. Patton, Jr. M. L. Silberman collaborated for several days in the field to collect rock samples for age dating. Completion of a quadrangle geologic map is planned for the latter part of 1978. Reports on geochemical and geochronological samples will be completed when the analyses are available, probably by early 1979.

*Project:* Western Alaska uranium.  
*Region and map key:* West-central Alaska; fig. 10 (3).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology, and Office of Energy Resources, Branch of Uranium and Thorium Resources.

*Project chief:* Thomas P. Miller, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 272-8228.

*Project objectives:* The objective is to evaluate the uranium-thorium potential of selected areas in western Alaska. The investigation includes geologic mapping and petrologic studies in order to determine the characteristics and possible extent of mineralized areas.

*Project status:* Approximately 60 percent of the project has been completed. Reports on the results of these studies are in preparation.

*Project:* Preliminary investigation of coal outcrops near Farewell, Alaska.

*Region and map key:* West-central and southern Alaska; fig. 10 (4), fig. 12 (18).

*Organizational designation:* Conservation Division, Office of the Area Geologist, Alaska Area.

*Project chiefs:* Ernest Sloan and Gerald Shearer, U.S. Geological Survey, 800 A Street, Anchorage, Alaska 99501; (907) 278-3571.

*Project objectives:* The purpose of this reconnaissance investigation is to determine the extent and quality of coal cropping out along the north front of the Alaska Range between Big River and the Boundary of Mount McKinley National Park. Outcrops of coal were mapped, measured, and extensively sampled. The data gathered will be used in the initial classification of these lands and provide a base for more detailed resource evaluation of these coal occurrences.

*Project status:* Fieldwork was completed during the summer of 1977. The samples collected are being studied and tested at the present time. An open-file report should be released by the middle of 1978.

*Project:* Hughes-Shungnak area.

*Region and map key:* West-central and northern Alaska; fig. 10 (5), fig. 8 (17).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain

Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project will provide new 1:63,360-scale topographic maps in an area previously unmapped at this scale.

*Project status:* The project consists of 55 1:63,360-scale quadrangles. Mapping control is about 50 percent complete. This project has been deferred because of higher priority requirements in the National Petroleum Reserve and Coal Resources area. The present schedule calls for the remaining control to be obtained in FY 1979 and advance manuscript copy to be available in 1980.

#### SOUTHWESTERN ALASKA

*Project:* Goodnews and Hagemeister Island quadrangles region (AMRAP).

*Region and map key:* Southwestern Alaska; fig. 11 (1).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chiefs:* J. M. Hoare and W. L. Coonrad, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2372 and 2608, respectively.

*Project objectives:* The principle objective is to assess the mineral resources using reconnaissance geologic, geochemical, geophysical, and telegeologic mapping. Fieldwork also includes sampling of an old metamorphic terrane and intrusive bodies for radiometric dating.

*Project status:* The fieldwork and analysis of geochemical specimens are complete. The Circular and the 26 maps that constitute the final report will be placed in open file early in 1978.

*Project:* Chignik-Sutwik Island quadrangles (AMRAP).

*Region and map key:* Southwestern Alaska; fig. 11 (2).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Robert L. Detterman, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2244.

*Project objectives:* The project objective is to use reconnaissance geologic, geochemical, geophys-

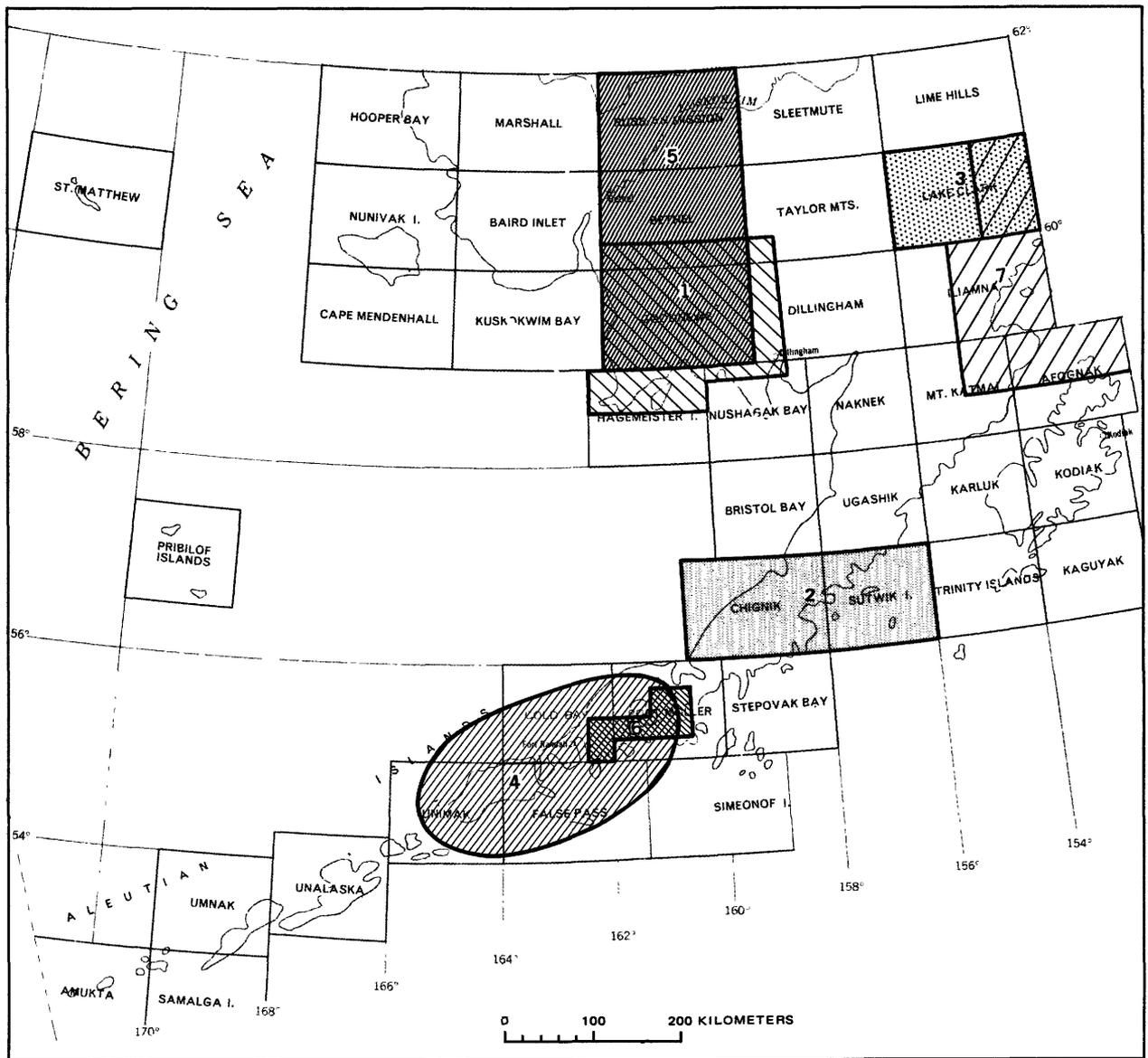


FIGURE 11.—Locations of projects, southwestern Alaska.

ical, and telegeologic mapping to provide data for rapid assessment of mineral and energy resources of the quadrangles. Fieldwork includes: (1) geologic mapping at 1:250,000 scale; (2) geochemical sampling of stream sediments, panned concentrates, and altered or mineralized bedrock; (3) sampling mineralized areas for age determinations and for trace element and stable-isotope studies; (4) regional gravity study; and (5) geothermal investigations of volcanic centers.

*Project status:* This is the second year for the 2-year project. Reconnaissance geochemical sampling is completed; some detailed work in mineralized areas will be completed this year. Geologic mapping is about 50 percent complete. The aeromagnetic survey has been flown, but interpretation is still to be completed. Preliminary maps and reports are scheduled for 1978, and the final reports and Miscellaneous Field Studies folio are scheduled for completion by the middle of 1979.

TABLE 5.—Regional projects, southwestern Alaska

Name of Project; map key	Personnel	Type of work	Area
Goodnews and Hagemeister Island quadrangles region (AMRAP); fig. 11 (area 1)	J.M.Hoare, W.L.Coonrad, T.D.Hessin and other Geologic Division personnel	Geologic mapping, geochemical sampling, geophysical interpretation, mineral-resource assessment	Goodnews and Hagemeister Island quadrangles, parts of Bethel, Taylor Mountains, Dillingham, and Nushagak Bay quadrangles
Chignik-Sutwik Island quadrangles (AMRAP); fig. 11 (2)	R.L.Detterman, T.P.Miller, M.E.Yount, D.E.Detra and other Geologic Division personnel	Geologic mapping, geochemical sampling, mineral-resource assessment	Chignik and Sutwik Island quadrangles
Lake Clark quadrangle (AMRAP); fig. 11 (3)	W.H.Nelson, B.L.Reed, M.A.Lanphere, J.E.Case, W.D.Crim, H.D.King, D.Cohen	Geologic mapping, geochemical sampling, mineral-resource assessment	Lake Clark quadrangle
Petroleum potential of the Cold Bay area and adjacent offshore basins, Alaska Peninsula; fig. 11 (4)	Hugh McLean, D.G.Howell, Claus Engelhardt	Sedimentologic and stratigraphic studies	Alaska Peninsula
Russian Mission, Bethel, Goodnews; fig. 11 (5)	A.E.Letey and Topographic Division personnel	Topographic mapping	Russian Mission, Bethel, and Goodnews quadrangles
Port Moller; fig. 11 (6)	A.E.Letey and Topographic Division personnel	Topographic mapping	Port Moller and Cold Bay quadrangles
Petroleum geology of Cook Inlet basin; fig. 11 (7), fig. 12 (8)	See table 6 and section entitled "Regional projects, southern Alaska."		

*Project:* Lake Clark quadrangle (AMRAP).

*Region and map key:* Southwestern Alaska; fig. 11 (3).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Willis H. Nelson, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2274.

*Project objectives:* Reconnaissance geologic, geochemical, geophysical, and telegeologic mapping will provide data for a rapid assessment of the mineral resources of the quadrangle. Fieldwork includes: (1) geologic mapping at 1:250,000 scale; (2) collection and geochemical analysis of stream-sediment and bedrock samples; (3) aeromagnetic survey and interpretation; (4) augmentation of a regional gravity survey; and (5) isotopic investigations of intrusive rocks.

*Project status:* Fieldwork was finished in more than half the quadrangle at the end of 1977 and will be completed during 1978. Preliminary maps and reports are scheduled for 1978.

*Project:* Petroleum potential of the Cold Bay area

and adjacent offshore basins, Alaska Peninsula.

*Region and map key:* Southwestern Alaska; fig. 11 (4).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

*Project chief:* Hugh McLean, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2802.

*Project objectives:* Project objectives are: (1) to map the geology of the outermost part of the Alaska Peninsula; (2) to gather and evaluate data on source and reservoir rocks; (3) to determine the stratigraphy and sedimentology of Tertiary sedimentary rocks; and (4) to tie onshore geology with offshore geophysical data.

*Project status:* We are presently evaluating data collected during one month of fieldwork in the summer of 1977. Geologic maps and stratigraphic cross sections are in preparation. Samples will be selected to study source and reservoir rock quality.

*Project:* Russian Mission, Bethel, Goodnews.

