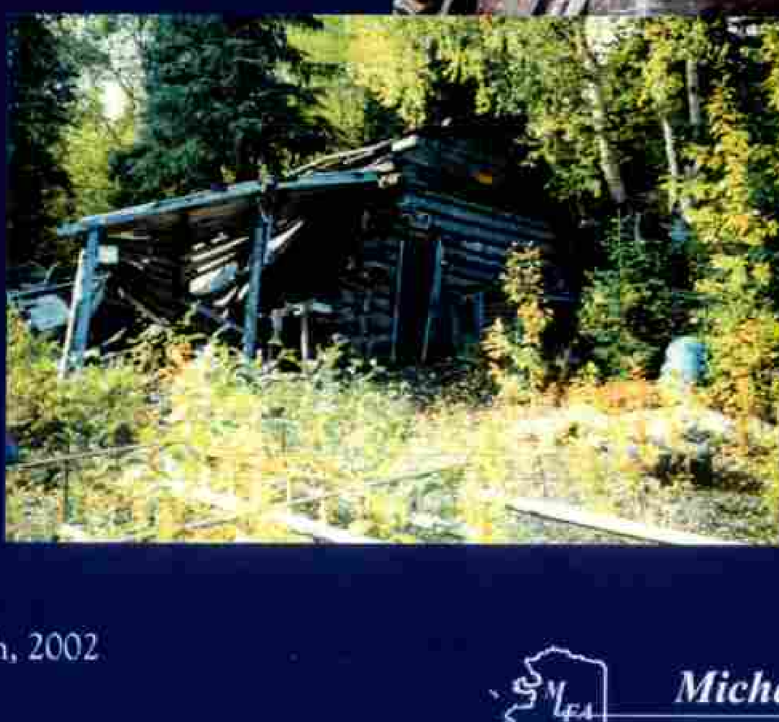
Prospects and Producers:
Historic Context for Mining Properties, Chugach and Tongass National Forests, Alaska, 1850s-1950s

prepared for the
USDA Forest Service, Alaska Region

Contract No. 53-0109-1-00568



Prepared by: J. Simon Bruder

March, 2002

Michael L. Foster & Associates
An Alaskan Owned and Operated Company
Engineers • Planners • Scientists

SIT AS
CRG C2
SEWD4

SIT: 00522
CRG-00019
SEW-00951
SEW-00425

Michael L. Foster & Associates

An Alaskan Owned and Operated Company

Engineers • Planners • Scientists
Contractors • Surveyors

Alaska Department of Natural Resources
ID_CITATION
6943
Office of History & Archaeology

April 12, 2002

Ms. Susan H. Marvin, Regional Archaeologist
USDA Forest Service, Alaska Region
P.O. Box 21628
Juneau, Alaska 99802-1628

Completion of
Historic Context for Alaskan Mines
Contract No. 53-0109-1-00568
MLFA Job No. USDA-USFS-001-0000

Dear Sue:

Enclosed are the requisite copies of the final, two-volume historic context for mining properties on the Chugach and Tongass National Forests. As stipulated in the contract, one unbound single-sided copy of the context report itself (*Prospects and Producers*) and another of the companion field report (*Pilot Field Study Results*) are enclosed along with four spiral bound, double-sided copies of each volume. These final versions contain the revisions requested by the Forest Service after their review of draft editions. All substantive modifications were sent to you for a final review prior to their incorporation in these documents. Electronic versions of both documents in Microsoft Word and Excel also are provided as required on the enclosed compact disc.

Working on this project with you has been a pleasure. We look forward to continuing the evaluation of the seven additional mining properties assigned to us in the modification to the original contract.

Sincerely,

J. Simon Bruder, Ph.D.
Cultural Resource Specialist

Enclosures

PROSPECTS and PRODUCERS:
Historic Context for Mining Properties, Chugach and Tongass National Forests, Alaska, 1850s-1950s

Volume I: Historic Context Report

Prepared for

USDA Forest Service, Alaska Region
P.O. Box 21628
Juneau, Alaska 99802-1628

Contract No. 53-0109-1-00568

Prepared by

J. Simon Bruder

Contributors

Holly L. Morris, Donald K. Chancey and Traci R. Bradford

Michael L. Foster & Associates
13135 Old Glenn Highway, Ste. 210
Eagle River, Alaska 99577

March 2002

COVER PHOTOGRAPHS

Upper Left: Dock pilings with collapsed mill building in background at Salt Chuck Mine photographed by Stefanie Ludwig August 8, 2001; Lower Left: Bunkhouse at Mull Claims photographed by Carol Huber September 12, 1991; Center: Stamp mill at Granite Mine photographed by Holly L. Morris August 14, 2001; Lower Right: Aqueduct at the Granite Mine photographed by Holly L. Morris August 15, 2001.

FLYLEAF PHOTOGRAPHS

Upper: Bunkhouse at Mull Claims photographed by Carol Huber September 12, 1991; Lower: Mill building remains at Salt Chuck Mine photographed by Holly L. Morris, August 8, 2001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF IMAGES FROM APPENDIX E

LIST OF TABLES

Page intentionally left blank.

PREFACE

Development of this historic context for mining properties throughout the Chugach and Tongass National Forests was prompted by proposed initiatives for dealing with health, safety, and environmental concerns at over 200 properties, many of them of possible historic importance. In fact, however, the approach for assessing eligibility for listing on the National Register of Historic Places articulated in this document has broader applicability. There are an estimated 150 to 160 productive lode mines and placer streams, perhaps two to three times that many developed prospects, and an even larger number of smaller prospecting sites scattered throughout Alaska's Forests. Many of these properties are threatened, not only by proposed clean-up efforts, but also by intentional or inadvertent vandalism, environmental restoration, renewed mining activities, and perhaps most importantly, Alaska's harsh climate.

This project benefited greatly from the quantity and quality of studies undertaken over the past 20 years by the Bureau of Mines, U.S. Geological Survey, and Bureau of Land Management to assess mineral potential throughout the Forests. These synthetic efforts provide exceptional background material that is invaluable to researchers interested in recording and assessing historic mining properties. This context, which is comprised of two volumes, was developed to guide such future research. Volume I contains the context proper. Volume II presents the results of a pilot field study and analyses of four mining properties: the Halleck Island Prospect and Salt Chuck Mine in Southeastern Alaska, the Granite Mine in Prince William Sound, and the Mull (placer) Claims on the Kenai Peninsula. Together these two volumes are intended for use by cultural resource professionals as well as the Forest Service managers charged with appropriate stewardship of historic properties on the lands they administer.

I extend my thanks first to all of my coworkers at Michael L. Foster & Associates, both for their interest in the project, and for the many hours some of them spent assisting me in its many facets. In particular I wish to acknowledge Holly Morris who participated in the field as well as preparing much of Chapter 3, two additional contributors to this report: Don Chancey and Traci Bradford, and the graphics staff: Brian Hannafious, Craig Hanson, and Tim Russell. Numerous individuals shared their knowledge with me during the course of the project; these people are listed in Chapter 1 (pages 18-19). I found these miners, minerals specialists, geologists, historians, archaeologists, and other professionals and *aficionados* to be encouraging and enthusiastic in addressing my queries and offering the benefits of their expertise. Ken Maas, Carol Huber, Rolfe Buzzell, Chuck Hawley, and Logan Hovis were particularly patient and unfailingly responsive and informative. Stefanie Ludwig, the State Historic Preservation Officer's representative for this project, joined in the field effort and provided input whenever called upon to do so.

Forest Service personnel aided my efforts greatly, continually expressing interest and reviewing drafts of this context. The Forest archaeologists all shared information freely. John Autrey went out of his way to gather documentary materials for me and served as a "sounding board" on more than one occasion as I struggled to develop a workable assessment approach. Last, but most definitely not least, I thank Susan Marvin, who

served as the contracting officer's representative, for her unswerving support and practical approach to managing this project for the Forest Service.

J. Simon Bruder, Ph.D.
Principal Investigator

ABSTRACT

The search for and exploitation of precious and base metals was an integral and important component of Alaska's history. Evidence for this history is present throughout the Chugach and Tongass National Forests. The Chugach National Forest comprises the Kenai Peninsula and Turnagain Arm and Prince William Sound and the Copper River Delta. The Tongass National Forest includes much of Alaska's Southeastern Panhandle. This historic context was developed to outline an approach to allow the Forest Service to distinguish among mining properties that do and do not qualify for listing on the National Register of Historic Places. The context was developed in consideration of a variety of statutes, regulations and guidance documents; principal among them was National Register Bulletin 42, *Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties* (Noble and Spude 1992). There are a considerable quantity of data available for mines and prospects located on the Forests. Minerals evaluations undertaken in the 1980s and 1990s by the U.S. Bureau of Mines and cooperating agencies provide the bulk of these data.

Alaska Natives are known to have obtained and traded both copper and gold, but nothing is currently known about any mining efforts they might have undertaken on the Forests. Russian prospectors on the Kenai Peninsula in 1850 were the first European gold seekers in what would become the Territory of Alaska. Prospecting began near Sitka just a few years after the United States acquired "Russian America" in 1867. The rush to the Juneau Gold Belt in 1880 was the first in a series of Alaskan gold rushes. That region also was an important source for silver and lead. Important gold mines also were developed on Chichagof Island. The Ketchikan Mining District produced a variety of minerals; principal among them was copper, however the region also produced gold, silver, lead, zinc, palladium, uranium, and tungsten. Prince William Sound and the Copper River Delta witnessed mining beginning in the 1880s. Copper was the region's mainstay, but gold and silver mines were developed as well. The northern Kenai Peninsula and Turnagain Arm experienced a gold rush from 1896 to 1898, one that actually began prior to the stampede to the Klondike. Both placer mining and lode gold mining were locally important on the Peninsula and Turnagain Arm.

Important mining related themes and periods of significance for Alaska's National Forests include:

- Pre-contact Native mineral exploration and extraction (dates undetermined)
- Mineral exploration and extraction in the Juneau Mining District, 1870s-1944
- Mineral exploration and extraction in the Tracy Arm-Fords Terror Wilderness / Windham Bay Area, 1869-1940s
- Mineral exploration and extraction in Chichagof and Baranof Islands Area, 1870s-1942
- Mineral exploration and extraction in the Stikine area, 1900-1930s
- Mineral exploration and extraction in the Ketchikan Mining District, 1867-1950s
- Gold mining in Prince William Sound, 1880s-1920s
- Copper mining in Prince William Sound, 1890s-1920s
- Russian and early American gold prospecting on the Kenai Peninsula, 1850s-1890s

- Kenai Peninsula and Turnagain Arm Gold Rush, 1895-1898
- Post-gold rush mining activities on the Kenai Peninsula and Turnagain Arm, 1900-1940s

Mining properties throughout the Forests are primarily archaeological sites, some amenable to aggregation into historic districts. Rare standing buildings and structures are present as well along with infrequent isolated objects. Properties that reflect prospecting, exploration, development, and exploitation of both lode and placer deposits are found. Transportation facilities and mineral processing sites and equipment also occur. There are an estimated 500 prospects and mines throughout the Chugach National Forest and 800 such properties within the Tongass National Forest. Determinations of eligibility for listing on the National Register have been made for just a handful of properties to date as shown in Appendix D. A single site, the Hirshey-Lucky Strike Mine on the Kenai Peninsula is a listed property.