*Region and map key:* Southwestern Alaska; fig. 11 (5).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project is to prepare three new 1:250,000-scale maps to replace the reconnaissance maps of that series. This revision was made possible by mapping the remaining twenty-four 1:63,360-scale maps of this area.

*Project status:* Advance manuscript copy is available for the twenty-four 1:63,360-scale quads, and they are scheduled to go to publication in FY 1978. The Goodnews 1:250,000-scale map will be published in FY 1978; the Bethel and Russian Mission 1:250,000-scale maps should be finished in FY 1979.

*Project:* Port Moller.

*Region and map key:* Southwestern Alaska; fig. 11 (6).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project will prepare eight new 1:63,360-scale topographic maps of the Port Moller area.

*Project status:* Two quadrangles have been compiled, and advance copy is available. Advance manuscript copy of the remaining six 1:63,360-scale quads should be available by the end of FY 1978.

#### SOUTHERN ALASKA

*Project:* Mount Hayes quadrangle (AMRAP).

*Region and map key:* Southern Alaska; fig. 12 (1).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Warren J. Nokleberg, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2277.

*Project objectives:* Reconnaissance geologic, geochemical, and geophysical mapping will provide data for a rapid mineral-resource assessment of the quadrangle. Fieldwork will include: (1) geologic mapping at 1:250,000 scale; (2) detailed studies of the mineral deposits; (3) geochemical sample surveying of stream

sediments and mineralized rocks; (4) isotopic studies of mineralized rocks; (5) interpretation of aeromagnetic survey; (6) regional gravity survey; and (7) geochronologic investigations of igneous rocks.

*Project status:* The project is planned for two and one-half field seasons. Fieldwork in 1978 will consist of geologic mapping and geochemical sampling along two north-south traverses in the central and western parts of the quadrangle. The fieldwork in 1978 will provide a basis for planning the geologic, geochemical, and geophysical mapping during 1979 and 1980.

*Project:* Seward-Blying Sound quadrangles (AMRAP).

*Region and map key:* Southern Alaska; fig. 12 (2).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Russell G. Tysdal, U.S. Geological Survey, Office of Mineral Resources, 12201 Sunrise Valley Drive, Reston, Va. 22091; (703) 860-6566.

*Project objectives:* The objectives of the project are reconnaissance geologic, geophysical, geochemical, and telegeologic mapping to provide data for rapid assessment of mineral resources of the quadrangles. Fieldwork included: (1) geologic mapping at 1:250,000 scale; (2) geochemical surveying for metals by sampling and analysis of stream sediments and panned concentrates; (3) aeromagnetic survey of the entire quadrangle; (4) obtaining additional gravity data to enhance existing map; (5) telegeologic mapping using Landsat imagery; (6) detailed geologic mapping in gold district near Hope, Alaska including mapping and geochemical sampling in mines; and (7) sampling of greenstone on Resurrection Peninsula and Knight Island for paleomagnetic studies.

*Project status:* Fieldwork was completed during the 1977 field season. Project work is now focusing on preparation of a folio that includes geochemistry, geophysics, telegeology, and mineral economics, in addition to the geologic data. A detailed study of the Hope gold district is being done by P. A. Mitchell. Paleomagnetic study of greenstones is being done by J. H. Hillhouse and C. S. Grommé. The folio is scheduled for completion during early 1978.

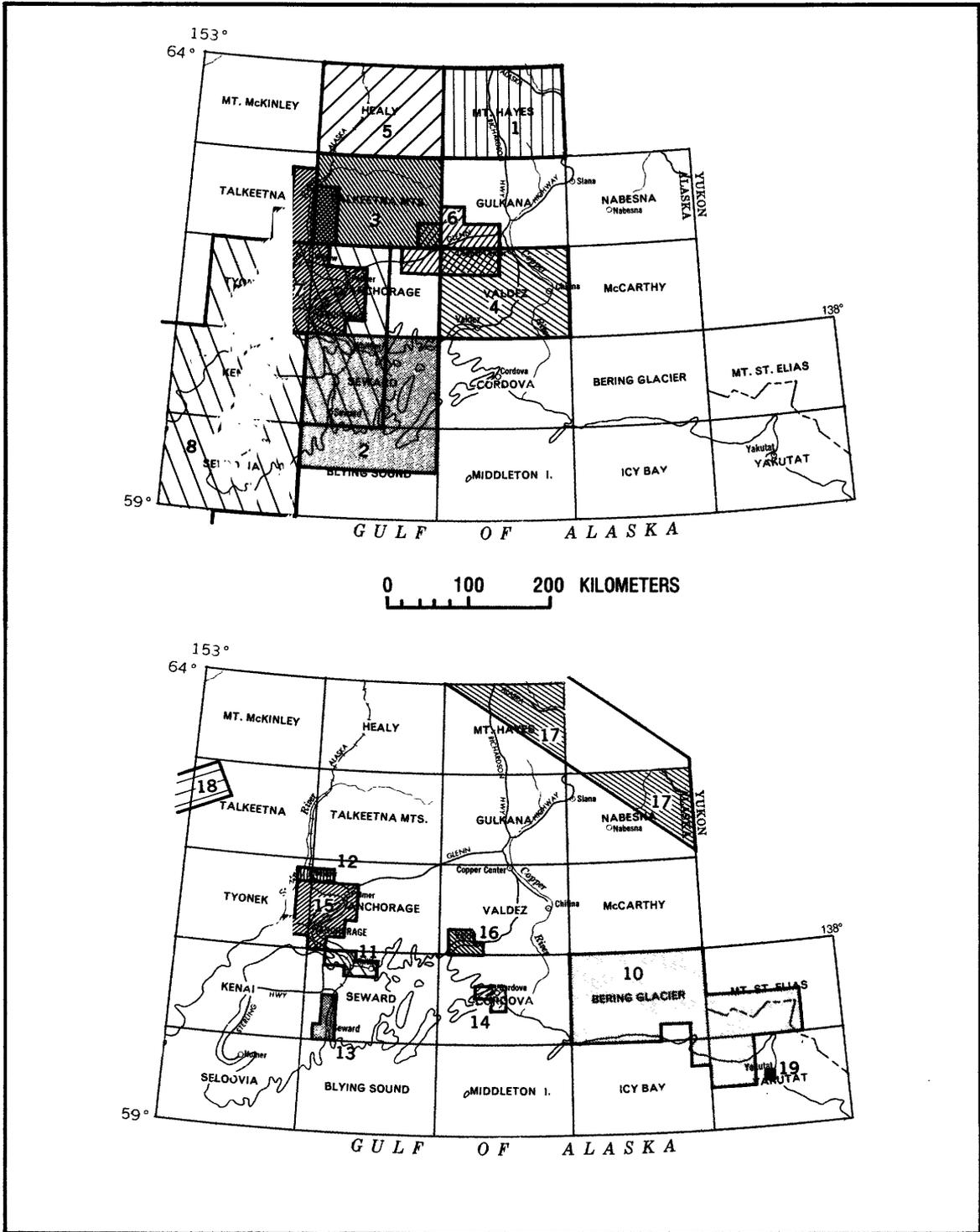


FIGURE 12.—Locations of projects, southern Alaska.

TABLE 6.—Regional projects, southern Alaska

Name of Project; map key	Personnel	Type of work	Area
Mount Hayes quadrangle fig. 12 (area 1)	W.J.Nokleberg, J.L.Brown	Geologic mapping, geochemical and geophysical studies, mineral-resource assessment	Mount Hayes quadrangle
Seward-Blying Sound quadrangles (AMRAP); fig. 12 (2)	R.G.Tysdal, J.E.Case, G.R. Winkler, P.A.Mitchell, C.S.Grommé, J.Hillhouse, R.Tripp, W.Crimm, M.L.Silberman	Geologic mapping, geochemical and geophysical studies, mineral-resource assessment	Seward and Blying Sound quadrangles
Talkeetna Mountains quadrangle (AMRAP); fig. 12 (3)	Bèla Csejtey, Jr., R.J. Miller	Geologic mapping, geochemical sampling	Talkeetna Mountains quadrangle
Valdez quadrangle (AMRAP); fig. 12 (4)	G.R.Winkler, E.M.MacKevett, Jr., J.R.Williams, C.D. Holloway, and other Geologic Division personnel	Geologic mapping and mineral-resource assessment	Valdez quadrangle
Healy quadrangle (AMRAP); fig. 12 (5)	Bèla Csejtey, Jr.	Geologic mapping, geochemical sampling	Healy quadrangle
Southwestern Copper River basin (Arctic Environmental Studies); fig. 12 (6)	J.R.Williams	Glacial geology	Southwestern Copper River basin
Earthquake hazards mapping, Upper Cook Inlet-Susitna Lowlands; fig. 12 (7)	O.J.Ferrians, Jr.	Earthquake hazards mapping	Upper Cook Inlet-Susitna Lowlands
Petroleum geology of Cook Inlet basin; fig. 12 (8), fig. 11 (7)	L.B.Magoon, R.M.Egbert, G.E.Claypool, M.A.Fisher, S.M.Lankford	Framework and petroleum geology	Cook Inlet region
Impact of Outer Continental Shelf (OCS) development on coastal land and environmental resources; fig. 12 (9)	H.F.Lins	Land-use and land-cover analysis	Kenai Peninsula
Alaska seismic studies; fig. 13	J.C.Lahr, C.D.Stephens, J.Roger	Assessment of level of seismicity and potential seismic risk, operation of 50 seismic stations	Cook Inlet to Yakutat Bay
Bering Glacier-Mount Saint Elias area; fig. 12 (10)	A.E.Letey and Topographic Division personnel	Topographic mapping	Bering Glacier, Mount Saint Elias, and Yakutat quadrangles
Whittier; fig. 12 (11)	A.E.Letey and Topographic Division personnel	Topographic mapping	Whittier area
Willow South; fig. 12 (12)	A.E.Letey and Topographic Division personnel	Topographic mapping	Southern Alaska
Seward; fig. 12 (13)	A.E.Letey and Topographic Division personnel	Topographic mapping	Seward area
Cordova; fig. 12 (14)	A.E.Letey and Topographic Division personnel	Topographic mapping	Cordova area
Anchorage; fig. 12 (15)	A.E.Letey and Topographic Division personnel	Topographic mapping	Anchorage area
Valdez; fig. 12 (16)	A.E.Letey and Topographic Division personnel	Topographic mapping	Valdez area

TABLE 6.—Regional projects, southern Alaska—Continued

Name of Project; map key	Personnel	Type of work	Area
Tanana Valley transportation-development corridor, Fairbanks to Canadian border (Arctic Environmental Studies Program); fig. 12 (area 17), fig. 9 (3)	See table 3 and section entitled "Regional projects, east-central Alaska."		
Preliminary investigation of coal outcrops near Farewell, Alaska; fig. 12 (18), fig. 10 (4)	See table 4 and section entitled "Regional projects, west-central Alaska."		
Engineering geology studies, certain coastal communities; fig. 12 (19), fig. 14 (6), fig. 14 (7)	See table 7 and section entitled "Regional projects, southeastern Alaska."		

*Project:* Talkeetna Mountains quadrangle (AMRAP).

*Region and map key:* Southern Alaska; fig. 12 (3).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Bela Csejtey, Jr., U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2613.

*Project objectives:* The principal objective is the evaluation of the mineral resources of the quadrangle through reconnaissance geologic, geochemical, geophysical, and telegeologic mapping.

*Project status:* Fieldwork has been completed. Final reports are scheduled for completion in late 1978.

*Project:* Valdez quadrangle (AMRAP).

*Region and map key:* Southern Alaska; fig. 12 (4).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chiefs:* Gary R. Winkler (team leader) and E. M. MacKevett (co-scientist), U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2795 and 2310, respectively.

*Project objectives:* The project objective is evaluation of the mineral resources of the Valdez 1° × 3° quadrangle through geologic, geochemical, geophysical, and telegeologic mapping. Fieldwork is to include (1) geologic mapping of the entire quadrangle at 1:250,000 scale; (2) a geochemical survey for metals, primarily

through the use of stream sediments, panned concentrates, and altered or mineralized rocks; (3) detailed geologic and geochemical studies of known mineral deposits and investigation of potential for stratabound deposits; (4) completion of the regional gravity survey; (5) an aeromagnetic survey; (6) geochronologic, isotopic, and trace-element investigations of volcanic and intrusive rocks; and (7) detailed structural and stratigraphic studies in terranes proximal to the Contact and Border Ranges fault systems.

*Project status:* This new project is planned for two field seasons. A 50-day, helicopter-supported season in 1978 will emphasize geologic mapping and geochemical and geochronologic sampling. The relatively well known geology of the Wrangell Mountains will be extended into the northeast corner of the quadrangle, permitting further evaluation of the copper resources of the Kotsina district. Detailed mapping of the diverse Paleozoic and younger(?) rocks north of the Border Ranges fault system and south of the Copper River lowlands and the Chitina Valley will be carried out in order to evaluate more fully their age, structural style, potential for stratabound sulfide deposits, and extent and nature of included mafic and ultramafic complexes. Scattered mapping in the upper Mesozoic Valdez terrane adjacent to the Richardson Highway will be extended into less accessible parts of the quadrangle—particularly westward to include nearly unknown country near the headwaters of the Nelchina, Tazlina, Columbia, and Valdez Glacier systems.

*Project:* Healy quadrangle (AMRAP).

*Region and map key:* Southern Alaska; fig. 12 (5).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Bela Csejtey, Jr., U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2613.

*Project objectives:* The principal objective is the evaluation of the mineral resources of the quadrangle through reconnaissance geologic, geochemical, geophysical, and telegeologic mapping.

*Project status:* The project is tentatively scheduled to start in July 1978. Only a few days of reconnaissance work is anticipated for the summer of 1978. Much of the geology of the quadrangle has already been mapped by University and Alaska State Survey geologists, and the compilation and integration of these data, perhaps through cooperative measures, are planned as the initial phase of the project.

*Project:* Southwestern Copper River basin, Alaska (Arctic Environmental Studies Program).

*Region and map key:* Southern Alaska; fig. 12 (6).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* John R. Williams, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2924.

*Project objectives:* On the basis of four summers' field investigation of the distribution, stratigraphy, thickness, and physical characteristics of the unconsolidated deposits, objectives were to prepare terrain analyses, including effect on military trafficability, and reports on availability of construction materials, foundation conditions, and maps of surficial deposits and their engineering characteristics.

*Project status:* Reports on terrain, trafficability, and engineering geology were supplied to the military between 1955 and 1960. The project was then recessed until 1976, when compilation was begun of a glacial/surficial deposits map and engineering summary for publication at a scale of 1:125,000 in the Miscellaneous Field Studies series. Compilation is about 20 percent complete.

*Project:* Earthquake hazards mapping, Upper Cook Inlet-Susitna Lowland.

*Region and map key:* Southern Alaska; fig. 12 (7).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Oscar J. Ferrians, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2247.

*Project objectives:* The Upper Cook Inlet-Susitna Lowland region, which is within an extremely active seismic zone, undoubtedly will be the region of greatest development and population growth in Alaska. It occupies a strategic location for land and air transportation in Alaska; includes the largest city in Alaska (Anchorage); has oil, gas, and coal reserves; and is the site (near Willow) of the new State capital. As a means of providing the information needed for proper planning and development, an investigation of this earthquake-prone region is being undertaken in order to obtain the data necessary for earthquake hazards identification and evaluation. The primary field objective will be engineering-geologic mapping of the region, with emphasis given to assessing the response of surficial materials to earthquakes.

*Project status:* This project was initiated October 1, 1977; consequently, no significant accomplishments have been made, although aerial photographs of the region have been ordered and field plans are being made.

*Project:* Petroleum geology of Cook Inlet basin.

*Region and map key:* Southern and southwestern Alaska; fig. 12 (8), fig. 11 (7).

*Organizational designation:* Geologic Division, Office of Energy Resources, Branch of Oil and Gas Resources.

*Project chief:* Leslie B. Magoon, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2979.

*Project objectives:* The major objectives are concurrent study of the geologic framework and petroleum geology to assess more accurately the oil resources of the Cook Inlet basin. The principal parts of this study include: (1) a geologic map which displays those elements that relate to oil and gas activity; (2) structural and stratigraphic framework that ties subsurface to surface geology; (3) oil and gas source rock

evaluation; and (4) examination of the composition and diagenesis of possible reservoir sandstones.

*Project status:* The geologic map of Cook Inlet basin by L. B. Magoon, W. L. Adkison, and R. M. Egbert has been published. A paper by M. A. Fisher and L. B. Magoon discussing the structural framework of Lower Cook Inlet is in press. Fieldwork in the Kamishak Hills-Cape Douglas and Seldonia areas is completed, and papers are being written. R. M. Egbert will start fieldwork in the Tuxedni Bay area in 1978. A paper by L. B. Magoon and G. E. Claypool containing the preliminary results of the oil and gas source rock study is in the review process; a final paper is planned for 1978. Preliminary data on the composition and diagenesis of sandstone are being compiled by S. M. Lankford. Further work in the Tuxedni Bay and other parts of the basin are to be completed over the next few years.

*Project:* Impact of Outer Continental Shelf (OCS) development on coastal land and environmental resources.

*Region and map key:* Southern Alaska; fig. 12 (9).

*Organizational designation:* Land Information and Analysis Office, Geography Program, Research and Analysis Branch.

*Project chief:* Harry F. Lins, Jr., U.S. Geological Survey, Reston, Va. 22092; (703) 860-7645.

*Project objectives:* The impact of offshore oil and gas development on onshore land use and land cover in the Cook Inlet-Kenai Peninsula area is being evaluated. Historical and recent aerial photographs are being analyzed to evaluate their utility in documenting land-use and land-cover changes resulting from offshore development.

*Project status:* Commercial, residential, and institutional developments in the town of Kenai were mapped and studied, as well as the industrial development in Nikiski. The Cook Inlet area was chosen as a test site because it was a frontier area with respect to energy development. The land-use and land-cover changes that have occurred in Kenai were almost entirely the result of the offshore oil and gas activity. Results indicate that remotely sensed data are useful in documenting land-use and land-cover changes that occur because of

offshore petrochemical development. Research results will be released through normal Geological Survey publications.

*Project:* Alaska seismic studies.

*Region and map key:* Southern Alaska; fig. 13.

*Organizational designation:* Geologic Division, Office of Earthquake Studies, Earthquake Hazards Branch.

*Project chief:* John C. Lahr, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2510.

*Project objectives:* The fundamental goal of this project is to develop an understanding of the current tectonic processes that are generating earthquakes in Alaska in order to evaluate the hazards that pose a threat to the safety of present and future development. Of particular importance is the search for premonitory phenomena and physical conditions prior to moderate- and large-sized earthquakes.

*Project status:* The Alaska seismic studies project, which began in 1971, currently operates seismic equipment at 50 sites covering the region from Cook Inlet to Yakutat Bay. Topics currently under investigation include: the detailed configuration of the Benioff zone below Cook Inlet; review of the seismicity of the Prince William Sound and Valdez regions; and study of the relation of seismic activity to the 1976 eruption of Augustine Volcano. Open-file reports summarizing the data collected to date, with quarterly listings of earthquake parameters and epicenter maps, are in preparation.

*Project:* Bering Glacier-Mt. St. Elias area.

*Region and map key:* Southern Alaska; fig. 12 (10).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project objective is to provide new 1:63,360-scale topographic maps in an area previously unmapped at this scale.

*Project status:* This project area consists of fifty 1:63,360-scale quadrangles. Five quadrangles have been compiled, and advance manuscript copy is available. Work on the remaining quad-

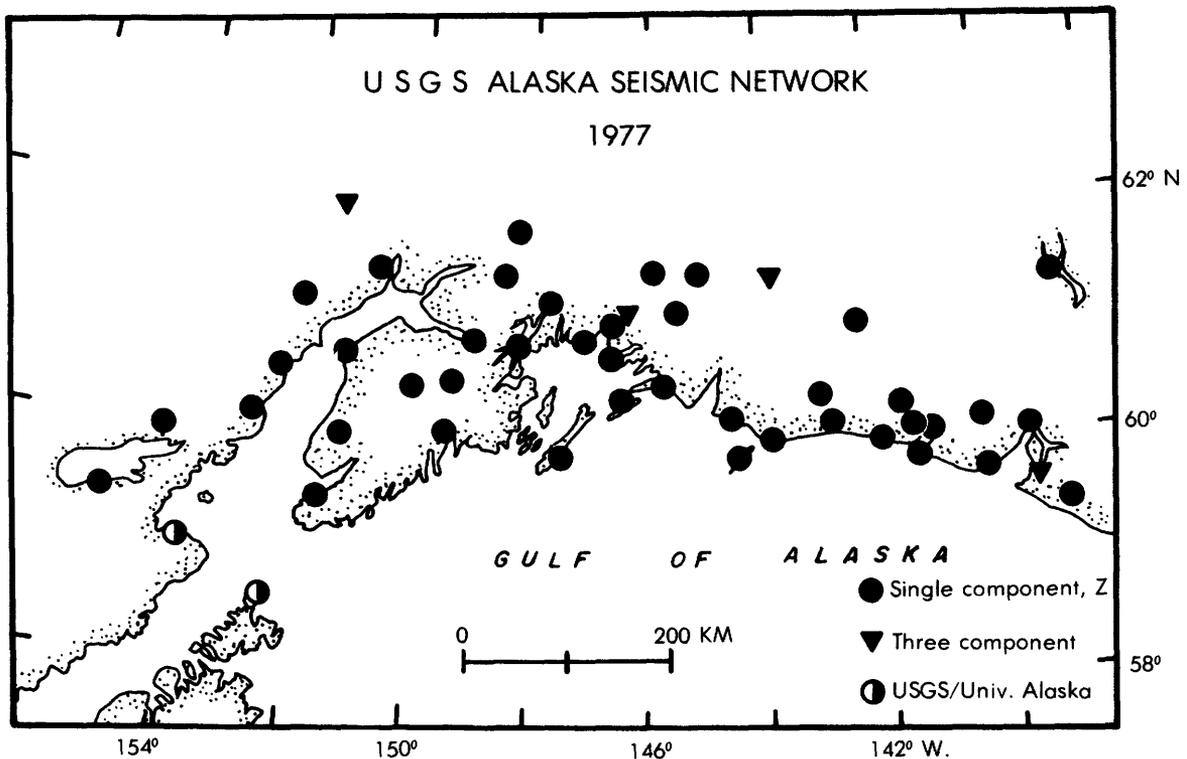


FIGURE 13.—Location of high-gain seismographs operating in the USGS seismic network during 1977.

rangles has been deferred because of higher priority mapping requirements in the National Petroleum Reserve and Coal Resources area.

*Project:* Whittier.