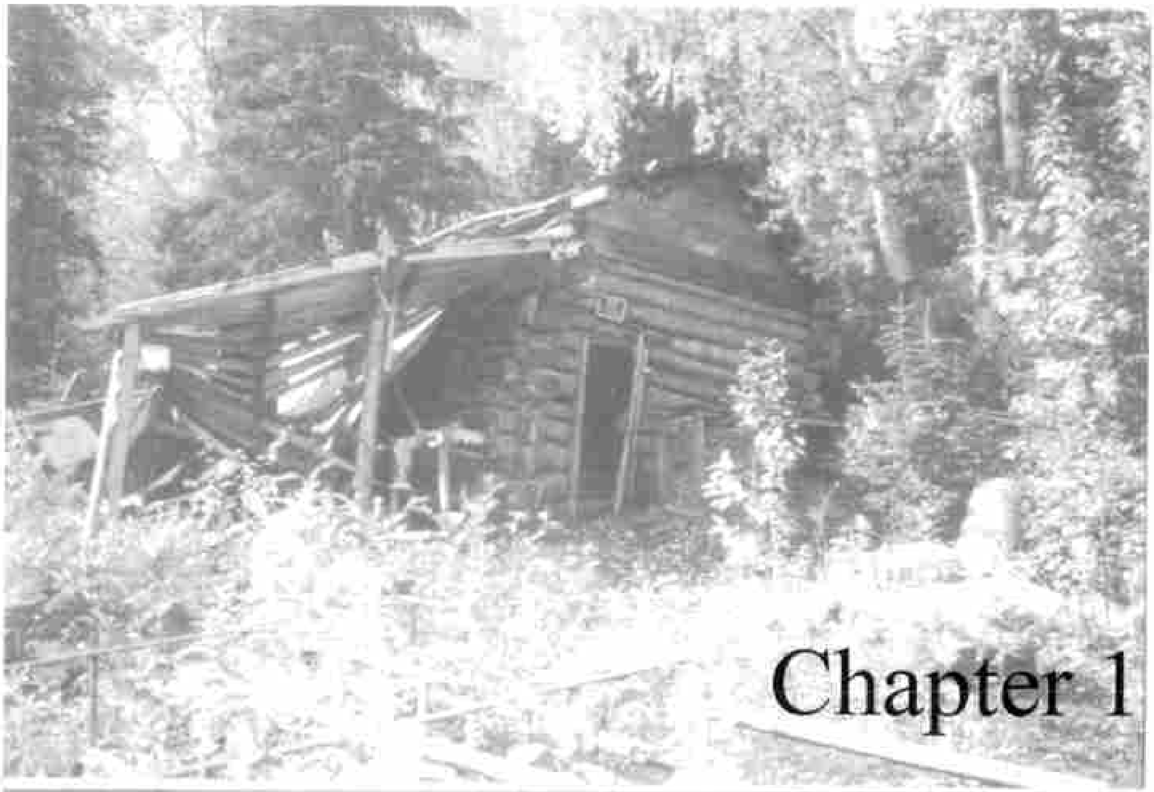
The methodology for assessing National Register eligibility under criteria A, B, and C follows Noble and Spude's (1992) guidelines with an emphasis placed on a property's integrity of design. For mines and prospects, design is "the combination of elements that create the form, plan, space, structure, and style of a property." In general, rare or unique mining properties will require less integrity to qualify for listing than will more common types. Undeveloped prospects will not ordinarily qualify for listing because they lack the kinds of attributes that best exemplify mining. In order to assess eligibility under criterion D, questions that address how miners lived, specific applications of mining technologies, and internal arrangements and site-specific dynamics are outlined, and properties likely to have the potential to address them are identified.

The report concludes with a consideration of the current state of knowledge concerning mining properties within both Forests and an identification of data gaps. Much more detailed summary data have been assembled for Tongass mining properties than for those on the Chugach. Threats to mining properties include hazards remediation, renewed mining activities, vandalism, and environmental restoration. But the single most important threat to mining properties in Alaska's Forests is the weather. Avoiding properties does not preserve them in the long run. The Forest is encouraged to explore proactive management strategies that emphasize stabilization and public interpretation at selected mines rather than piece meal mitigation.

Appendices include a list of acronyms, a glossary, tabulations and summary data about mines and prospects evaluated for potential hazards and mining properties included in the Alaska Heritage Resources Survey, and illustrations of mining techniques and equipment. A references section concludes the report. In a companion document (Volume II) the results of a pilot field study to apply the methods developed in this context are reported. Four properties were evaluated: the Halleck Island Prospect near Sitka and the Salt Chuck Mine on Prince of Wales Island in the Tongass National Forest, and the Granite Mine in Prince William Sound and the Mull Claims placer mining property on the Kenai Peninsula in the Chugach National Forest.

Chapter 1

Introduction



CHAPTER 1. INTRODUCTION

"The Congress finds and declares that . . . the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people ... ." (National Historic Preservation Act, Section 1).

The search for gold was an integral and dramatic component of Alaskan history from the late 1800s to the 1930s. Copper mining too, while less glamorous, played an important role in the state's development during the first half of the twentieth century. Less well-known efforts to extract silver and a variety of base metals also have played a role in the state's history. This document (1) briefly relates the history of nineteenth and twentieth century mining on the Alaskan Panhandle (Southeast), throughout Prince William Sound and the Copper River Delta, and on the Kenai Peninsula and Turnagain Arm; and (2) provides guidance for identifying related properties that may warrant preservation. This historic context was developed in accordance with a contract issued by the United States Department of Agriculture (USDA) Forest Service, Alaska Region specifically for use by the Tongass and Chugach National Forests (Figure 1). These are Alaska's only National Forests, but they are vast, encompassing approximately 16.5 million acres (25,780 square miles) and 5.4 million acres (8,440 square miles) respectively.

PURPOSE AND GOALS

A historic context can be understood as a road map that delineates past research and maps out future preservation opportunities and activities. The major goal of this document is to outline an approach that will provide the Forest Service with a succinct, defensible, and easily applied method for distinguishing among mining properties that do and do not qualify for listing on the National Register of Historic Places (National Register). Especially to the uninitiated, the regulatory context within which the Forest Service must tackle this challenge can be torturous. Nonetheless, it is crucially important to understand the Forest Service's role and responsibilities toward cultural resources in general and historic mining properties in particular.

Like all federal land managing agencies, the Forest Service is required to identify and to the extent possible, protect *historic properties* on lands under its jurisdiction. There are a host of statutes involved, but the regulatory issues relevant to development and use of historic contexts stem principally from the National Historic Preservation Act, as amended (NHPA). In the NHPA and its implementing regulations, the term "historic property" is used to refer specifically to cultural resources that are eligible for listing on the National Register. Historic properties include sites, buildings, structures, districts (including landscapes), and objects included in, or eligible for inclusion in, the National Register, as well as the artifacts, records, and remains related to such properties.

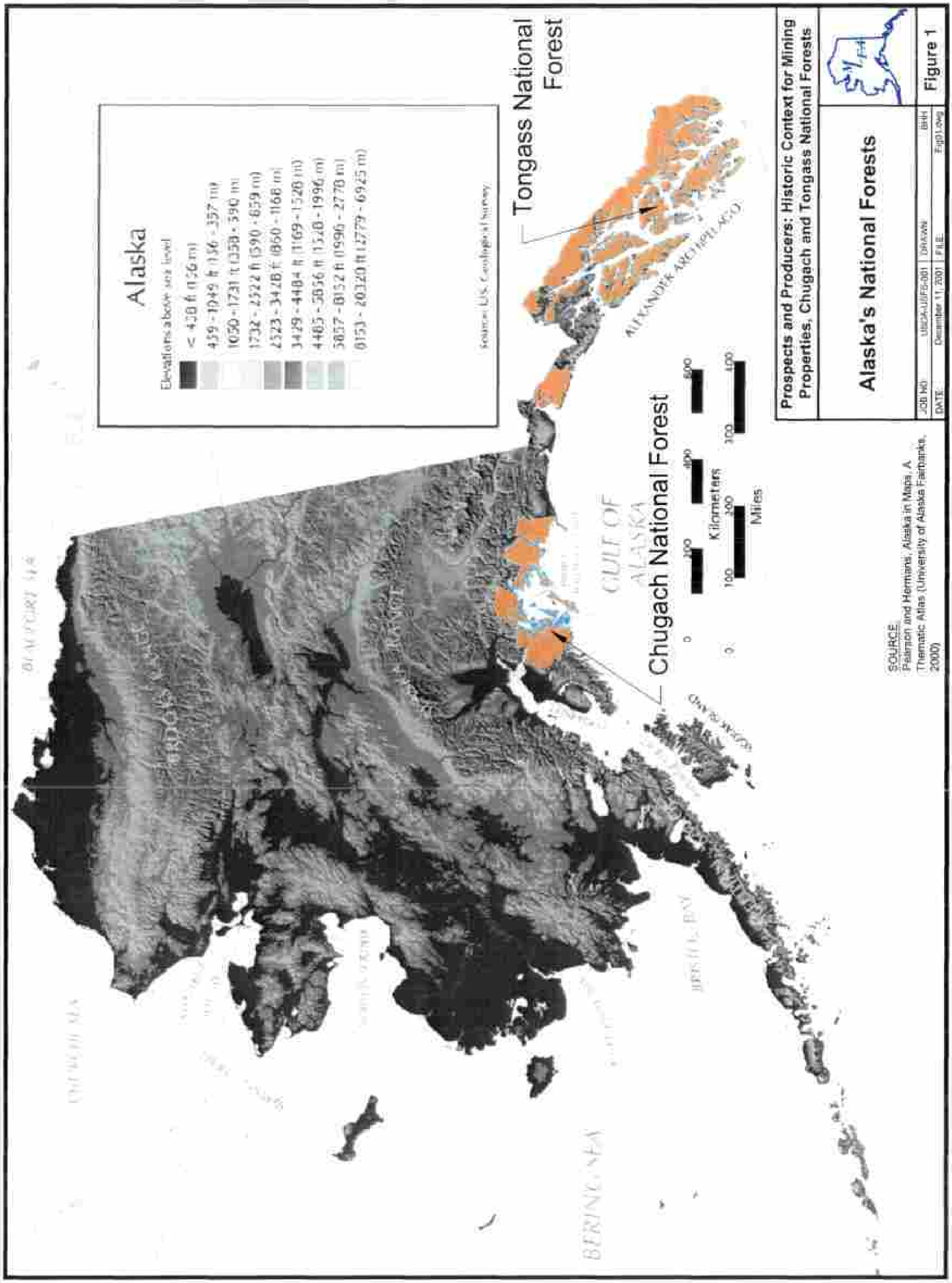
Sections 110 and 106 of the NHPA are of particular relevance. Section 110 lays out affirmative agency responsibilities with respect to properties eligible for National Register listing. Federal agencies are responsible for locating National Register eligible properties under their jurisdiction and assuming responsibility for their preservation. Section 106 of the NHPA requires federal agencies to take into account the effects of their activities and programs on National Register eligible properties. Regulations for *Protection of Historic Properties* (36 CFR Part 800), which primarily implement Section 106, were most recently amended in 2000 and took effect January 11, 2001. These regulations define a process for responsible federal agencies to consult with the State Historic Preservation Officer (SHPO), Native groups, other interested parties, and when necessary, the Advisory Council on Historic Preservation (ACHP) to ensure that historic properties are duly considered as federal projects are planned and implemented. The steps in the "Section 106 consultation process" involve:

- Identifying the area where a proposed undertaking could affect cultural resources. (Undertakings can include approvals, funding, issuance of permits, and so forth.)
- Identifying and evaluating the eligibility for listing on the National Register of properties that might be affected by the proposed undertaking.
- Assessing the potential effects of the undertaking on eligible properties.
- Consulting with the SHPO, Native groups, other interested parties, and the ACHP (as appropriate) to determine ways to avoid or reduce any adverse effects (impacts) if such are anticipated.
- If necessary, providing the ACHP a reasonable opportunity to comment on the proposed undertaking and the effects on properties determined to be eligible for National Register listing.
- Proceeding with the undertaking under the terms of a programmatic agreement, a memorandum of agreement, or in consideration of ACHP comments if required.

To be determined eligible for inclusion in the National Register, properties must be important in American history, architecture, archaeology, engineering, or culture. They also must possess integrity of location, design, settings, materials, workmanship, feeling, and association, and meet at least one of four criteria:

A Are associated with events that have made a significant contribution to the broad patterns of our history.
B Are associated with the lives of persons significant in our past.
C Embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction.
D Have yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60.4).

Properties may be of local, state, or national importance. Typically, historic properties are at least 50 years old, but more recent properties may be considered for listing if they are of exceptional importance. The issue of integrity is of extreme importance. *To qualify for National Register listing, a property must retain sufficient integrity to convey its historic significance.* It is not enough that a property can be demonstrated to have been connected


Alaska
Tongass National Forest
Chugach National Forest
ALEXANDER ARCHIPELAGO
GULF OF ALASKA
Kilometers
Miles
SOURCE
Pearson and Hermans, Alaska in Maps, A Thematic Atlas (University of Alaska Fairbanks, 2000)
Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Alaska's National Forests
Figure 1

with an important event or person, or to be characteristic of a distinctive period or method of construction. The property also must retain sufficient integrity to visually convey that connection. Put differently, it does not matter how important an event or person connected with a specific property was, or how great an engineering feat the construction of the property entailed. To be eligible for listing on the National Register, the property must be sufficiently intact and visually distinctive for a knowledgeable observer to be able to grasp that significance. Some level of signage or other public interpretation may be required as an aide to viewers unfamiliar with the history or kinds of properties involved.

The immediate and pressing need for a historic context for the evaluation of mining properties in the Tongass and Chugach National Forests stems from health, safety, and environmental concerns posed by abandoned or inactive mining sites. An evaluation begun in the mid 1990s inventoried over 200 such properties on the two Forests and determined the need for a variety of clean-up measures at many of them. These clean-up initiatives are undertakings with the potential to affect historic properties because many of these mining properties are over 50 years old and may qualify for listing on the National Register. For those that do qualify, the Forest Service (as the federal lead) will need to consult and identify appropriate mitigation prior to proceeding with the clean-up. This context also will have broader applicability as the Forest Service assesses future undertakings and plans proactive identification and preservation efforts.

Specific goals mirror the organization of this document and correspond to guidance on historic context development by the Secretary of the Interior (48 FR 44716, 1983, as amended and annotated). Research methods and resources employed during context development, and available for use by persons who may use the context, are described. The environmental setting of the Tongass and Chugach National Forests is characterized as a necessary backdrop for understanding the history of mineral exploitation in those areas. Thereafter, the actual context is developed; that is, the history of mining is outlined. Then properties typically associated with mining efforts are defined. With this background, it is possible to layout a rationale and procedure for assessing the significance and integrity of individual mining properties. Potential threats to mining properties also are considered along with a description of information gaps and recommendations for future investigation and preservation priorities. A glossary and list of acronyms are included as Appendices A and B along with information about the mining properties evaluated for potential hazards (Appendix C), and a sample of mining properties recorded as archaeological sites in the database maintained by the Alaska Department of Natural Resources (DNR), Office of History and Archaeology (OHA)–the Alaska Heritage Resources Survey (AHRS) (Appendix D). The final Appendix E contains illustrations of specific mining techniques and equipment mentioned in the text.

In accordance with contractual requirements, this context is applicable to mining properties associated with the extraction of "locatable minerals," which include precious and base metals including gold, silver, lead, zinc, and copper. In this regard, it was developed specifically to address mining properties identified by the Forest Service as priorities for potential remediation of physical and chemical hazards. Properties associated with "leasable" (for example, oil, gas and coal) and "saleable" (common varieties of sand, gravel, stone and so forth) resources are not addressed. The context covers the earliest recorded mining efforts through those undertaken in the early 1950s. More recent mining developments are excluded as too recent to be regarded as historic.

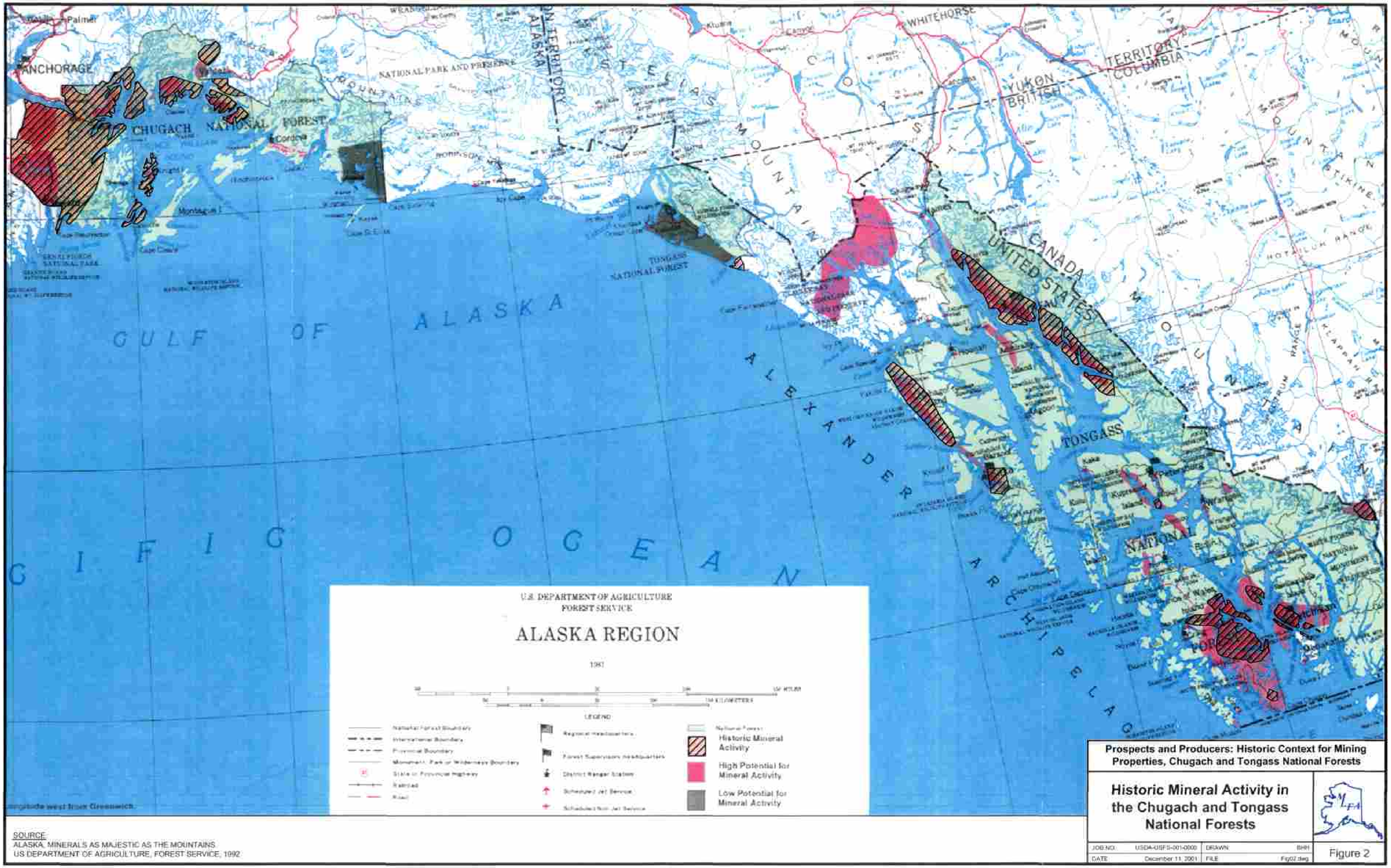
STUDY AREA AND TERMINOLOGY: A CONSIDERATION OF MINING DISTRICTS

The general locations of historic mining activities on both Forests are depicted on Figure 2. Some of the most historically important and productive mines are located off of National Forest System lands on Native-conveyed lands (for example, the Beatson copper mine on Latouche Island in Prince William Sound) and patented mining claims (for example, the lode gold Alaska-Juneau Mine and Treadwell mines complex near Juneau). To provide a regional perspective, therefore, the study area was defined to include areas both within and immediately adjacent to the Tongass and Chugach National Forests. The history of mineral exploration and production throughout the United States and neighboring portions of Canada also is considered briefly to place the mining properties of Alaska's National Forests in a broader context, but the emphasis is on Southeast, Prince William Sound and the Copper River Delta, and the Kenai Peninsula and Turnagain Arm.

The mining history related in Chapter 4 (the Historical Context) was derived from a variety of sources. Some of the most important sources for specifics about individual mines, their years of operation, and their production records are mineral resource evaluations accomplished by the U.S. Bureau of Mines (BOM) in cooperation with the U.S. Geological Survey (USGS) and the U.S. Bureau of Land Management (BLM). Therefore, the geographic divisions used in those mineral resources studies were followed here with a few exceptions.

Geographic Units or Regions

The study area as discussed in Chapter 4 is subdivided for the Tongass National Forest into five spatially distinct units or regions: (1) the Juneau Mining District (further subdivided into the Juneau Gold Belt subarea, the West Lynn Canal subarea, and the Coastal Range subarea), (2) the Tracy Arm-Fords Terror Wilderness and Windham Bay Area, (3) the Chichagof and Baranof Islands Area, (4) the Stikine Area, and (5) the Ketchikan Mining District. Labels for these units follow directly from usage employed in recent minerals studies issued by the BOM and the BLM (which assumed the duties of the BOM in 1996). The locations of these units are illustrated in Figure 3. The reader will note that the terminology is not consistent; some units are called "mining districts" while others are identified as "areas." This usage is engrained in recent literature, however, and was followed to provide consistency between this historic context and the literature used in its development. The Stikine Area and the Ketchikan Mining District are roughly



SOURCE:
ALASKA, MINERALS AS MAJESTIC AS THE MOUNTAINS.
US DEPARTMENT OF AGRICULTURE, FOREST SERVICE, 1992

analogous to the old Stikine and Ketchikan areas into which the Tongass National Forest used to be subdivided; the third old area was called the Chatham Area.

We have added the Tracy Arm-Fords Terror Wilderness / Windham Bay area to the units identified by the BLM on Figure 3. This unit is not addressed fully in the BLM's coverage of the Juneau Gold Belt, but some fairly recent studies on mineral exploration have been accomplished there by the BOM and USGS. The existence of these studies made it possible for this unit to be considered for historic mining resources on a level comparable to other regions within the Tongass National Forest.

Two spatial units within the Tongass National Forest–Admiralty Island and the Yakutat area (the latter identified as low in mineral potential)–have not received recent, systematic minerals evaluations. Thus those areas are not addressed here in the same level of detail possible for the rest of the Tongass National Forest. These data gaps are discussed further in Chapter 7.

As shown on Figure 3, the BLM includes the entire Chugach National Forest in a single unit, somewhat arbitrarily labeled "Prince William Sound" although it clearly includes a portion of the Kenai Peninsula as well as the Copper River Delta. The Chugach National Forest is regarded as a single unit by the BLM because recent minerals assessments have addressed the entire Forest as a unit. The mining history of Prince William Sound and the Copper River Delta is quite distinct from the mining history of the Kenai Peninsula and Turnagain Arm. Therefore, it was decided that these two regions would be addressed separately in this historic context. The minerals evaluations for the Chugach National Forest are considerably less detailed than those done for the Tongass. This discrepancy is recognized as a data gap and addressed in Chapter 7.

It is important for the reader to understand that the geographic units (whether called districts or areas) used in the most recent minerals evaluations published by the BOM, USGS, and BLM (and followed in this historic context) are larger (more simplified) than the "mining districts" identified for statistical reporting purposes by economic geologists with the BOM and USGS beginning in the 1950s. And the units used here as well as the districts identified by economic geologists also are distinct from "mining districts" organized by early miners.

Mining Districts Organized by Miners

The General Mining Act of 1872 (30 USC 21 *et seq.*) authorized the formation of mining districts to provide a mechanism for miners to file and record claims in areas where other formal mechanisms for such recording were absent. The mining districts organized by the often isolated, mining communities were quasi-political entities that served as a form of self-government. These districts often were short-lived with fluid and fluctuating boundaries. For example, the Turnagain Arm Mining District was organized in 1893, early in the gold rush to the Kenai Peninsula (Buzzell 1998). Members were miners focused on placer deposits on Resurrection Creek near Hope, but they soon expanded their efforts and began to explore adjacent drainages including Sixmile and Canyon Creeks, filing over 100 claims. In 1895, some of these miners formed a new district, the Sunrise Mining District, although their initial claims had been recorded within the Turnagain Arm Mining District. In 1895 the Turnagain Arm Mining District also was expanded to include the Girdwood area.