*Region and map key:* Southern Alaska; fig. 12 (11).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project aims to provide modern large-scale maps of Whittier and vicinity, including Portage and part of Turnagain Arm.

*Project status:* The project consists of seven 1:25,000-scale quadrangles with metric contours. The schedule calls for field operations to be conducted in 1979 and advance manuscript copy to be available in 1980.

*Project:* Willow South.

*Region and map key:* Southern Alaska, fig. 12 (12).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project will provide large-scale topographic maps of the new State capital site near Willow.

*Project status:* The project consists of four 1:25,000-scale maps with metric contours. Aerial photography was obtained in 1977. The schedule calls for field operations to be conducted in 1979 and advance manuscript copy to be available in 1980.

*Project:* Seward.

*Region and map key:* Southern Alaska; fig. 12 (13).

*Organizational designation:* Topographic Division, Rocky Mountain Mapping Center.

*Project chief:* A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

*Project objectives:* The project will provide modern large-scale maps for Seward and vicinity.

**Project status:** The project consists of six 1:25,000-scale maps with metric contours. The schedule calls for field operations to be conducted in 1979 and advance manuscript copy to be available in 1980.

**Project:** Cordova.

**Region and map key:** Southern Alaska; fig. 12 (14)

**Organizational designation:** Topographic Division, Rocky Mountain Mapping Center.

**Project chief:** A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

**Project objectives:** The project aims to provide modern large-scale maps for Cordova and vicinity.

**Project status:** The project consists of four 1:25,000-scale quadrangles with metric contours. Field control was established in 1977. Advance manuscript copy should be available by the end of FY 1978.

**Project:** Anchorage.

**Region and map key:** Southern Alaska; fig. 12 (15).

**Organizational designation:** Topographic Division, Rocky Mountain Mapping Center.

**Project chief:** A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

**Project objectives:** The project objective is to provide modern large-scale topographic maps of the greater Anchorage area.

**Project status:** The project consists of 31 quadrangles at 1:25,000 scale with metric contours. Advance copy is presently available for these quadrangles. The maps are scheduled to be sent in for printing in late FY 1978.

**Project:** Valdez.

**Region and map key:** Southern Alaska; fig. 12 (16).

**Organizational designation:** Topographic Division, Rocky Mountain Mapping Center.

**Project chief:** A. E. Letey, Chief, Rocky Mountain Mapping Center, Federal Center, Denver, Colo. 80225; (303) 234-2351.

**Project objectives:** The project will provide modern large-scale topographic maps for this developing area.

**Project status:** The project consists of five 1:25,000-scale quadrangles with metric contours. Field control was established during 1977. Advance manuscript copy should be available by the end of FY 1978.

#### SOUTHEASTERN ALASKA

**Project:** Ketchikan-Prince Rupert quadrangles (AMRAP).

**Region and map key:** Southeastern Alaska; fig. 14 (1).

**Organizational designation:** Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

**Project chiefs:** Henry C. Berg and Raymond L. Elliott, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2266 and 2614, respectively.

**Project objectives:** The main goal of this project is to assess the mineral-resource potential of the Ketchikan and Prince Rupert 1:250,000-scale ( $1^{\circ} \times 2^{\circ}$ ) quadrangles. The area has been

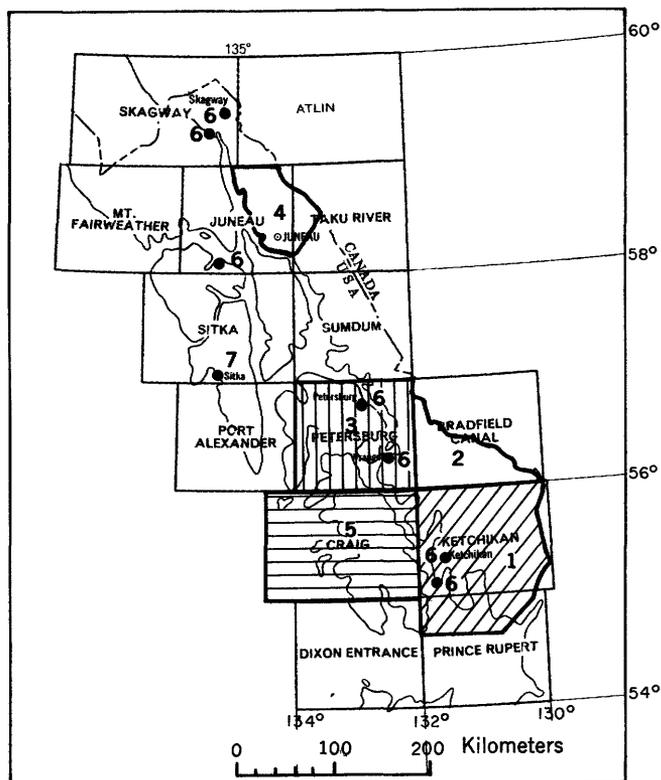


FIGURE 14.—Locations of projects, southeastern Alaska.

TABLE 7.—Regional projects, southeastern Alaska

Name of Project; map key	Personnel	Type of work	Area
Ketchikan-Prince Rupert quadrangles (AMRAP); fig. 14 (area 1)	H.C.Berg, R.L.Elliott, J.G. Smith, R.D.Koch	Geologic mapping, mineral-resource assessment	Ketchikan and Prince Rupert quadrangles
Bradfield Canal quadrangle (AMRAP); fig. 14 (2)	R.L.Elliott, R.D.Koch, M.F.Diggles	Geologic mapping, geochemical and geophysical studies, mineral-resource assessment	Bradfield Canal quadrangle
Petersburg quadrangle; fig. 14 (3)	To be assigned	Geologic and geochemical mapping, mineral-resource assessment	Petersburg quadrangle
Juneau investigations; fig. 14 (4)	D.A.Brew, A.B.Ford	Geologic and geochemical mapping, mineral-resource assessment	Juneau and Taku River quadrangles
Craig quadrangle; fig. 14 (5)	G.D.Eberlein, Michael Churkin, Jr.	Geologic mapping, stratigraphic, petrologic, and structural studies	Craig quadrangle
Engineering geology studies, certain coastal communities; fig. 14 (6), fig. 14 (7), fig. 12 (19)	L.A.Yehle	Geologic mapping, evaluation of geologic hazards	Yakutat, Hoonah, Sitka, Metlaketla, Haines, Skagway, Petersburg, Wrangell, and Ketchikan
Sitka Observatory; fig. 14 (7)	W.E.Osbakken	Geomagnetic and seismic studies	Sitka

mapped geologically and surveyed systematically by geochemical and geophysical methods, including interpretation of space-satellite imagery. The project incorporates and extends the results of four recently completed geologic and mineral-resource investigations within the quadrangles.

*Project status:* Geologic mapping of Revillagigedo Island and Cleveland Peninsula was completed during the 1977 field season by Berg, Elliott, James G. Smith, and Richard D. Koch. Koch also spent 2 weeks studying the Cape Fox pluton and adjacent units in the Prince Rupert D-3 quadrangle. Over 1,500 stream-sediment geochemical samples were collected during the field season, and analyses of these samples have been completed. All phases of project fieldwork are now complete; further project work will involve preparation of a folio that will include a 1:250,000-scale geologic map as well as several geochemical, geophysical, telegeologic, and mineral resource maps. These maps and other project reports are scheduled for completion in 1978.

*Project:* Bradfield Canal quadrangle (AMRAP).  
*Region and map key:* Southeastern Alaska; fig. 14 (2).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Raymond L. Elliott, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2614.

*Project objectives:* Reconnaissance geologic, geochemical, geophysical, and telegeologic mapping will provide the data for a rapid assessment of the mineral resources of the quadrangle. Fieldwork is to include: (1) geologic mapping at 1:250,000-scale; (2) geochemical survey utilizing stream-sediment and bedrock samples; (3) an aeromagnetic survey and interpretation; (4) geologic and geochemical studies of mineral deposits; and (5) investigation of potential for radioactive energy resources.

*Project status:* The project is planned for two field seasons. Fieldwork in 1978 will consist of geologic mapping, geochemical sampling, and investigations of mineralized areas. Preliminary maps and reports are scheduled for 1979.

*Project:* Petersburg quadrangle.  
*Region and map key:* Southeastern Alaska; fig. 14 (3).

**Organizational designation:** Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

**Project chief:** Not yet assigned, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025.

**Project objectives:** The major objectives are reconnaissance geologic and geochemical mapping and mineral-resource assessment of this critical area where diverse structural, stratigraphic, and tectonic units come together. The project will include geophysical surveys and will draw upon previous geologic studies to the west and northwest by L. J. P. Muffler, to the south and west by A. T. Ovenshine, to the south by G. D. Eberlein and Michael Churkin, Jr., to the southeast by H. C. Berg and D. L. Jones, and to the north and east by D. A. Brew, A. L. Clark, and Donald Grybeck.

**Project status:** The project is scheduled to start fieldwork in late July 1978.

**Project:** Juneau investigations.

**Region and map key:** Southeastern Alaska; fig. 14 (4).

**Organizational designation:** Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

**Project chief:** D. A. Brew, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2178.

**Project objectives:** The major objectives are reconnaissance (in part) and detailed (in part) geologic and geochemical mapping and mineral-resource appraisal of a broad transect across the Coast Range batholithic complex. The transect begins in metavolcanic and metaclastic rocks of a low-grade intermediate pressure and temperature facies series on the southwest and progresses through higher grade schists, gneisses, and spatially associated meta-intrusive rocks to the relatively young intrusive rocks and associated metavolcanic and metaclastic rocks of a low-pressure-high-temperature facies series along the international boundary. Geochronologic studies of the transect are made in cooperation with the Coast Range geochronology project, J. G. Smith, Chief. This information will provide the regional framework for the Juneau Gold Belt and

for mineral occurrences immediately east of the U.S.-Canada boundary.

**Project status:** The project has been active since 1964 with full or near-full seasons devoted to fieldwork in 1964, 1965, 1967, 1968, 1970, and 1973. To date, detailed (1:31,380) mapping of about three quadrangles has been completed and published, six short papers have been published, and three more submitted for publication. Completion of the reconnaissance geologic mapping of the remainder of the Juneau and Taku River 1:250,000 quadrangles will require one more full season with helicopter support, not anticipated for the near future. In the meantime, Brew and A. B. Ford (who are primarily engaged in other projects) continue compilation and office studies and attempt every season to map a few more square miles. Completion of the final report depends on completion of the field studies.

**Project:** Craig quadrangle.

**Region and map key:** Southeastern Alaska; fig. 14 (5).

**Organizational designation:** Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

**Project chiefs:** G. Donald Eberlein and Michael Churkin, Jr., U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2210 and 2256, respectively.

**Project objectives:** The primary objective is to provide the public and other Government agencies with a modern geologic map of the Craig quadrangle at 1:250,000 scale as a frame of reference for resource appraisal, development, and multi-use planning. Secondary objectives relate to developing the stratigraphic, petrologic, and structural data needed to understand, especially in the light of modern plate-tectonic concepts, the geologic evolution of a major part of the Alexander Archipelago.

**Project status:** Fieldwork was completed in 1975. Map compilation is underway to formulate a map explanation that will permit H. C. Berg, A. L. Clark, and A. T. Ovenshine to compile parts of the 1:250,000 quadrangle that are peripheral to the central part of the quadrangle being compiled by Eberlein and Churkin. Open-file compilation is scheduled for 1978.