This sequence of events was typical and demonstrates that districts organized by the miners themselves lacked hard and fast boundaries or even a given set of claims within a specified area. The details behind the emergence of individual mining districts and their evolution through time are of unquestionable interest and would add greatly to an understanding of the mining history of any given region. For Alaska, however, not even an inventory of these districts has been compiled, much less detailed information about each of them (Rolfe Buzzell, personal communication, 2001; Sharon Young, Alaska State Recorder, personal communication, 2001.) Theoretically, each mining district kept records of claims and other business transactions in a district book. Today, these books are on file at Alaska Recorders Offices and it is necessary to visit the individual offices in order to examine them. To research mining districts on the Kenai Peninsula, it is necessary to visit the Seward Recorders Office. Those in Prince William Sound are filed with the Valdez Recorders Office (although many of the Valdez records were lost in a fire according to Sharon Young). And so forth. (The locations of recorders' offices are discussed in greater detail in Chapter 2.)

In a personal communication (2001), Alaska State Recorder Sharon Young explained that Alaska's recording districts (or precincts) actually developed originally out of mining districts because miners were among the first people in the territory to need an official recording mechanism. Recorders Offices handle much more than mining claims, of course, and were established to maintain official records of a variety of real and personal property transactions. The Territory of Alaska's Recording Districts were administered initially by the U.S. Commissioners Office, then administration was transferred to the Territorial courts. When Alaska became a state, administration was transferred to the state courts, then to the Department of Administration, thereafter to the Department of Commerce, and finally to the DNR. Exceptions are the Seward, Valdez and Glennallen Recorder's Offices, which still fall under the State Magistrates Court System and are administered on behalf of DNR.

In some states, mining districts organized by miners were legally established and named and their boundaries defined. In Arizona, for example, all mining districts established within each county have been tabulated and the information is available on county maps (Keane and Rogge 1992). That was not the case in Alaska (Ransome and Kerns 1954:1), which is why it became necessary for economic geologists to define their own kind of "mining districts" as discussed in the following section. To research the districts organized by miners in Alaska requires dealing with primary data, specifically the individual district books at the individual Recorder's Offices. And even then, the researcher cannot expect to find clear-cut boundary descriptions or lists of associated mines. For example, Rolfe Buzzell (personal communication, 2001) mentioned having

Mining District Studies

Final Reports

Final reports present the results of completed mining district studies. All were produced by the USBM, except for the Chichagof report, which was completed by the BLM.

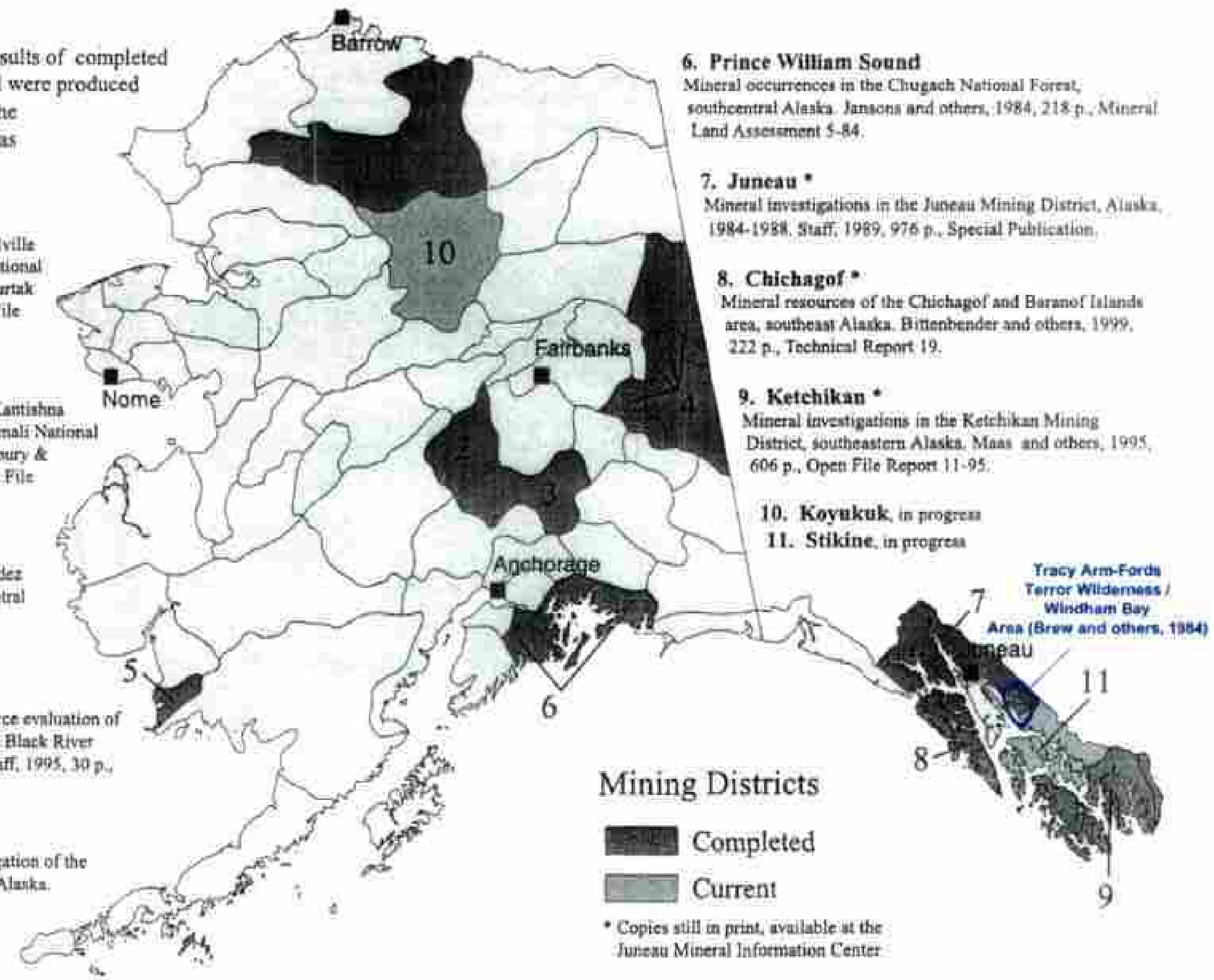
1. Colville *
Mineral investigations in the Colville Mining District and southern National Petroleum Reserve in Alaska. Kurtak and others, 1995, 217 p., Open File Report 08-95.

2. Kantishna
1983 mineral resource studies: Kantishna Hills and Dunkle Mine areas, Denali National Park and Preserve, Alaska. Salisbury & Dietz, Inc., 1984, 1080 p., Open File Report 129-84.

3. Valdez Creek *
Mineral investigations in the Valdez Creek Mining District, south-central Alaska. Kurtak and others, 1991, 658 p., Open File Report 1-92.

4. Fortymile
Final report of the mineral resource evaluation of the Bureau of Land Management Black River and Fortymile River subunits. Staff, 1995, 30 p., Open File Report 79-95.

5. Goodnews Bay
Bureau of Mines mineral investigation of the Goodnews Bay Mining District, Alaska. Fechner, 1988, 230 p., Open File Report 1-88.



6. Prince William Sound
Mineral occurrences in the Chugach National Forest, southcentral Alaska. Jansons and others, 1984, 218 p., Mineral Land Assessment 5-84.

7. Juneau *
Mineral investigations in the Juneau Mining District, Alaska, 1984-1988. Staff, 1989, 976 p., Special Publication.

8. Chichagof *
Mineral resources of the Chichagof and Baranof Islands area, southeast Alaska. Bittenbender and others, 1999, 222 p., Technical Report 19.

9. Ketchikan *
Mineral investigations in the Ketchikan Mining District, southeastern Alaska. Maas and others, 1995, 606 p., Open File Report 11-95.

10. Koyukuk, in progress
11. Stikine, in progress

* Copies still in print, available at the Juneau Mineral Information Center

Source:
U.S. Department of the Interior,
Bureau of Land Management, 1999

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Mining District Studies

JOB NO: USDA-USFS-001-0000 | DRAWN: BHH
DATE: March 26, 2002 | FILE: Fig03.dwg

Figure 3

examined a book for the "Cleveland Mining District" at the Seward Recorder's Office and not being able to determine where it had been located on the Kenai Peninsula because geographic references were so vague, and names (for creeks and so forth) likely have changed. In sum, the history of districts organized by Alaskan miners remains a subject for future investigation. To conclude, it may be well to note that some miners continue to organize districts today, but these districts serve functions (lobbying efforts, for example) very different than the earlier districts (Chuck Hawley, personal communication, 2001).

Mining Districts Identified by Economic Geologists

It was originally the responsibility of the USGS to report on minerals availability and mining production in Alaska. The BOM officially assumed this function in 1944 (Ransome and Kerns 1954:2). It fell to Alfred Ransome and William Kerns to explain and standardize the regions and districts employed by the BOM in Alaska to fulfill its legal function of collecting and disseminating mineral statistics. They explain why their assignment was necessary thus:

> One of the first natural offshoots from the development of a mining camp is to name the camp, then to adopt a district name for the adjacent area. In whatever manner such names may be selected they tend to go down in history by virtue of customary usage. It is to be expected that many names mentioned in relation to areas in Alaska stem directly from what were originally, and still may be, considered mining districts. In certain States the mining districts were legally established and the boundaries defined subsequent to their being named. Such is not the case in Alaska, consequently any concept of a district exists, for the most part, in the minds of men; it is not defined in the record as a standard for reference and comparison.
>
> Anyone at all familiar with Alaska no doubt has a good idea of what is meant by the names Copper River region, Fortymile district, White River area, or the Fairbanks precinct. In all probability, however, a comparison of definitions for each one of these names – which are representative of hundreds of names in the Territory – would show no two definitions in agreement as to the boundaries or as to the terms region, district, or precinct because, with the possible exception of precinct, all the terms are used loosely to describe something that has not been legally defined or even defined at all, and which varies according to the factors of local usage, general custom, or arbitrary choice.
>
> Contrary to the general pattern existing in the separate States of the United States, Alaska has no political subdivisions such as the counties but it does have "judicial divisions," which include the recording districts or precincts. Some may have the mistaken opinion that the recording district or precinct in Alaska is synonymous with the term "mining district." … [B]ut … the precinct

> boundaries – though legally defined – are subject to change. ... (Ransome and Kerns 1954:1)

Ransome and Kerns (1954:2-4) go on to explain that beginning in 1941, the BOM worked with the Bureau of the Mint to divide the Territory of Alaska into regions and districts designed to reflect the locations of mines in production at that time. This was necessary because of the need for production figures that were geographically accurate. A system of geographic divisions, which was based on one initiated by the USGS in the late 1890s, although revised somewhat, was adopted and first published in the *Mineral Yearbook* for 1946. The system was presented as a list of regions and districts, but covered only those portions of the Territory with a record of mineral production.

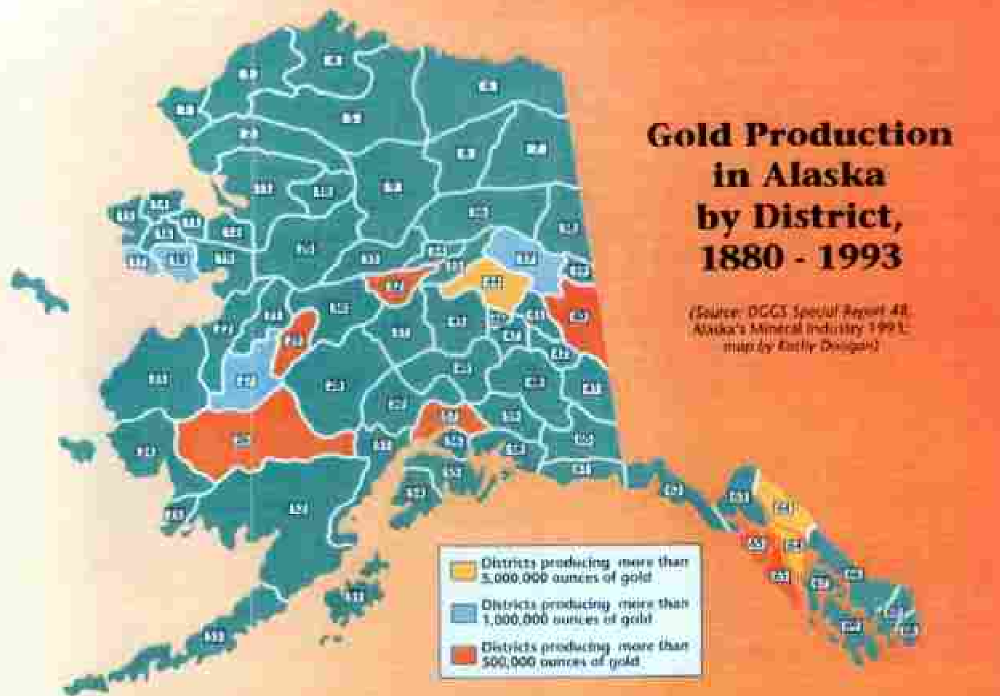
In 1948 the BOM established a Metal Economics Branch office in Juneau and became aware of five major deficiencies in the geographic classification system. These were: (1) a lack of precise boundary descriptions, (2) gaps in areas where no mining was taking place, (3) no easily accessible publication of the region with district labels and descriptions including the names of mines included in each, (4) no attempt other than communication with the Bureau of the Mint to contact others interested in mineral statistics in formulating the region and district definitions, and (5) no good way to understand the region and district boundaries with reference to geographic features like streams, mountains, settlements, and so forth. Therefore, efforts to correct these problems were initiated in 1949. The Ransome and Kerns (1954) publication addressed all but the fifth deficiency. They employed the (then) recently issued USGS 1:250,000 scale quadrangles for base maps on which to delineate regions, districts, and subdistricts.

In general, the regions were defined by major drainage basins. The districts were named to follow as closely as possible names used by the miners themselves and delineated such that none overlapped and no areas were excluded. Subdistricts were delineated to reflect historical or local usage and, thus, most closely resemble districts organized by miners. In the Ransome and Kerns (1954) classification system, all of the Tongass National Forest falls within Region M, Southeastern Alaska, and is further divided into the Admiralty, Chichagof, Hyder, Juneau, Ketchikan, Kupreanof, Petersburg, and Yakutat districts (some of which are broken down into subdistricts). Portions of the Chugach National Forest fall within Ransome and Kerns' (1954) Region E, Cook Inlet – Susitna (Anchorage District), Region F, Copper River (Prince William Sound District subdivided into the Cordova, Latouche, Tasnuna, Valdez, and Wells subdistricts), and Region G, Kenai Peninsula (Hope and Seward Districts).

Today there are several variants of the classification scheme devised and published by Ransome and Kerns (1954). These include schemes published by Cobb (1973) and more recently the Alaska Division of Geological & Geophysical Surveys (DGGS) (1993). The latter is reproduced here as Figure 4 for comparison with Figure 3 and as an illustration of production reporting by district.

Gold Production in Alaska by District, 1880 - 1993

(Source: DGGS Special Report 48, Alaska's Mineral Industry 1993; map by Kathy Doogan)



Mining districts *	Production (in troy ounces)
1. Lisborne district	0
2. Noatak district	7,800
3. Wainwright district	0
4. Barrow district	0
5. Colville district	0
6. Canning district	0
7. Sheenjek district	0
8. Chandalar district	63,158
9. Koyukuk-Nolan district	324,804
10. Shungnak district	15,000
11. Squirrel River district	40,600
12. Fairhaven-Inmachuk district	347,671
13. Candle district	248,130
14. Serpentine district	4,220
15. Port Clarence district	40,946
16. Kougarok district	173,015
17. Cape Nome district	4,822,569
18. Council and Solomon districts	1,044,013
19. Koyuk district	83,532
20. Koyukuk-Hughes district	227,788
21. Kaiyuh district	5,400
22. Aniak district ᵇ	0
23. Marshall district	123,319
24. Bethel district	42,945
25. Goodnews Bay district	29,700
26. Aniak-Tuluksak district ᶜ	566,751
27. Iditarod district	1,559,260
28. McGrath-McKinley district	190,300
29. Innoko-Tolstoi district	696,047
30. Ruby-Poorman district	469,795
31. Kantishna district	99,307
32. Hot Springs district	560,532
33. Gold Hill-Melozitna district ᵈ	11,059
34. Rampart district	187,061
35. Tolovana-Livengood district	480,013
36. Yukon Flats district	0
37. Circle district	1,019,843
38. Black district	0
39. Eagle district	32,000
40. Fortymile district	530,265
41. Chisana and Nabesna districts	144,500
42. Tok district	0
43. Goodpaster district	2,350
44. Fairbanks district	8,275,576
45. Bonnifield district	80,492
46. Richardson district	118,570
47. Delta River district	5,647
48. Chistochina district	181,261
49. Valdez Creek district	427,875
50. Yentna-Cache Creek district	196,754
51. Redoubt district	105
52. Iliamna-Bristol Bay district	1,570
53. Kodiak and Unga Island district	112,400
54. Homer district	16
55. Hope-Sunrise-Seward district	130,178
56. Anchorage district ᵉ	0
57. Willow Creek-Hatcher Pass district	664,788
58. Prince William Sound district	137,715
59. Nelchina district	13,860
60. Nizina district	148,500
61. Yakataga district	18,040
62. Yakutat district ᶠ	13,200
63. Porcupine district	80,373
64. Juneau and Admiralty districts	7,260,248
65. Chichagof district	770,000
66. Petersburg-Sumdum district	15,000
67. Kupreanof district	0
68. Hyder district	219
69. Ketchikan district	62,000
Subtotal	32,926,280
Undistributed ᵍ	127,886
Total Production (troy ounces)	**33,054,166**
(metric tonnes)	**1,028**

* Mining district names and boundaries revised slightly from those defined by Ransome and Kerns (1954) and Cobb (1973). Sources of data: U.S. Geological Survey, U.S. Bureau of Mines, and Territorial Department of Mines Records 1880-1930; U.S. Mint Records 1930-1969; State of Alaska production records 1970-1993. Entries of "0" generally mean no specific records are available.

ᵇ Included in Marshall district.
ᶜ Includes Georgetown and Donlin districts.
ᵈ Includes Tanana precinct.
ᵉ Placer gold included in Willow Creek-Hatcher Pass district.
ᶠ Includes lode production from Glacier Bay and placer production from Lituya Bay district.
ᵍ Production that cannot be credited to individual districts due to lack of specific records or for reasons of confidentiality.

ALASKA GEOGRAPHIC® 29

Source:
DGGS Special Report 48,
Alaska's Mineral Industry 1993

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests	
Gold Production in Alaska by District	
JOB NO: USDA-USFS-001-0000	DRAWN: BHH
DATE: July 18, 2001	FILE: Fig04.dwg
Figure 4	

PROJECT PARTICIPANTS AND CONSULTANTS

This historic context was developed by Michael L. Foster & Associates (MLFA) personnel with input, assistance and encouragement provided by a number of other people including Forest Service representatives, other federal and state agency representatives, and several individuals from the private sector. Project participants and their roles and responsibilities and/or areas of expertise are listed in Table 1. Participant input is described below or cited as personal communications throughout the text.

DATES AND WORK ON THE PROJECT

The contract to develop a historic context for mining properties on the Tongass and Chugach National Forests was awarded to MLFA on April 3, 2001. The original contract end date was November 30, 2001, but this was subsequently extended to March 2002. MLFA was tasked with initiating the evaluation of seven additional historic mines in September necessitating the extension. (The additional mines are reported separately.) Activities, milestones and the project schedule are summarized in Figure 5. Major activities included research and data collection, development of the draft historic context (this volume), a pilot field study during which the context evaluation criteria were applied at four target mining properties, review of the context and field report by Forest Service personnel, and preparation of the final documents.

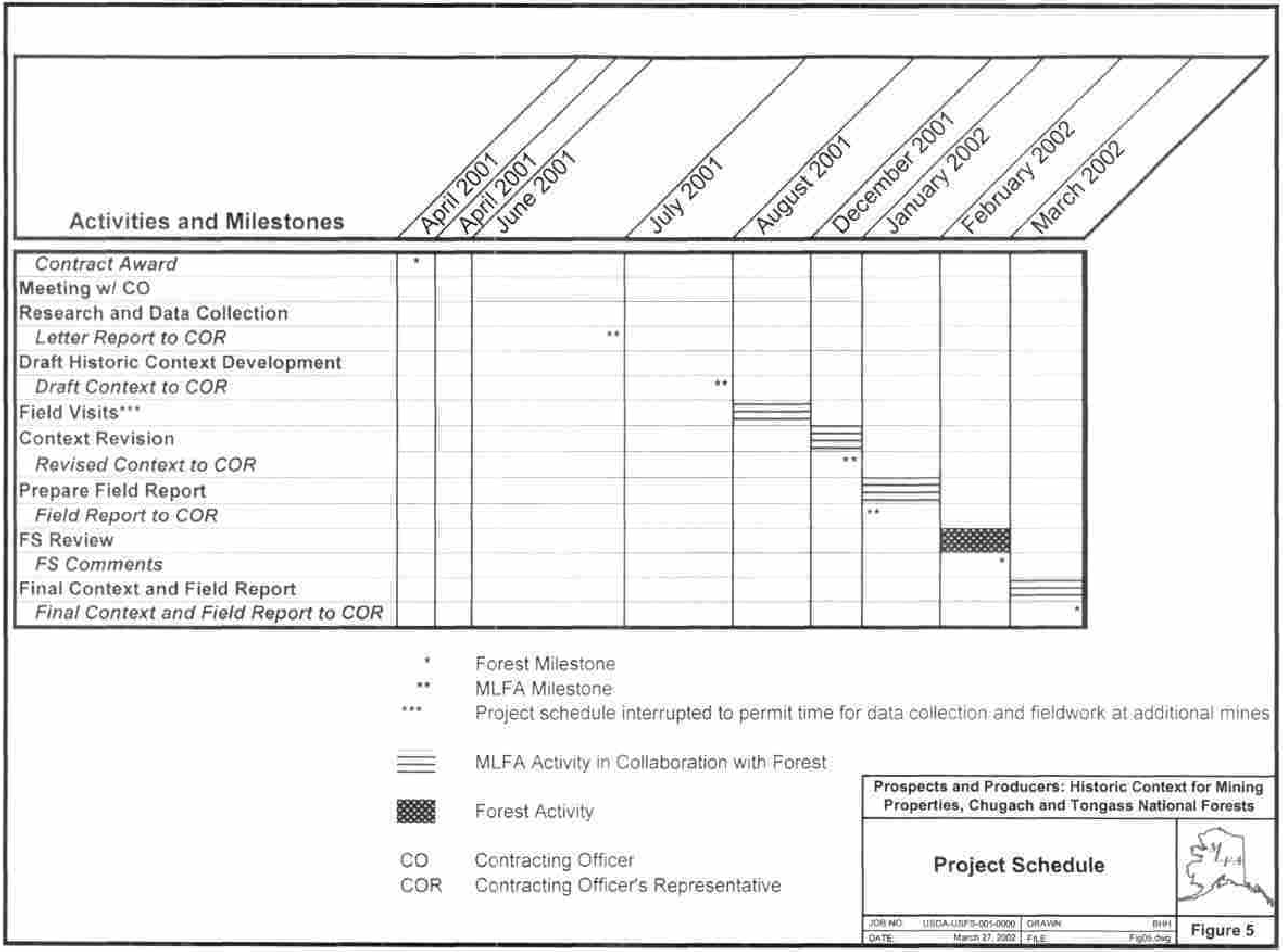
Mining properties included in the pilot field study are the Halleck Island Prospect and Salt Chuck Mine in the Tongass National Forest, and Mull Claims and the Granite Mine in the Chugach National Forest (Figure 6). The Halleck Island Prospect is situated on the western shore of its namesake about 12 miles northwest of Sitka. It represents a lode gold prospect with no production record. The Salt Chuck Mine was an important copper producer that also yielded palladium, gold, and silver. Salt Chuck is situated at the head of Kasaan Bay on Prince of Wales Island near Thorne Bay. Mull Claims is a gold placer mine located on Resurrection Creek south of Hope on the Kenai Peninsula. The Granite Mine, which was a leading lode gold and silver producer in Prince William Sound, is situated on the west side of Port Wells in Prince William Sound about 22 miles northeast of Whittier. MLFA personnel spent one to two days at each mining property and completed site forms for each. They were joined by Forest Service representatives, members of local Native communities, and a member of the SHPO's staff for some of that time. The results of the pilot field study are included in a companion volume to this report as Volume II.