Publication plans also call for releasing Geologic Quadrangle Maps of the Craig C-5 and C-6 subquadrangles (1:63,360) and open-file maps of other subquadrangles where warranted by available control. Reports, mainly in the form of topical papers, are in various stages of completion.

*Project:* Reconnaissance engineering geology of certain coastal communities, Alaska.

*Region and map key:* Southeastern and southern Alaska; fig. 14 (6), 14 (7), fig. 12 (19).

*Organizational designation:* Geologic Division, Office of Environmental Geology, Engineering Geology Branch.

*Project chief:* Lynn A. Yehle, U.S. Geological Survey, Mail Stop 903 KCG Box 25046, Denver, Colo. 80225; (303) 234-2999 or (303) 234-3721.

*Project objectives:* Objectives are to evaluate by reconnaissance field methods the general and engineering geology of certain Alaskan communities for geologic hazards including earthquakes and to present the results on maps and in reports.

*Project status:* Reconnaissance fieldwork has been completed and open-file reports released to the public for Metlakatla, Sitka, and Yakutat, and (under earlier project chief, R. W. Lemke) Haines, Ketchikan, Skagway, and Wrangell. An open-file report on Petersburg is in final review; a formal report on Yakutat is in process, and one on Metlakatla is in review. Reports on other communities (several in southwestern, west-central, and northern Alaska) will be prepared when time allows because the project chief was diverted to another project.

*Project:* Sitka Observatory.

*Region and map key:* Southeastern Alaska; fig. 14 (7).

*Organizational designation:* Geologic Division, Office of Geochemistry and Geophysics, Branch of Electromagnetism and Geomagnetism.

*Project chief:* Willis E. Osbakken, U.S. Geological Survey, Box 158, Sitka, Alaska 99835; (907) 747-3332.

*Project objectives:* The observatory operates seismic instruments for acquiring information on the global occurrence of earthquakes; telemeters seismic and tide station data to the NOAA Tsunami Warning System Observatory at

Palmer; and continuously records and measures the various elements of the Earth's magnetic field and distributes these data to scientists either directly or through the Branch of Electromagnetism and Geomagnetism at Denver.

*Project status:* This project is a continuing one; the station has functioned as a geomagnetic observatory since 1902 and as a seismic station since 1925. The station furnishes seismic recordings to the National Earthquake Information System for epicenter studies. Telemetered data furnished to Palmer are considered vital to the Warning System, as Sitka Observatory is the only data source south of Yakutat. As a geomagnetic observatory, Sitka plays an important role in the international scientific community, being 1 of 13 selected observatories used in the derivation of  $K_p$ , the planetary geomagnetic activity index. Geomagnetic data collected at the station find a wide variety of uses, including the compiling of magnetic charts, radio propagation studies, and ionospheric studies.

#### OFFSHORE ALASKA

*Project:* Marine geologic processes of the Beaufort Sea shelf and coastal regions.

*Region and map key:* Offshore Alaska; fig. 15 (1).

*Organizational designation:* Geologic Division, Office of Marine Geology, Branch of Pacific Arctic Geology.

*Project chiefs:* Peter Barnes and Erk Reimnitz, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2114, 2695 respectively.

*Project objectives:* This project is studying geologic processes that are unique to the arctic shelf environment, where ice plays a dominant role. Owing to the likelihood of petroleum development on the inner shelf (0-30 m), the studies to date have emphasized this area. The present emphasis of the project is on: (1) understanding the year-round processes of arctic delta fronts; (2) defining the repetitive rates of ice gouging in differing ice regimes; (3) defining storm surge history; (4) understanding barrier island processes and stability; and (5) defining inner shelf sedimentation history and sediment trajectories.



TABLE 8.—Regional projects, offshore Alaska

Name of Project; map key	Personnel	Type of work	Area
Marine geologic processes of the Beaufort Sea shelf and coastal regions; fig. 15 (area 1)	P.W.Barnes, Erk Reimnitz, D.E.Drske, L.J.Toimil	Evaluation of arctic shelf geologic processes, in particular the role of ice	Beaufort and Chukchi Seas continental shelves
Environmental geologic studies of the northern Bering Sea; fig. 15 (2)	C.H.Nelson, J.D.Heward, D.R.Thor, M.Larsen, R.Williams	High-resolution seismic profiling, side-scan sonar profiling, vibracoring, Soutar van Veen sampling, box core sampling, underwater 70 mm camera and TV, current meter/transmissometer/CTD measurements	Northeastern Bering Sea
Geologic framework and resource assessment of the Aleutian-Bering Sea area; fig. 15 (3)	M.S.Marlow, A.K.Cooper, D.W.Scholl, Hugh McLean, James Hein	Geophysical and geologic mapping	Bering Sea
Environmental geology investigations of lower Cook Inlet and off Kodiak Island; fig. 15 (4)	A.H.Bouma, M.A.Hampton	Analysis of geologic hazards	Lower Cook Inlet

*Project status:* The project is a continuing study of arctic processes that has been underway since 1970. Reports have been prepared on the following aspects of the Beaufort and Chukchi Sea shelf: river overflow, strudel scour, ice gouge distribution, rates of ice gouging, the stamukhi zone, trace metal distribution, coastal currents, sediment facies distribution, sediment structures, barrier island movement, suspended sediment distribution, bathymetric and coastline changes, shallow water bedforms, Holocene sedimentation, distribution of shelled benthic fauna, sediment strength and interstitial salinities. Work is continuing on rates of ice gouging, island and coastal stability, storm surge history, Holocene sediment thickness and character, sediment character and structure, and river delta front processes.

*Project:* Environmental geologic studies of the northern Bering Sea.

*Region and map key:* Offshore Alaska; fig. 15 (2).

*Organizational designation:* Geologic Division, Office of Marine Geology, Branch of Pacific Arctic Geology.

*Project chief:* C. Hans Nelson, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2603.

*Project objectives:* The following environmental geologic factors are to be assessed in preparation for the Outer Continental Shelf leasing

program: (1) tectonic stability, including active faulting and seismicity; (2) sediment stability, including thickness and engineering properties of recent sediment bodies and regions of active gas cratering and thermogenic gas seeps; (3) sediment dynamics, including significant sediment transport by storm surges, and important sites of deposition off major river sources; and (4) contaminant dispersal by pathways of artificially and naturally introduced materials. Assessment of the mineral-resource potential of near-surface sedimentary minerals will also be completed.

*Project status:* A 3-week cruise to the northern Bering Sea during July, 1977 covered 2,900 km of geophysical tracklines and collected 3.5 kHz, 12 kHz, 200 kHz, Uniboom, minisparker, side-scan sonar, and 120 kJ single-channel sparker seismic data. Forty-eight stations were occupied; 29 box cores, 10 vibracores, and 11 Soutar van Veen grab samples were collected. In addition, 18 hours of underwater video tapes of the bottom were recorded, 38 current meter profiles from water surface to sea floor were completed, and 12 bottom penetrometer stations were occupied.

Sediment cores were logged for lithology, photographed, radiographed, and subsampled at sea. Gas composition and geotechnical properties of cores were also measured at sea. Selected subsamples from cores are presently

undergoing laboratory analyses for texture, mineralogy, paleontology, radiocarbon dates, lead-210 dates, carbon content, hydrocarbon fractions, and trace elements.

These data are presently being reduced and analyzed for presentation in open-file reports and papers in scientific journals. Plans for 1978 field season include: (1) use of a small boat (R/V *Karluk*) to gather vibracores and high-resolution seismic data in and around the shoals of the Yukon prodelta and major delta distributaries, and nearshore areas of northern Norton Sound; and (2) gathering additional seismic profiles and gas sample data aboard the R/V *Sea Sounder* to continue assessment of environmental geologic hazards in northern Bering Sea, particularly those associated with active thermogenic gas seeps and biogenic gas cratering.

*Project:* Geologic framework and resource assessment of the Aleutian-Bering Sea area.

*Region and map key:* Offshore Alaska; fig. 15 (3).

*Organizational designation:* Geologic Division, Office of Marine Geology, Branch of Pacific Arctic Geology.

*Project chief:* Michael S. Marlow, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2656.

*Project objectives:* The primary objective is to map the Bering Sea geologically and geophysically on a regional basis in order to evaluate the resource potential of the area. Data gathered have included marine seismic reflection profiles, gravity, magnetics, bathymetry, and dredge samples. Another important objective is the evaluation of several large subshelf basins adjacent to Alaska as to their oil and gas potential.

*Project status:* Approximately half the Bering Sea area has been traversed with regional geophysical profiles. Approximately 6,000 km of 24 channel seismic-reflection data collected in 1976 and 1977 are currently being processed and interpreted and will be published in 1978. Fieldwork in 1978 will consist of a 2-week sampling cruise along the eastern continental margin and 1-week geophysical cruise in the Aleutian arc.

*Project:* Environmental geology investigations of lower Cook Inlet and off Kodiak Island.

*Region and map key:* Offshore Alaska; fig. 15 (4).

*Organizational designation:* Geologic Division, Office of Marine Geology, Branch of Pacific Arctic Geology.

*Project chiefs:* Arnold H. Bouma and Monty A. Hampton, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2912, 2973 respectively.

*Project objectives:* The primary objective is to study offshore geologic hazards. For lower Cook Inlet the study concentrates on type, distribution, and dynamics of bedforms, and on grain size, petrography, and surface textures of the sediments.

On the shelf and upper slope off Kodiak, volcanic ash of the 1916 Katmai eruption is used to establish the influence of recent sediment transport. Large and small slumps on the upper continental slope are being studied and their activity correlated with the tectonic activity of the various subareas. Geotechnical studies form an essential part of the slump analyses.

*Project status:* A cruise in both areas was completed late in 1977; the results are now being analyzed.

## COOPERATIVE PROJECTS WITH OTHER AGENCIES

Certain projects of the Geological Survey are undertaken to meet specific needs of city or State governments or to provide scientific or technical data required by other Federal agencies. These projects are funded jointly and are termed cooperative projects. In addition to joint funding for cooperative projects, members of the participatory agencies may collaborate in the scientific work. —

Listed in this section are the cooperative projects of the U.S. Geological Survey. Most cooperative projects concern the hydrology of Alaska and are statewide in scope; others have a regional focus. Project locations are shown in figure 16.

## STATEWIDE PROJECTS

*Project:* Metamorphic facies map of Alaska.

*Region:* Statewide.

*Organizational designation:* Geologic Division,



TABLE 9.—Statewide cooperative projects

Name of Project;map key	Project chief	Type of work	Area(s)	Cooperating agencies
Metamorphic facies map of Alaska	D.A.Brew, Bèla Csejtey, Jr., A.B.Ford, H.L.Foater, T.P.Miller, H.N.Reisaer	Office compilation	Statewide	State of Alaska, Division of Geological and Geophysical Surveys
Geologic map of Alaska	H.M.Beikman	Office compilation	Statewide	State of Alaska, Division of Geological and Geophysical Surveys
TAPS construction hydrology; fig. 16 (area 1)	J.M.Childers	Evaluation of pipeline construction impact on water resources	Statewide	State of Alaska, Alaska State Pipeline Coordinator's Office
Floods from small drainage areas	S.H.Jones	Flood peak data collection from a network of crest-stage gages	Statewide	State of Alaska, Department of Highways, U.S. Forest Service
Surface-water stations	R.D.Lamke	Monitoring a network of stream, lake and estuary gaging stations	Statewide	Alaska Power Administration, U.S. Air Force, U.S. Army Corps of Engineers, U.S. Forest Service, State of Alaska, Department of Fish and Game, Department of Highways, Department of Natural Resources, Municipality of Anchorage, Kenai Peninsula Borough
Ground-water inventory	L.L.Dearborn	Ground-water data collection, compilation and summary of conditions	Statewide	State of Alaska, Department of Natural Resources
Ground-water stations	L.L.Dearborn	Monitoring water levels in a network of observation wells	Statewide	State of Alaska, Department of Natural Resources, Kenai Peninsula Borough, Municipality of Anchorage
Quality-of-water stations	R.J.Madison	Monitoring a network of water quality stations	Statewide	U.S. Army Corps of Engineers, U.S. Forest Service, State of Alaska, Department of Fish and Game, Department of Environmental Conservation
Municipal water supply studies and water resource evaluations at selected Alaskan communities	G.L.Nelson	Hydrologic data collection and evaluation	Statewide	State of Alaska, Department of Natural Resources, Department of Environmental Conservation
Training programs in remote sensing for Department of Interior personnel	D.M.Carneggie, W.G. Rohde	Instruction in remote sensing applications	Statewide	U.S. Bureau of Land Management, U.S. Fish and Wildlife Service

Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* David A. Brew, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2178. (Chairperson of committee whose other members are Bèla Csejtey, Jr., A. B. Ford, H. L. Foster, T. P. Miller, and H. N. Reiser.)

*Cooperating agency:* State of Alaska, Division of Geological and Geophysical Surveys.

*Project objectives:* Compilation of a 1:2,500,000-

scale metamorphic facies map of Alaska showing metamorphic facies, facies groups, facies series, selected isograds, and granitic rock bodies in the style of the metamorphic facies map explanation suggested by the International Union of Geological Sciences (1967). The map is planned as a contribution to a Map of the Metamorphic Belts of the World, which is sponsored by the Commission for the Geological Map of the World (of the International Geological Congress and the International Union of

Geological Sciences) and as a joint U.S. Geological Survey-State of Alaska Geological Survey publication.

*Project status:* Progress to date includes preliminary compilation and review of regional metamorphic facies maps at 1:1,000,000 scale for all of the state, coding of background metamorphic mineral locality information, and start of the compilation of the final 1:2,500,000-scale map.

*Project:* Geologic map of Alaska

*Region:* Statewide.

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Helen M. Beikman, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2330.

*Cooperating agency:* State of Alaska, Division of Geological and Geophysical Surveys.

*Project objectives:* The objective of this project, which is now completed, was to prepare a multicolor geologic map of Alaska at a scale of 1:2,500,000. The new map is a summary of mapping done by hundreds of geologists who have worked in Alaska at various times since geologic mapping was begun there in the late 1800's. This wall map, when printed, will serve a nationwide audience by providing a ready visual reference upon which planning for future geologic studies, such as earthquake hazard evaluation, mineral-resource estimates, and exploration programs for new mineral resources, can be based. The map will be printed on one sheet and will also show the bathymetry of adjacent ocean areas.

*Project status:* Five uncolored geologic maps at a scale of 1:1,000,000 covering the entire State, which are preliminary compilations on which the final multicolor map is based, have been published. These include Miscellaneous Field Studies Maps MF-611 (covering the southwestern part of the State), MF-612 (covering the south-central part), MF-673 (covering southeastern Alaska), MF-674 (covering the Alaska Peninsula and Aleutian Islands), and MF-789 (covering northern Alaska). An uncolored preliminary version of the 1:2,500,000-scale map will be released in the MF series in the first half

of 1978. The multicolor wall map is now in cartographic preparation, which will require more than a year.

*Project:* Trans-Alaska pipeline hydrology.

*Region and map key:* Statewide (trans-Alaska pipeline corridor, Prudhoe Bay to Valdez); fig. 16 (1).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* J. M. Childers, U.S. Geological Survey, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526.

*Cooperating agency:* State of Alaska, Alaska State Pipeline Coordinator's Office.

*Project objectives:* This project evaluated the impacts of pipeline construction on water resources, particularly regarding the effects on water quality resulting from waste disposal, construction disturbance, and oil spills.

*Project status:* This project, begun in 1975, measured changes in water quality and aquatic habitat at selected sites along the trans-Alaska pipeline during and after construction disturbances. Study sites included reaches of streams impacted by fuel oil spillage or sewage at construction camps and reaches of streams impacted by sediment and turbidity during pipeline burial. During 1977 data collection was completed at all sites except for the Little Tonsina River near Tonsina, where more data are needed. Results for this project are published in the Alaska District annual basic-data reports.

*Project:* Floods from small drainage areas.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* Stanley H. Jones, U.S. Geological Survey, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526.

*Cooperating agencies:* State of Alaska, Department of Highways; U.S. Forest Service.

*Project objectives:* This project collects and publishes flood-peak data from a network of small-stream crest-gaging stations for the purpose of defining the magnitude and frequency of floods within Alaska.

*Project status:* This is a continuing project; all

data are published in the annual series "Water Resources Data for Alaska." The 1977 report will be completed by September 1978. A flood frequency and magnitude analysis by multiple-regression methods will be made to define a set of equations that can be used to estimate flood magnitudes for selected recurrence intervals at any site on ungaged streams in Alaska. The equations will relate floods to drainage-basin characteristics. The flood-frequency analysis will be completed by June 1978.

*Project:* Surface-water stations.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* R. D. Lamke, U.S. Geological Survey, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526.

*Cooperating agencies:* Alaska Power Administration; U.S. Air Force; U.S. Army Corps of Engineers; U.S. Forest Service; State of Alaska, Department of Fish and Game, Department of Highways, and Department of Natural Resources; Municipality of Anchorage; Kenai Peninsula Borough.

*Project objectives:* The Geological Survey operates a network of gaging stations to provide data on (1) streamflow, (2) flood discharges and stages, (3) lake stage and contents, and (4) estuary flow conditions. This program is part of an ongoing national assessment of the nation's water resources. The data are used in project design and planning of water-supply and waste-disposal systems and of bridges and are useful in the assessment of environmental impact of these and other proposed activities.

*Project status:* This is a continuing project; all data are published in the annual series "Water Resources Data for Alaska." The 1977 report is expected to be completed by September 1978.

*Project:* Ground-water inventory.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* L. L. Dearborn, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agency:* State of Alaska, Department

of Natural Resources, Division of Geological and Geophysical Surveys.

*Project objectives:* The purpose of the project is to collect, compile, and publish basic ground-water data and to conduct special studies related to ground-water availability and development in various areas of the state. Work plans include field inventories to acquire newly available data, water-quality sampling, and geophysical logging.

*Project status:* Conversion of existing ground-water data files to the U.S.G.S. National Ground-Water Site-Inventory Data Base has begun. Data for the Kenai, North Kenai, Matanuska and Susitna Valleys, Kodiak, Valdez to Copper Center, Cordova, and Yakutat areas have been processed within the system. A summary of ground-water conditions prepared within the project is to be published in 1978. Personnel of the U.S.G.S. and the Division of Geological and Geophysical Surveys are working to develop a joint operating procedure to coordinate field data collection, compilation, and report preparation within this project.

*Project:* Ground-water stations.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* L. L. Dearborn, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agency:* State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys; Kenai Peninsula Borough; Municipality of Anchorage.

*Project objectives:* This project maintains a network of observation wells to provide data on ground-water levels throughout Alaska. Water-level data indicate the status of ground water in storage or in transit and the availability of water supplies, permit estimation and forecast of base flow of streams, and identify areas where changes in ground-water levels may affect current or planned land use and water supply development. The core of the monitoring network provides long-term records for regional or watershed studies that in turn serve as a basis for correlation of short-term hydrologic records and data collection activities for specific purposes.

*Project status:* Continuing water-level records for long-term (Federal) observation wells are to be published annually in "Water Resources Data for Alaska." Data from Special-purpose or project-oriented water-level networks are processed for use and selected for publication in project reports.

*Project:* Quality-of-water stations.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* R. J. Madison, U.S. Geological Survey, 218 E Street, Anchorage, Alaska 99501; (907) 277-5526.

*Cooperating agencies:* U.S. Army Corps of Engineers; U.S. Forest Service; State of Alaska, Department of Environmental Conservation, Department of Fish and Game.

*Project objectives:* This project provides information on the physical and chemical properties of water by: (1) determining the mineral content and biological aspects of water, thereby establishing a base line from which changes can be evaluated; and (2) determining mineral composition of water to evaluate its use for domestic, municipal, and industrial water supplies. These objectives will be accomplished by operation of a network of water-quality stations.

*Project status:* This is a continuing project; all data are published in the annual series "Water Resources Data for Alaska."

*Project:* Municipal water supply studies and water resource evaluations at selected Alaskan communities.

*Region:* Statewide.

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* G. L. Nelson, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agencies:* State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys, and Department of Environmental Conservation.

*Project objectives:* To evaluate the availability and quality of the water resources, determine current water-use patterns, monitor critical hydrologic variables, and determine potential for water-resource development in several

Alaskan communities, particularly coastal communities that will be affected by anticipated development of offshore petroleum reserves.

*Project status:* A summary of the status of the water-resources information for the various communities has been prepared. A priority list for community studies has been established on the basis of the adequacy of understanding of the hydrologic system to meet the project objectives and the anticipated degree and timing of impact of growth and development in each of the communities. Water-resource evaluations have begun in the Seward and Cordova areas, and a report on the Seward area is planned for publication in 1978.

*Project:* Training programs in remote sensing for Department of the Interior personnel.

*Region:* Statewide.

*Organizational designation:* Land Information and Analysis Office, EROS Program, Applications Branch.

*Project chiefs:* David M. Carneggie and Wayne G. Rohde, EROS Data Center, Applications Branch, Sioux Falls, South Dakota 57198; (605) 549-6511, ext. 114.

*Cooperating agencies:* U.S. Bureau of Land Management; U.S. Fish and Wildlife Service.

*Project objectives:* One of the major activities of the Applications Branch is to transfer remote sensing technology to other Department of the Interior agencies. One of the ways to effect this transfer is to conduct training courses on remote sensing for U.S. Bureau of Land Management and U.S. Fish and Wildlife Service personnel. Regularly scheduled courses emphasize (a) basic principles of manual interpretation of aircraft and Landsat imagery, and (b) digital analysis techniques for Landsat data. These courses have been offered to Alaska resource managers to teach them about the availability of remote sensing data and methods for analyzing the data.

*Project status:* Personnel from the EROS Data Center and Bureau of Land Management conduct four basic training courses and one digital analysis course each year for BLM resource managers. In addition, EROS Data Center and U.S. Fish and Wildlife Service personnel conduct two or three basic photo-interpretation

courses at EDC.

In January 1977, EDC personnel conducted a short course on remote sensing for the Alaskan chapters of the American Society of Photogrammetry and the American Congress for Surveying and Mapping in Anchorage, Alaska. Over 80 participants attended the 3-day course, which emphasized manual techniques for image analysis using Landsat and color infrared aerial photographs. Personnel from the Geophysical Institute, University of Alaska, also participated, presenting examples of the uses of various remote sensing data for addressing resource inventory problems in Alaska.

#### NORTHERN ALASKA

*Project:* Land-use study of National Petroleum Reserve in Alaska (NPRA).

*Region and map key:* Northern Alaska; fig. 16 (2).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Branch of Alaskan Geology.