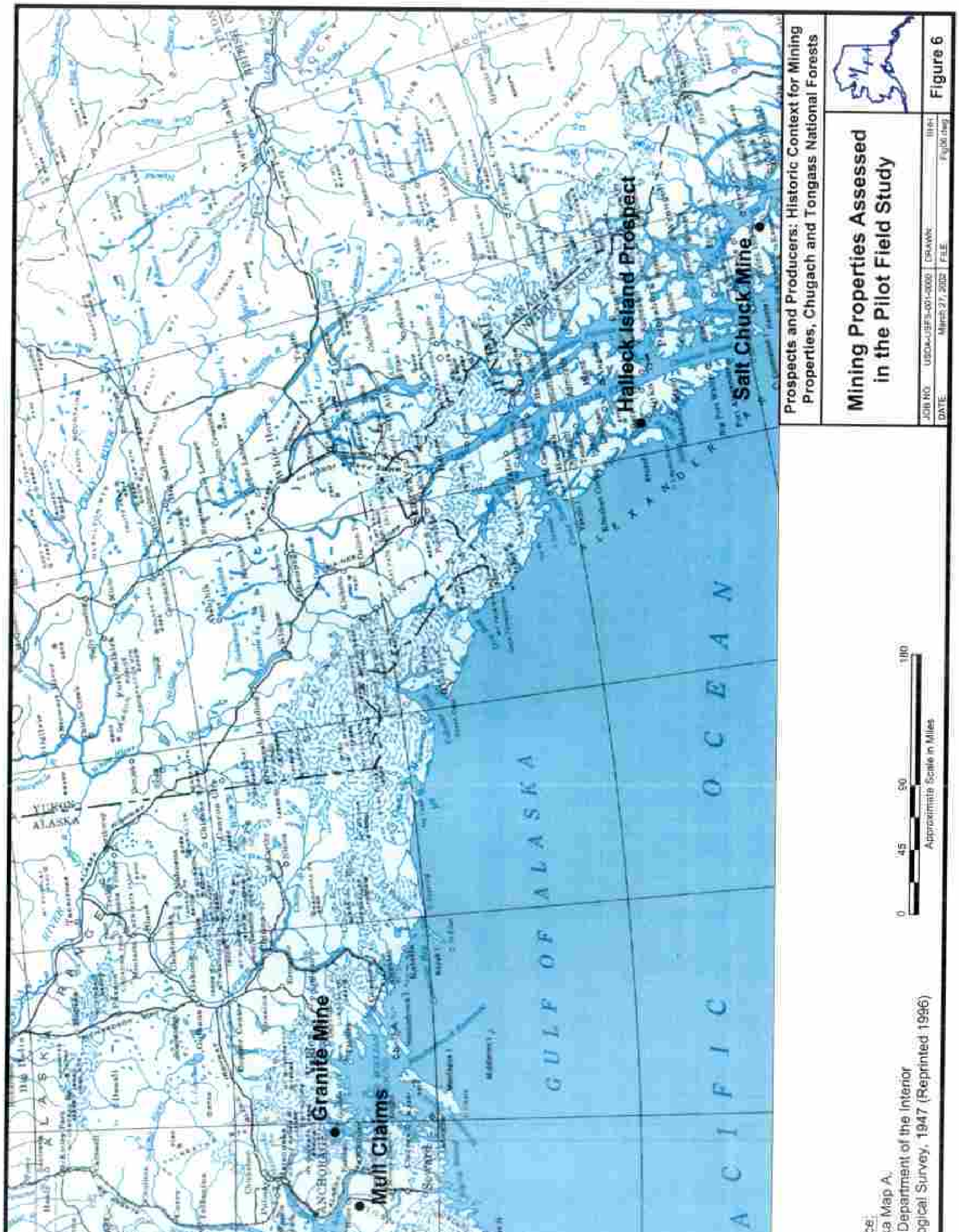
Table 1
Project Participants

AFFILIATION	ROLE OR AREA OF EXPERTISE
MLFA	
J. Simon Bruder, Ph.D.	Principal Investigator
Holly L. Morris, C.P.G.	Mining Geologist
Michael L. Foster, P.E.	Senior Advisor
Brian Hannafious, E.I.T.	CAD Operator, Graphics
Craig Hanson	CAD Operator, Graphics
Tim Russell	Graphics
Traci R. Bradford, E.I.T.	Technical Research
Donald K. Chancey, P.E.	Technical Research
Forest Service, Alaska Region	
Susan Marvin	Regional Archaeologist, Alaska Heritage Program Leader, Contracting Officer's Representative (COR)
John Autrey	Archaeologist, Ketchikan, Tongass National Forest
Pat Bower	Archaeologist, Sitka, Tongass National Forest
Terry Brock	Soil Scientist (retired), Tongass National Forest
Terry Fifield	Archaeologist, Craig, Tongass National Forest
Myra Gilliam	Archaeologist, Anchorage, Chugach National Forest
Karen Iwamoto	Archaeologist, Sitka, Tongass National Forest
Mark McCallum	Forest Archaeologist, Petersburg, Tongass National Forest
Jane Smith	Archaeologist, Petersburg, Tongass National Forest
Linda Yarborough, Ph.D.	Forest Archaeologist, Anchorage, Chugach National Forest
Dave Blanchett	Hydrologist, Chugach National Forest
Steve Heppner	Minerals Management Specialist, Juneau Ranger District
Carol Huber	Forest Geologist, Chugach National Forest
John Kato	Assistant Director, Minerals and Geology, Alaska Region
Ken Maas	Geologist, Alaska Region
Donna Peterson	Minerals Specialist, Seward, Chugach National Forest
Ann Puffer	Watershed and Air Program Leader, Alaska Region
Gary Sonnenberg	Environmental Engineer, Ketchikan, Tongass National Forest
Bureau of Land Management	
Jane Albrecht	Director, Juneau Minerals Information Center
Peter Bittenbender	Minerals Specialist, Juneau Minerals Information Center
Ed Gensler	Environmental Engineer, Juneau Minerals Information Center
Joe Kurtak	Geologist, Anchorage
Shirley Mercer	GIS Specialist, Juneau Minerals Information Center
Mark P. Meyer	Geologist, Anchorage
National Park Service	
Logan Hovis, Ph.D.	Mining Historian, Anchorage
Becky Saleeby, Ph.D.	Archaeologist, Anchorage

AFFILIATION	ROLE OR AREA OF EXPERTISE
U.S. Geological Survey	
Julie Dumoulin, Ph.D.	Geologist, Anchorage (Prince William Sound)
Marti Miller	Geologist, Anchorage (Prince William Sound)
Steve Nelson	Geologist, Anchorage (Prince William Sound)
Robert (Bob) Rogers	Mining Geologist, Anchorage
Jill Schneider	Librarian
Frederic (Ric) Wilson	ARDF Coordinator
State of Alaska	
Jo Antonson	State Historian, Deputy State Historic Preservation Officer
Judith Bittner	State Historic Preservation Officer
Rolfe Buzzell, Ph.D.	Historian, Office of History and Archaeology
Joan Dale	Archaeologist, Office of History and Archaeology
Stefanie Ludwig	Compliance Specialist, Office of History and Archaeology
Bruce Novinski	Minerals Specialist, DNR
Sharon Young	Alaska State Recorder, Anchorage
Private Sector	
Steve Burrell	Alaska Miners Association
Ray deFrance	Sunrise area resident
Richard (Dick) Emanuel	Science Writer (Alaska Mining History)
Charles (Chuck) Hawley	Mining Geologist (Honors Committee Chair, Alaska Mining Hall of Fame Foundation)
Nancy Lethcoe	Prince William Sound
Billy Miller	Hope Historical Society
Charles (Chuck) Mobley, Ph.D.	Archaeologist (Historic Mines)
Tim Sczawinski	Seward Library (Photo Archives)
Donald Stevens, Ph.D.	Mining Geologist (Salt Chuck Mine)
David Stone	Juneau Area Mines
Paul White	Industrial Archaeologist (Bremner Historic District)

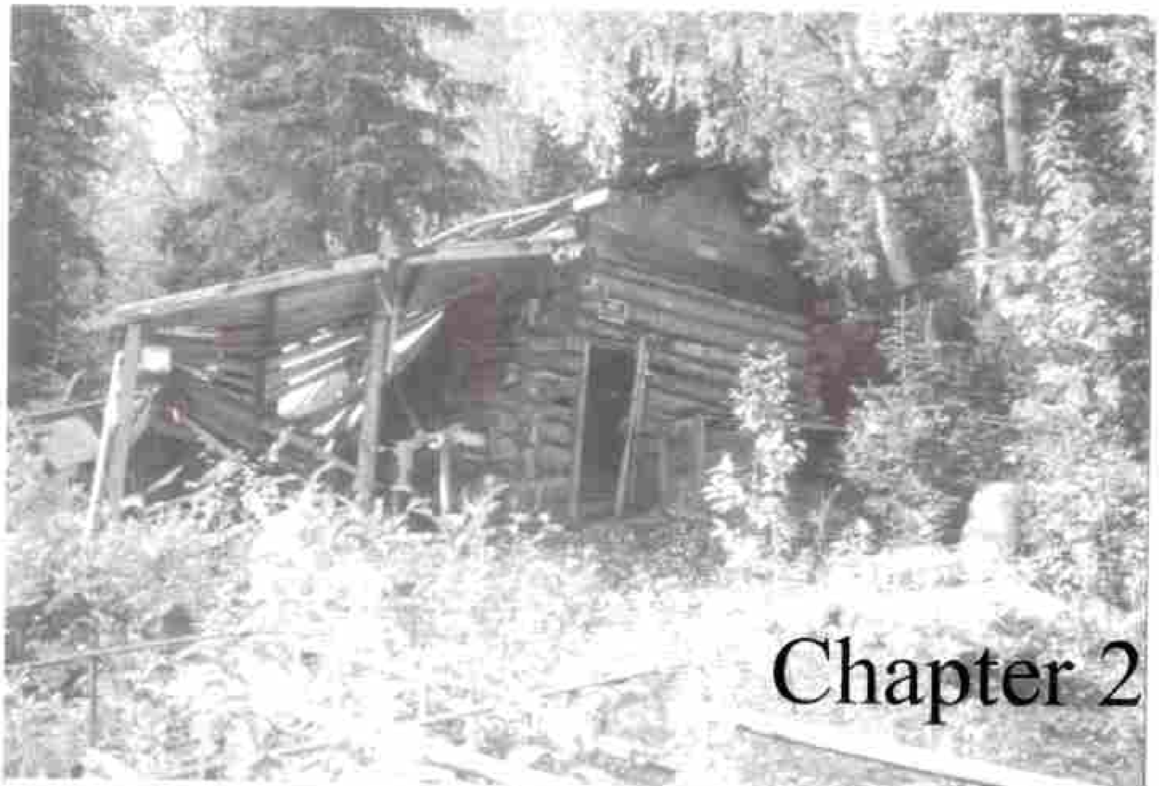
Page intentionally left blank.