*Project chief:* Oscar J. Ferriars, Jr., U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2247.

*Cooperating agencies:* U.S. Bureau of Land Management; U.S. Bureau of Mines.

*Project objectives:* This project will carry out surficial geologic investigations and mineral resource assessment studies of NPRA.

The surficial geologic investigations include the following activities: (1) determination of distribution and character of natural construction materials (for example, gravel deposits); (2) investigation of geologic hazards such as thawing of permafrost, unstable bentonitic soils, accelerated erosion, and flooding; (3) determination of distribution of ice-rich permafrost, including ice wedge polygons, pingos, and other indicators of the presence of permafrost; (4) study of the character and distribution of various types of surficial deposits to determine their engineering properties; (5) study of unique arctic drainage conditions; (6) study of coastal zone processes and conditions; and (7) preparation of a slope map.

The mineral resource assessment study includes: (1) determination of the distribution, character, and stratigraphic and structural relation of rocks that are potentially mineral

bearing; (2) systematic sampling of rocks and soils in areas of mineral potential in order to determine their geochemistry; and (3) determination of the types and values of mineral commodities present.

*Project status:* The first field season has been completed, and preliminary reports covering the surficial geologic investigations and the mineral resource assessment studies have been completed and transmitted to the U.S. Bureau of Land Management. Final reports will be completed after the second field season.

*Project:* NPRA data release.

*Region and map key:* Northern Alaska; fig. 16 (2).

*Organizational designation:* Office of National Petroleum Reserve in Alaska (ONPRA).

*Project chief:* Robert D. Carter, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2116.

*Cooperating agency:* Environmental Data Service, National Oceanic and Atmospheric Administration (NOAA).

*Project objectives:* The objective is to gather, inventory, organize, and make available to the public all geophysical and geological data generated in the petroleum exploration of NPRA by the U.S. Navy and by the Office of National Petroleum Reserve in Alaska.

*Project status:* The project will be an ongoing program so long as ONPRA is responsible for the petroleum exploration of NPRA. Most of the data covering operations on the Reserve since 1955 have been gathered from various sources and are being assembled in Houston. The initial release of material on the 17 wells drilled since 1955 should be ready for reproduction and dissemination by the National Oceanic and Atmospheric Administration, Boulder, Colo., early in 1978. Geophysical data releases will follow in chronological order. Detailed descriptions of the releases and instructions for ordering them will be extensively advertised by NOAA.

#### EAST-CENTRAL ALASKA

*Project:* Geohydrology of Fairbanks-North Star Borough.

*Region and map key:* East-central Alaska; fig. 16 (3).

TABLE 10.—Regional cooperative projects

Name of Project; map key	Project chief	Type of work	Area(s)	Cooperating agencies
Land-use study of National Petroleum Reserve in Alaska; fig. 16 (area 2)	O.J.Ferrians, Jr.	Surficial geology, mineral resource	National Petroleum Reserve in Alaska (NPRA)	U.S. Bureau of Land Management, U.S. Bureau of Mines
NPRA data release; fig. 16 (2)	R.D.Carter	Data collection and release	NPRA	National Oceanic and Atmospheric Administration
Geohydrology of Fairbanks-North Star Borough; fig. 16 (3)	G.L.Nelson	Monitoring observation wells, water-quality sampling, interpretive studies	East-central Alaska	Fairbanks-North Star Borough
Geohydrology of the Delta-Clearwater area; fig. 16 (4)	G.L.Nelson	Seepage measurements, aquifer testing, water-quality sampling, report preparation	Delta area	State of Alaska, Department of Natural Resources
St. Lawrence Island stratigraphic project; fig. 16 (5)	I.F.Palmer	Measurement of stratigraphic sections	St. Lawrence Island	State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys
Stratigraphic study of the Alaska Peninsula; fig. 16 (6)	I.F.Palmer	Assess petroleum reservoir and source rock potential	Southwestern Alaska	State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys
Water resource studies of the Kenai-North Kenai area; fig. 16 (7)	G.L.Nelson	Basic hydrologic data collection, analysis, and interpretation	Kenai Peninsula	Kenai Peninsula Borough, State of Alaska, Department of Natural Resources
Hydrologic studies related to coal mining; fig. 16 (8), (9), (10)	D.R.Scully	Collection of basic hydrologic data in areas with proven coal reserves and in an area of active coal mining	Upper Cook Inlet and Healy coal field	U.S. Environmental Protection Agency
Hydrologic data compilation for Cook Inlet area; fig. 16 (11)	G.W.Freethey	Collection and completion of basic hydrologic data, for agency and public use	Cook Inlet	State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys, Kenai Peninsula Borough, Municipality of Anchorage
Hydrologic data summary for the Cook Inlet area; fig. 16 (11)	D.R.Scully	Summary of hydrologic data	Cook Inlet area	Water Resources Council, Level B Study--Southcentral Alaska
Geohydrology of the Anchorage area; fig. 16 (12)	R.S.George	Hydrologic data collection, ground-water resource evaluation, monitoring urban effects on hydrologic system	Anchorage area	Municipality of Anchorage
Classification of vegetation in the Denali, Alaska area; fig. 16 (13)	W.G.Rohda	Vegetation classification from digital Landsat data	Southern Alaska	U.S. Bureau of Land Management
Application of remote sensing data for ground-water analysis near Denali, Alaska; fig. 16 (13)	J.K.Richard	Ground-water analysis	Southern Alaska	U.S. Bureau of Land Management

TABLE 10.—Regional cooperative projects—Continued

Name of Project; map key	Project chief	Type of work	Area(s)	Cooperating agencies
Computer enhancement of Landsat digital data for mapping material-related geomorphic features near Denali, Alaska; fig. 16 (area 13)	Cynthia Sheehan	Enhancement of digital Landsat data	Southern Alaska	U.S. Bureau of Land Management
Eastern Gulf of Alaska seismicity; fig. 16 (14)	J.C. Lahr	Seismic network to monitor earthquake activity	Prince William Sound to Yakutat	National Oceanic and Atmospheric Administration
Glacier Bay National Monument Wilderness Study Area; fig. 16 (15)	D.A. Brew	Report preparation	Glacier Bay National Monument	U.S. Bureau of Mines, Alaska Field Operations Center, Juneau
West Chichagof-Yakobi Wilderness Study Area; fig. 16 (16)	B.R. Johnson	Geologic mapping geochemical and geophysical surveys, mineral-resource assessment	Western Chichagof and Yakobi Islands	U.S. Bureau of Mines, Alaska Field Operations Center, Juneau

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* G. L. Nelson, U.S. Geological Survey, Federal Building and Courthouse, Box 11, 101 12th Avenue, Fairbanks, Alaska 99701; (907) 452-1951, ext. 214.

*Cooperating agency:* Fairbanks-North Star Borough.

*Project objectives:* Overall project objectives are to evaluate the quality and availability of water resources in the Fairbanks-North Star Borough. Specific objectives for FY 1978 are to continue monitoring selected wells in the Fairbanks area, to evaluate methods that might be used to enhance natural recharge in parts of the uplands, and to define further the occurrences of arsenic contamination of ground water in the uplands.

*Project status:* A report summarizing the first three years of the program is in review and should be released during FY 1978. A map depicting the distribution of arsenic, nitrate, iron, and hardness in ground water has also been prepared and is being reviewed. A report summarizing arsenic studies during FY 77-78 will be prepared during the spring of 1978.

*Project:* Geohydrology of the Delta-Clearwater area.

*Region and map key:* East-central Alaska; fig. 16 (4).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* G. L. Nelson, U.S. Geological Survey, Federal Building and Courthouse, Box 11, 101 12th Avenue, Fairbanks, Alaska 99701; (907) 452-1951, ext. 214.

*Cooperating agency:* State of Alaska, Department of Natural Resources.

*Project objectives:* The objectives of this project are to produce hydrologic data that can be used to assess the environmental impact of agricultural development in the Delta-Clearwater area and provide a hydrologic interpretation of the area that can be used to plan for and manage orderly agricultural development.

*Project status:* This project was initiated in August 1977. Existing U.S. Geological Survey hydrologic data for the area has been compiled. Field data collection has begun: several discharge measurements have been made, surface-water quality samples have been collected, and three test wells have been completed in the aquifer. A report on the results of studies conducted during the first year should be completed by December 1978.

WEST-CENTRAL ALASKA

*Project:* St. Lawrence Island stratigraphic project.

*Region and map key:* West-central Alaska; fig. 16 (5).

*Organizational designation:* Conservation Division, Office of the Alaska Area Geologist.

*Project chief:* I. F. Palmer, U.S. Geological Sur-

vey, 800 A Street, Anchorage, Alaska 99501; (907) 278-3571.

*Cooperating agency:* State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys.

*Project objectives:* The objective is to conduct potential petroleum reservoir and source rock investigations in upland areas adjacent to proposed OCS sale areas to facilitate extrapolation of geologic data into the OCS area for prospect area and block economic evaluations.

*Project status:* This project is in the planning stages.

#### SOUTHWESTERN ALASKA

*Project:* Stratigraphic study of the Alaska Peninsula.

*Region and map key:* Southwestern Alaska; fig. 16 (6).

*Organizational designation:* Conservation Division, Office of the Alaska Area Geologist.

*Project chief:* I. F. Palmer, U.S. Geological Survey, 800 A Street, Anchorage, Alaska 99501; (907) 278-3571.

*Cooperating agency:* State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys (co-project chief, W. M. Lyle).

*Project objectives:* The project aims to assess petroleum reservoir and source rock potential and determine the hydrocarbon maturation level within the basin.

*Project status:* All fieldwork is completed, and most laboratory analyses have been completed. Drafting of stratigraphic sections is nearing completion, and report writing is in progress. The data will be released through the State of Alaska open-file publication series.

#### SOUTHERN ALASKA

*Project:* Water resource studies of the Kenai-North Kenai area.

*Region and map key:* Southern Alaska; fig. 16 (7).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* G. L. Nelson, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agencies:* Kenai Peninsula Borough;

State of Alaska, Department of Natural Resources.

*Project objectives:* Project objectives are (1) to maintain a basic hydrologic data collection and monitoring network on streamflow, groundwater levels, and lake levels in the Kenai-North Kenai areas, and (2) to define the hydrologic system in order to evaluate the hydrologic effects of ground-water withdrawal from the confined aquifer in the North Kenai area.

*Project status:* Existing data are being evaluated and new data collected in light of increasing demands for industrial water sources throughout the Kenai Peninsula area, but most immediately in the North Kenai area. The water tables and lake levels have been declining concurrently with lowering potentiometric levels in confined aquifers. Such decreases in water levels are apparently related to a combination of the effects of ground-water pumping and below normal precipitation from 1968 through 1976. However, after near-normal precipitation in 1977, significant water-table and lake level rises were measured. Water level recorders have been installed at several wells and lakes considered critical to definition of surface water-ground water relations. Additional geologic and hydraulic data were collected during test drilling and aquifer tests conducted in late 1977.

*Project:* Hydrologic studies related to coal mining.

*Region and map key:* Southern Alaska; fig. 16 (8), (9), (10).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* D. R. Scully, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agency:* Environmental Protection Agency.

*Project objectives:* This project is designed to collect data that characterize present hydrologic conditions in areas of known potential for coal development and in an area of active mining. Information obtained includes: (1) quantity and seasonal distribution of water discharge; (2) seasonal and areal variations in surface-water quality, including organic and inorganic

constituents, minor-element concentrations, sediment, and temperature; (3) stream-basin characteristics; and (4) aquatic benthic invertebrate communities.