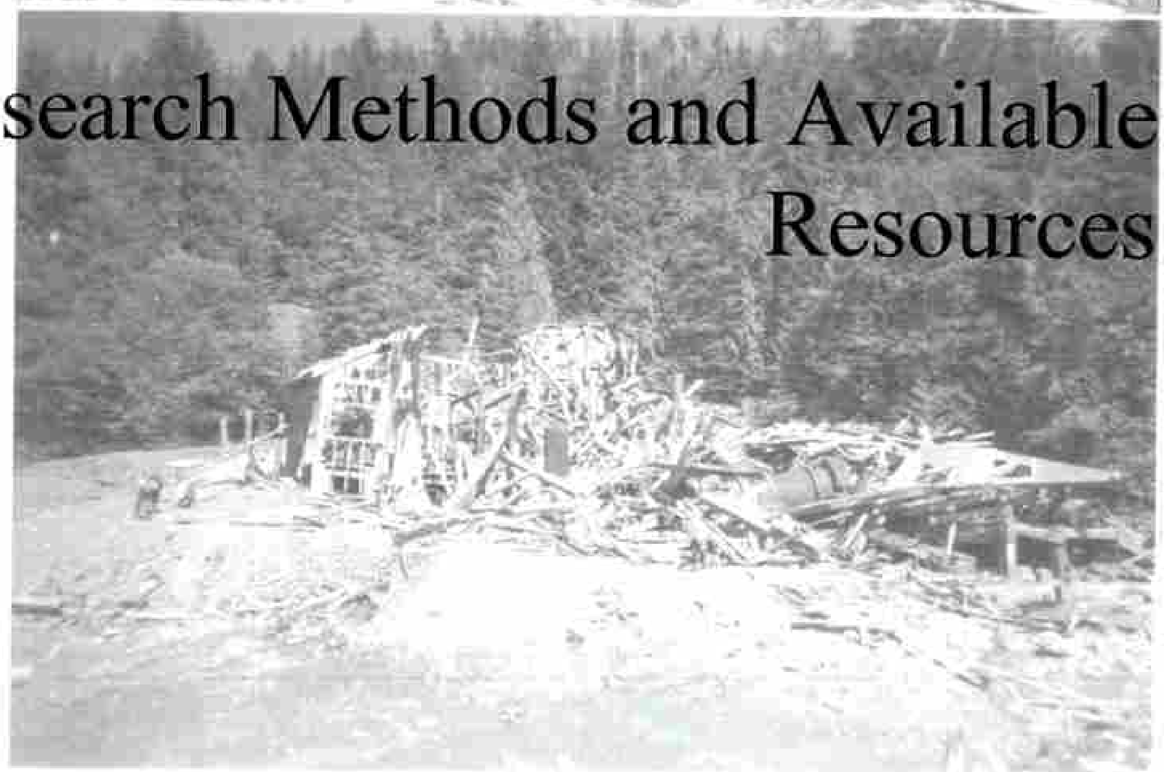

Activities and Milestones
April 2001
April 2001
June 2001
July 2001
August 2001
December 2001
January 2002
February 2002
March 2002
Contract Award
Meeting w/ CO
Research and Data Collection
Letter Report to COR
Draft Historic Context Development
Draft Context to COR
Field Visits***
Context Revision
Revised Context to COR
Prepare Field Report
Field Report to COR
FS Review
FS Comments
Final Context and Field Report
Final Context and Field Report to COR
* Forest Milestone
** MLFA Milestone
*** Project schedule interrupted to permit time for data collection and fieldwork at additional mines
MLFA Activity in Collaboration with Forest
Forest Activity
CO Contracting Officer
COR Contracting Officer's Representative
Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Project Schedule
JOB NO. USDA-USFS-001-0000
DRAWN BHH
DATE March 27, 2002
FILE Fig05.dwg
Figure 5


Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Mining Properties Assessed in the Pilot Field Study
Figure 6
Granite Mine
Mull Claims
Halleck Island Prospect
Salt Chuck Mine
GULF OF ALASKA
PACIFIC OCEAN
YUKON
ALASKA
ANCHORAGE
Seward
Approximate Scale in Miles
Source:
Alaska Map A,
U.S. Department of the Interior
Geological Survey, 1947 (Reprinted 1996)

Chapter 2

Research Methods and Available Resources





CHAPTER 2. RESEARCH METHODS AND AVAILABLE RESOURCES

"research….n., to travel through, survey:…." (Webster's New World College Dictionary, Fourth Edition, 1999).

Development of this historic context proved to be an engaging journey for the author, entailing several complementary approaches. These included a review of relevant published guidance, literature review, compilation of mining property inventories, and interviews with individuals representing a variety of disciplines related to mining.

STATUTES, REGULATIONS AND GUIDANCE

Several sources that provide general guidance in context formation and the identification of historic properties were consulted as was a source on mineral law. These include:

- *The National Historic Preservation Act* (Public Law 89665; 80 Stat. 915, 1966, as amended)
- *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (48 FR 44716, 1983, as amended and annotated)
- *How to Apply the National Register Criteria for Evaluation* (National Register Bulletin 15, 1995, National Park Service)
- *How to Complete the National Register Registration Form* (National Register Bulletin 16A, 1995, National Park Service)
- *Guidelines for Evaluating and Documenting Rural Historic Landscapes* (Linda Flint McClelland and others, 1995, National Park Service; sometimes referenced as National Register Bulletin 30)
- *Guidelines for Evaluating and Registering Archaeological Properties* (Barbara Little and others, 2000, National Park Service)
- *Assessing Site Significance: A Guide for Archaeologists and Historians* (Donald L. Hardesty and Barbara J. Little, 2000, Altamira Press)
- *Protection of Historic Properties* (36 CFR Part 800, amended 2001)
- *Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes* (Charles A. Birnbaum, 1994, National Park Service Preservation Brief 36)
- *Mineral Law, Sixth Edition* (Terry S. Maley, 1996, Mineral Land Publications, Boise)

A National Park Service bulletin developed specifically as a guide for dealing with mining properties proved very useful and provided the general framework for portions of this context. This important document is entitled, *Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties*, (1992, Bruce J. Noble, Jr. and Robert Spude, National Park Service; sometimes referenced as National Register Bulletin 42).

Also consulted were several historic contexts (or context-like reports) for mining properties elsewhere in the United States. These include:

- *Proceedings of the Workshop on Historic Mining Resources* (South Dakota State Historical Society, 1987, Vermillion)
- *Gold & Silver Mining in Arizona, 1848-1945: A Component of the Arizona Historic Preservation Plan* (Melissa Keane and A.E. Rogge, 1992, Dames & Moore, Phoenix).
- *Deerlodge National Forest Historic Preservation and Management Plan for Historic Mining and Associated Properties, Deerlodge National Forest* (Richard D. Periman, 1995, Forest Service Northern Region)
- *Historical Mining Properties in National Park Service Units in the Pacific Northwest: National Register of Historic Places Multiple Property Documentation Form* (Ted Catton and Janene M. Caywood, 1999, Missoula)

Fortuitously, just a year prior to the development of this historic context for the Forest Service, the National Park Service – Alaska Region published the results of a 10-year study of mining properties throughout Alaskan National Parks (Saleeby 2000). This monumental undertaking, in addition to providing a compendium of valuable historical background on statewide mineral exploration and exploitation, also developed specific typologies (adapted here with some modifications) for the categorization and classification of mining properties.

PUBLISHED AND UNPUBLISHED RESOURCES

The availability and usefulness of published and unpublished documents that relate to the history of mining in the Tongass and Chugach National Forest vary by region and topic. Primary sources are numerous, but not always readily available. A variety of historic overviews and syntheses have been prepared on the history of mining in Southeast. A smaller number are available for the Kenai Peninsula and Turnagain Arm and Prince William Sound. Systematic efforts by geologists and mining engineers to identify and investigate mines, prospects, and unworked mineral occurrences throughout both Forests have been conducted and provide an important and accessible source of information.

Historic Overviews

Numerous secondary and tertiary sources relate the history of mining in Alaska. To provide a broader perspective for evaluating the importance of mining properties within the Tongass and Chugach National Forests, statewide mining history (and the history of the associated Klondike gold rush) was reviewed (for example, Berton 1972, Campbell 1995, Emanuel 1997, Gould 2001, Heiner 1977, Saleeby 2000). Histories and mining property evaluations specific to the study area (in and near the two Forests) include, the following:

Southeast

- *Heritage Resource Investigations for the Proposed Gravina Island Timber Sale, Southeast Alaska* (John T. Autrey and Martin V. Stanford, 2001, Ketchikan/Misty Fjords Ranger District, Tongass National Forest, Ketchikan).
- *History of Mines and Prospects, Ketchikan District, Prior to 1952* (John Bufvers, 1967, State of Alaska, Department of Natural Resources, Division of Mines and Minerals, Juneau).
- *Cultural Resources Inventory and Assessment of the Proposed A.J. Mine Project, Juneau, Alaska* (Peter M. Bowers, Bruce A, Ream, William H. Adams, Stefanie Ludwig and Robert Sattler, 1991, Northern Land Use Research, Fairbanks).
- *Cultural Resources Survey for the Thane Road Reconstruction Project, Juneau, Alaska* (Rolfe G. Buzzell, 1994a, Office of History and Archaeology Report No. 37, Alaska Department of Natural Resources, Anchorage).
- *Historic Structures Report, Jualpa Mine Camp of the Alaska Juneau Gold Mining Company, Last Chance Basin Historic District, Juneau, Alaska* (Gary H. Gillette, 1990, City and Borough of Juneau, Alaska, Juneau).
- *Three Historic Mines, Ketchikan, Alaska: A Cultural Resource Evaluation* (Charles M. Mobley, 2001, Charles M. Mobley & Associates, Anchorage).
- *History of the Mines and Miners in the Juneau Gold Belt: A Collection of Stories about the Mines, the Miners, and Their Dreams* (Earl Redman, 1988, Earl Redman, Juneau).
- *Fortunes from the Earth: An History of the Base and Industrial Minerals of Southeast Alaska* (Patricia Roppel, 1991, Sunflower University Press, Yuma).
- *Hard Rock Gold: The Story of the Great Mines that Were the Heartbeat of Juneau* (David and Brenda Stone, 1980, Juneau Centennial Committee, City and Borough of Juneau, Juneau).
- *The Founding of Juneau* (Robert DeArmond, 1980, Gastineau Channel Centennial Association).

Prince William Sound and the Copper River Delta

- *Cultural Resources Evaluation of the McKinley Lake Mine Site, near Cordova, Alaska, 1999* (Rolfe G. Buzzell, 2001a, Office of History and Archaeology Report No. 79, Alaska Department of Natural Resources, Anchorage).
- *Draft Archaeological Evaluation: Mineral King Mine and Granite Mine, Chugach National Forest, Alaska* (Chambers Group, Inc. and Tetra Tech, Inc., 2001, Redlands, California and Seattle, Washington).
- *A History of Prince William Sound, Alaska* (Jim and Nancy Lethcoe, 1994, Prince William Sound Books, Valdez).

Kenai Peninsula and Turnagain Arm

- *A History of Mining on the Kenai Peninsula, Alaska* (Mary J. Barry, 1997, MJP BARRY, Anchorage).
- *Cultural Resources Survey of the Seward Highway, Milepost 50-65.5, Kenai Peninsula, Alaska* (Rolfe G. Buzzell and J. David McMahan, 1986, Office of History and Archaeology Report No. 2, Alaska Department of Natural Resources, Anchorage).

- *Memories of Old Sunrise, Gold Mining on Alaska's Turnagain Arm* (Rolfe G. Buzzell, 1994, Cook Inlet Historical Society, Anchorage).
- *The Turnagain Arm Gold Rush, 1896-1898* (Rolfe G. Buzzell, 1998).
- *National Register of Historic Places Registration Form for the Jack White (Mull Claims) Cabins* (Linda Finn Yarborough, 1992, Chugach National Forest, Anchorage).

Especially for Southeast, about which a great deal has been written, this list of sources is far from exhaustive.

Primary and Secondary Sources

By its very nature, mining is typically an entrepreneurial, potentially important economic enterprise except when practiced as a purely recreational activity. As such, it is governed by legislation requiring documentation with regard to ownership of claims and mining companies and production records. Therefore, historic mining activities have generated voluminous quantities of both published and unpublished primary source material. An excellent source for identifying these resources is the *Guide to Alaska Geologic and Mineral Information*, Information Circular 44, edited by E. Ellen Daley and published by the Division of Geological & Geophysical Surveys (DGGS). This circular is periodically updated online at http://www.dggs.dnr.state.ak.us, hence the lack of a publication date. The circular was developed cooperatively by DGGS, which is an Alaska state agency, the USGS, and the BLM.

Important resources for researching historic mining properties include:

- The Alaska Support Services Division – Recorders' Offices, where mining claims are filed (refer to discussion below).
- Series published by the USGS beginning in 1879 (especially annual reports, bulletins and circulars, mineral commodity summaries, and some open file reports and professional papers).
- Series published by the former U.S. Bureau of Mines (USBM or BOM) from 1910 to 1996.
- Series published by DGGS (includes *Alaska Territorial Department of Mines Reports*, all of which are out of print, but available at libraries, and on microfiche at the Alaska Resources Library and Information Service [ARLIS]), and also at the DGGS web site referenced above.
- Mineral Industry Research Laboratory (MIRL) reports, published by the University of Alaska.
- Alaska Minerals/Mining Bibliographies, which provide references and other information on mines, prospects, and mineral occurrences by 1:250,000 quadrangle based on compilations by E.H. Cobb and currently being revised and readied for use online by the USGS and the Interagency Minerals Coordinating Group (IMCG). Descriptions of mines, prospects, and mineral occurrences in the Alaska Resource Data File (ARDF) are published by the USGS for individual

quadrangles as open file reports that are available online at http://ardf.wr.usgs.gov. Not all quadrangles have been completed. Hard copy open file reports with some of this information also are available.