*Project status:* Field investigations were started in 1975 and will continue through 1978 in the Beluga, Healy, and Peters Creek coal areas. A report will be published in 1979.

*Project:* Hydrologic data compilation for Cook Inlet area.

*Region and map key:* Southern and southwestern Alaska; fig. 16 (11).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* Geoffrey W. Freethy, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agencies:* State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys; Kenai Peninsula Borough; Anchorage Municipality.

*Project objectives:* The purpose of the project is to collect, compile, and make available to cooperating agencies existing hydrologic data for the Cook Inlet area. The information to be compiled encompasses all ground-water, surface-water, and quality-of-water data in files and publications of the U.S. Geological Survey and the State of Alaska, as well as new data to be collected during field inventories of the study area. The amassed data may be used as a foundation for investigations involving: (1) ground-water availability and quality in rapidly developing areas, including landfills; (2) changes in ground-water levels; and (3) surface-water resources of the agricultural, recreational, and developing residential areas.

*Project status:* Data collection and compilation for the Susitna, Matanuska, and Knik drainages, the west shore of Cook Inlet, and the western drainages of the Kenai Peninsula, and the surface-water compilation for the Anchorage Municipality are complete. The ongoing ground-water compilation for the Anchorage Municipality is approximately 25 percent complete. Two open-file reports are currently being prepared for publication in 1978. One is an index of ground-water hydrologic data; the other is a surface-water discharge and water temperature data compilation.

*Project:* Hydrologic data summary for the Cook Inlet area.

*Region and map key:* Southern and southwestern Alaska; fig. 16 (11).

*Organizational designation:* Water Resources Division, Alaska District Office.

*Project chief:* D. R. Scully, U.S. Geological Survey, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agency:* Water Resources Council, Level B Study—Southcentral Alaska.

*Project objectives:* The purpose of this project is to provide a ground-water atlas report summarizing ground-water availability and a surface-water report summarizing streamflow data and providing regional analysis of certain streamflow characteristics. These reports will be used to provide baseline hydrologic resource information for the Water Resources Council Southcentral Alaska Level B Study assessing water problems and defining alternate solutions in the next 10 to 25 years.

*Project status:* Previously compiled surface-water data will be used to summarize monthly and annual statistics (39 sites), flood-frequency analysis (47 sites), and low-flow frequency and flow duration (30 sites). Regional flow characteristics will be shown on maps or by regression equations. Ground-water data will be used in conjunction with surficial geology, baseflow predictions, and unconsolidated sediment thickness to prepare an atlas of ground-water availability. Schematic sections of the more developed areas will be used to show the varied aquifer systems within the basin.

*Project:* Geohydrology of the Anchorage area.

*Region and map key:* Southern Alaska; fig. 16 (12).

*Organizational designation:* Water Resources Division, Alaska, District Office.

*Project chief:* Raymond S. George, 1209 Orca Street, Anchorage, Alaska 99501; (907) 279-1563.

*Cooperating agency:* Municipality of Anchorage.

*Project objectives:* The project aims to assess the water resources of the Anchorage area, the State's largest population center, particularly with respect to the availability of water for increasing water supply demands and the effects of urbanization on the hydrologic system. In

addition, project personnel maintain a hydrologic data collection network that provides a basis for interpretive studies and hydrologic analyses.

*Project status:* The general hydrologic character of this area and potential for urban hydrology were described early in this 12-year-old project. Current project activities include continued operation of a basic hydrologic data collection network, evaluation of ground-water resources at Eagle River (a residential center north of Anchorage), and hydrologic model analysis of the confined ground-water system at Anchorage. Preliminary reports on the last two elements will be completed by mid-1978.

*Project:* Classification of vegetation in the Denali, Alaska area with digital Landsat data.

*Region and map key:* Southern Alaska; fig. 16 (13).

*Organizational designation:* Land Information and Analysis Office, EROS Program, Applications Branch.

*Project chief:* Wayne G. Rohde, EROS Data Center, Applications Branch, Sioux Falls, South Dakota 57198; (605) 594-6511, ext. 114.

*Cooperating agency:* U.S. Bureau of Land Management.

*Project objectives:* The purpose of this project is to provide BLM personnel with training and experience in Landsat digital image analysis for resource mapping and inventory. Specific objectives are to demonstrate the application of Landsat digital data for classifying and mapping wildland vegetation over approximately 118,623 ha (293,000 acres) near Denali, Alaska.

*Project status:* Personnel from the EROS Data Center and Bureau of Land Management, Denver, will perform the image analysis using an interactive system at the EROS Data Center. A sampling scheme will be used to estimate the classification accuracy of the vegetation map overlays. The classified Landsat data will be geometrically corrected and plotted with a flat-bed plotter to produce 1:63,360-scale map overlays. The classification and analysis will be completed in 1977. A report describing the analysis techniques, vegetation classification scheme, classification accuracy, and cost will be prepared in 1978.

*Project:* Application of remotely sensed data for ground-water analysis near Denali, Alaska.

*Region and map key:* Southern Alaska; fig. 16 (13).

*Organizational designation:* Land Information and Analysis Office, EROS Program, Applications Branch.

*Project chief:* James K. Richard, EROS Data Center, Applications Branch, Sioux Falls, South Dakota 57198; (605) 594-6511, ext. 114.

*Cooperating agency:* U.S. Bureau of Land Management.

*Project objectives:* The purpose of this investigation is to demonstrate the application of Landsat imagery and 1:30,000-scale color infrared aerial photography for identifying areas suitable for ground-water exploration in a typical subarctic, glaciated environment. Materials developed from this project will also be used in subsequent training courses in geology and hydrology applications of remotely sensed data.

*Project status:* The project area includes approximately 4,200 km<sup>2</sup> near Denali, Alaska. Landsat imagery at a scale of 1:250,000 will be analyzed and interpreted to develop a series of overlays presenting hydrogeologic and geologic information. More detailed image analysis will be done for selected areas with 1:30,000-scale color infrared photographs. Overlays illustrating features important to the development of a ground-water targeting strategy will be made. A field trip will be made to the Denali area to field check the interpretation results and make necessary modifications. It is anticipated that a final report will be written in 1978.

*Project:* Computer enhancement of Landsat digital data for mapping material-related geomorphic features near Denali, Alaska.

*Region and map key:* Southern Alaska; fig. 16 (13).

*Organizational designation:* Land Information and Analysis Office, EROS Program, Applications Branch.

*Project chief:* Cynthia Sheehan, EROS Data Center, Applications Branch, Sioux Falls, South Dakota 57198; (605) 594-6511, ext. 114.

*Cooperating agency:* U.S. Bureau of Land Management.

*Project objectives:* The purpose of this project is to

demonstrate the application of digitally enhanced imagery for mapping surficial deposits in the Denali area and to develop training materials for BLM/EROS training courses in geologic applications of remotely sensed data.

*Project status:* A series of digitally contrasted, enhanced images were made from Landsat digital data taken on August 1, 1976, over an area near Denali, Alaska. This area covers a 1,200-km<sup>2</sup> area of the Susitna River Valley. All processing and analysis were completed in 1977. The enhanced images will be evaluated to determine the application of digitally enhanced data for mapping surficial geology.

*Project:* Eastern Gulf of Alaska seismicity.

*Region and map key:* Southern and offshore Alaska; fig. 16 (14).

*Organizational designation:* Geologic Division, Office of Earthquake Studies, Earthquake Hazards Branch.

*Project chief:* John C. Lahr, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2510.

*Cooperating agency:* National Oceanic and Atmospheric Administration (NOAA).

*Project objectives:* The objective of this research project is to evaluate the hazards associated with earthquake activity in the eastern Gulf of Alaska and adjacent onshore areas that pose a threat to the safety of petroleum exploration and development.

*Project status:* A network of seismic stations installed in 1974 and expanded in 1975 is now operating between Prince William Sound and Yakutat Bay. Much interest is currently centered on the Icy Bay region, which has been the source of a concentration of microearthquakes. Quarterly and annual reports are published by NOAA as "Alaskan OCS Principal Investigators' Reports."

#### SOUTHEASTERN ALASKA

*Project:* Glacier Bay National Monument Wilderness Study Area.

*Region and map key:* Southeastern Alaska; fig. 16 (15).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Wilderness Program and Branch of Alaskan Geology.

*Project chief:* David A. Brew, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2178.

*Cooperating agency:* U.S. Bureau of Mines, Alaska Field Operations Center.

*Project objectives:* The principal objective is an appraisal of the mineral-resource potential of a large area of complex geology just northwest of the Alexander Archipelago, using: (1) reconnaissance geologic, geochemical, and detailed mineral-occurrence information gathered in the 1966 Geological Survey study of the Monument (Professional Paper 632); (2) reconnaissance geologic mapping of previously unmapped areas; (3) reconnaissance bedrock geochemical sampling; (4) reconnaissance stream-sediment geochemical sampling of previously unsampled areas; (5) aeromagnetic surveying; (6) gravity surveying; and (7) detailed examination and sampling of selected known mineral occurrences and of areas containing anomalous concentrations of selected metallic elements. Geochronologic studies are being done in cooperation with the Branch of Isotope Geology. The appraisal is part of the U.S. National Park Service study of the suitability of the area for inclusion in the National Wilderness Preservation System established by the Wilderness Act of 1964.

*Project status:* The project started in the 1975 field season with the main emphasis on verification testing of geochemical data from the 1966 studies, reconnaissance geologic mapping in previously unmapped areas, and reconnaissance bedrock geochemical sampling. Aeromagnetic, paleomagnetic, and gravity surveys were completed in 1976, as were reconnaissance bedrock geologic and geochemical studies in the westernmost part of the Monument. Reconnaissance geologic and geochemical mapping of the high part of the Fairweather Range was done in 1977. Manuscript submittal is scheduled for June 1978, and the report will be open filed by August 1978.

*Project:* West Chichagof-Yakobi Wilderness Study Area.

*Region and map key:* Southeastern Alaska; fig. 16 (16).

*Organizational designation:* Geologic Division, Office of Mineral Resources, Wilderness Pro-

gram and Branch of Alaskan Geology.

*Project chief:* B. R. Johnson, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025; (415) 323-8111, ext. 2769.

*Cooperating agency:* U.S. Bureau of Mines, Alaska Field Operations Center.

*Project objectives:* The principal objective is an appraisal of the mineral-resource potential of an area at the northwest corner of the Alexander Archipelago. The appraisal is part of a U.S. Forest Service study of the suitability of the area for inclusion in the National Wilderness Preservation System. The appraisal will evolve from: (1) reconnaissance geologic, geochemical, and structural information gathered in the 1975 Geological Survey study of the northwest-

ern Alexander Archipelago (Professional Paper 792); (2) detailed geologic mapping of selected parts of previous reconnaissance studies; (3) reconnaissance bedrock geochemical sampling; (4) reconnaissance stream-sediment geochemical sampling; (5) aeromagnetic surveying; and (6) detailed examination and sampling of selected known mineral occurrences and of areas containing anomalous concentrations of selected metallic elements.

*Project status:* The project will begin with a four-week field season during the summer of 1978; a second field season is projected for the summer of 1979. The aeromagnetic survey is scheduled to be flown in 1978. Manuscript submittal is tentatively planned for mid-1980.