- The Minerals Availability System (MAS)/ Minerals Industry Locator System (MILS) ARCVIEW geographic information system (GIS) database, which contains information on all recorded mines, prospects, and mineral occurrences within the state of Alaska. The MAS/MILS and ARDF databases are similar but also complementary; MAS/MILS emphasizes economics; ARDF emphasizes geology.

The MAS/MILS database is maintained by the BLM Juneau Mineral Information Center (JMIC), which also houses the paper records used to create the database. Some of these paper records also are on file at the BLM in Anchorage. The entire paper file was scanned and put onto CDs in 2001, but plans for its availability to the public are undetermined. The JMIC library and public room is the former USBM library and its staff is comprised largely of former USBM employees. The MAS/MILS database is also available at the BLM in Anchorage or online at http://imcg.wr.usgs.gov/cgi-bin//qalaska3.cgi. Mining properties in Alaska are typically identified by the name or names of the claims involved, the name of the mine, or the name of the mining company, *and* by a unique MAS numeric designation. For example, the Salt Chuck Mine's MAS designation is 002 119 0135. The 002 indicates an Alaska location; 119 refers to the Craig 1:250,000 quadrangle; 0135 is a number assigned consecutively within the quadrangle. The JMIC has developed an index (hardcopy) with an alphabetized list of mines and their respective MILS designations. The MAS/MILS database is particularly valuable because for each mine, it lists alternate names (some of these can provide clues for finding claim histories as discussed in the following paragraphs) as well as citations for publications and reports in which the mine is mentioned.

Specifics regarding mining claims (among numerous other real and personal property transactions) are on file at 15 Recorders' Offices throughout the state. Mining district record books are maintained at the Recorders' Offices, and there is an effort underway to microfiche these record books and make them available at ARLIS and other libraries (Rolfe Buzzell, personal communication, 2001). Currently, however, just the Skagway area record books have been scanned and are available at the State Archives in Juneau (Sharon Young, Alaska State Recorder, personal communication 2001). Today, the state is divided into 34 recording districts. The number of districts and boundaries has changed through time, but the older records continue to be maintained by whichever current office received the older office's records when changes occurred. Records filed prior to 1972 are maintained as hard copy in record books; they have not been computerized.

Current recording districts relevant to the Tongass National Forest are: Haines, Juneau, Ketchikan, Petersburg, Sitka, Skagway, and Wrangell. The Juneau Recorder's Office serves the Haines, Juneau and Skagway districts. The Ketchikan Recorder's Office serves the Ketchikan, Petersburg and Wrangell districts. The Sitka Recording Office serves just the Sitka district. Current recording districts relevant to the Chugach National Forest are Cordova, served by the Anchorage Recorders' Office, and Seward and Valdez, each with an individual Recorder's Office. Some caution is necessary when using documentation at Recorders' Offices; miners sometimes registered their claims in offices far from the claim site in order to keep the location of their finds a secret (Rolfe G. Buzzell, personal communication, 2001). Additionally, filing conventions tend to make it very difficult to research a claim unless the investigator comes supplied with the actual names of claims and claimants and a good idea as to the dates of claim location and operation. There is no necessary correlation or relationship between the name of a mine or prospect, and the name of the claims where those mines or prospects are situated. It is possible to search by township, but without claim or claimant names, this can be a laborious process. Typically experts are hired to conduct such records searches for third party liability purposes.

Since 1976 when the Federal Land Policy and Management Act (FLPMA) was passed, mining claimants of federal lands have been required to file a copy of their claim with the BLM as well as with the Recorder's Office. In Alaska, this can be done at the BLM state office in Anchorage, or with the BLM Fairbanks Support Center. In cases where recent mining activity is continuing in the vicinity of a historic claim, it is useful to check recent claim records to better distinguish modern mining evidence from the older manifestations. To keep a possessory interest in a claim, claimants must perform a minimum amount of labor or make improvements annually and file an affidavit to that effect with the Recorder's Office and the BLM. To do this in a National Forest, claimants also must file a Plan of Operation with the Forest if any surface disturbance is contemplated and either post an annual maintenance fee of $100 per claim or submit small miner's exemption documentation. Plans of Operation also should be examined to better understand recent disturbance to a historic mining property.

The preceding discussion referred to unpatented mining claims. Mining properties sometimes pass out of federal ownership when title to the land is actually acquired by a private individual or corporation. These parcels are patented claims. Records on patented claims are maintained by the BLM, which was established in 1946 and took over the roles and responsibilities of the General Land Office (where patents had been filed prior to 1946). Deeds on file at Recorders' Offices also will provide information about patented claims. Litigation records may be found in the National Archives. There is a regional office of the National Archives in Anchorage. Once a claim has been patented successfully, it can be difficult to obtain information on subsequent activities by the private landowner. But plats and survey notes that pertain to the initial patent typically can be found.

Period newspapers, photographic archives, and mining company literature also can be valuable sources of information. The publication by Redman (1988) cited above relied heavily on Juneau-area newspaper stories. Indexes of historic mining properties as described in area newspapers have been compiled for Southeast (DeArmond 1979; Redman 1989) and for the Seward area (Tim Sczawinski, Seward Library, personal communication 2002), for example. The Alaska State Library Historical Archives in Juneau are a particularly valuable resource for mining properties in Southeast. The Alaska Electric Light & Power Company (AELP) of Juneau maintains the company records of the Alaska Juneau Gold Mining Company (the A-J Mine) as well as the company records for the Alaska Gastineau Mining Company (the Alaska Gastineau Mine) and records that pertain to the Treadwell mining complex (Stone and Stone 1980). The Rasmuson Library at the University of Alaska Fairbanks has an extensive mining archive, but the emphasis is on mines in the Interior. Mining photographs are included among other historic photographs archived at the Anchorage Museum of History and Art. The Loussac Library in Anchorage maintains a file with clippings from the Mining and Scientific Press. Local historical societies and museums also maintain archival records and photographs. A guide to museums and historical societies throughout Alaska is available online at http://museums.state.ak.us/list.html.

Information on mining properties within the Tongass and Chugach National Forests also may be found in diaries maintained by chiefs-of-party for individual ranger districts or areas. These are on file at the National Archives branch in Anchorage. It is necessary, however, to determine which individual was in charge of a given area during the time frame in which one is interested in order to use these diaries efficiently. Field notebooks maintained by USGS mining inspectors also may contain information the inspectors did not include in their published reports. These notebooks are available at the USGS library in Anchorage.

Forest-wide Mining Property Studies

Tracking down the records for a specific mining property or attempting to understand the history of a specific mining district can be time-consuming and require a good bit of travel. Of considerable importance to this historic context, the USBM, USGS and BLM have already done a tremendous amount of research, resulting in summary reports that greatly facilitated the synthesis reported here and which should be of immense value for future research.

Chugach National Forest: The first of these studies is an open file report entitled *Mineral Occurrences in the Chugach National Forest, Southcentral Alaska*, which summarizes a joint investigation by the USBM and USGS (Jansons and others 1984). This work was undertaken in order to estimate future mineral exploitation potential. The report provides summary information about all known mines, prospects, and unworked mineral occurrences in the Chugach National Forest and areas immediately proximal to the Forest and includes an oversize map showing the location of each. The investigation included attempts (some unsuccessful) to locate all metallic deposits and related mines and prospects (coal, oil, gas, stone, and sand and gravel deposits were not field inspected). A follow-up study was conducted to more explicitly explore the mineral resource potential of the forest (Nelson and others 1984). That study too includes an oversize map with mines, prospects and mineral occurrences delineated; this map is somewhat easier to use than the ones in Jansons and others (1984).

Jansons and others (1984) and Nelson and others (1984) report on 662 localities; an estimated 20 percent are mineral occurrences that have never been prospected or worked. An exact figure is difficult because of the conventions employed and the fact that not all localities were visited. In round numbers, however, there are upwards of 500 prospects and mines throughout the Chugach National Forest and nearby areas and the suspected commodities associated with the vast majority have been identified. Fifty-two localities are characterized as "past [lode] mines or prospects with high development potential" (the later does not necessarily imply these prospects were extensively explored or developed). Fifteen placer mining localities also are identified as past mines or high potential prospects.

A total of 137 of the approximately 500 identified mines and prospects on or near the Chugach National Forest were included in the mining hazards evaluation; just a few of these pertain to non-locatable minerals. In sum, there are good data on the number of mining properties in the Chugach National Forest, and close to 30 percent of these properties have been examined within the last 10 years. Thus, the universe that may ultimately be evaluated for historic importance is reasonably well understood; and the mines and prospects that will be evaluated for historic importance because of proposed hazards mitigation are very well understood indeed.

Tongass National Forest: Studies similar to those conducted for the Chugach National Forest–aimed at understanding the mineral resource potential of Southeast–were initiated by the USBM in 1984 and continued by the BLM after the USBM was disbanded in 1996. The investigations were organized by geologically defined mining districts or areas and addressed Glacier Bay National Park along with Forest and other lands. Three of these studies are complete; a fourth is in progress under the auspices of the BLM. To date, studies (some multiple-volume works) have been issued or published for the Chichagof and Baranof Islands Area and the Ketchikan and Juneau Mining Districts. Earlier, preliminary reports are available for these areas/districts as well.

The Chichagof and Baranof Islands Area study was published by the BLM and is cited as Bittenbender and others (1999). The Ketchikan and Juneau Mining District studies were published by the USBM and are cited as Maas and others (1995) and USBM (1989). A similar study is underway for the Stikine Area; thus far, two open file reports have been issued (Bittenbender and others 2000, McDonald and others 1998). A similar minerals potential study also is available for the Tracy Arm Fords Terror Wilderness (USGS Bulletin 1525 published in 1984). Two areas within the Tongass National Forest have yet to be systematically assessed for mineral potential: Admiralty Island and the Yakutat area. The former contains just two historic mines (Ken Maas, personal communication, 2001). The latter is characterized as low in mineral potential (refer to Figure 2), although some historic placer mining may have taken place on the black sand beaches in this vicinity (*ibid.*). Therefore, data on historic mining in the Tongass is reasonably complete.

A query of the MAS/MILS database was undertaken by the JMIC at the author's request during the preparation of this historic context. There are roughly 1,350 mines, prospects and unworked mineral occurrences throughout the Tongass National Forest and immediately adjacent areas. At least locational information (Universal Transverse Locator [UTM] grid coordinates) is available for all of these properties and a considerable amount of additional information is available for many of them in the

MAS/MILS database and the mineral resource reports mentioned above. It is estimated that from a third to one half of the 1,350 listings are unworked mineral occurrences (Ken Maas, personal communication, 2001). Thus, the Tongass National Forest contains about 800 mines and prospects.

Abandoned and Inactive Mine (AIM) Inventory: The Forest Service initiated a series of investigations at AIM sites to identify the nature and extent of chemical and physical hazards present. The results of the mineral resource studies for the Chugach and Tongass National Forests were used by the Forest Service to identify mining properties that might contain these hazards. Properties chosen for evaluation generally were those at which major workings were reported, production took place, complex sulfide mineralogy was present, or where reported mining activities were likely to have involved or produced toxic substances. Not all of the mining properties included in the study are over 50 years old, but the vast majority are. The results of these studies are unpublished Forest Service reports on file in the Supervisor's Offices of the Chugach and Tongass National Forests. Files containing field notes and other written documentation, sketch maps, location maps, and photographs were produced for each property. A total of 109 mining properties on the Tongass National Forest and 137 properties on the Chugach National Forest were included in the study. The majority are unpatented claims. Only in cases where contamination was suspected to be spreading onto National Forest System lands were patented claims investigated.

In addition to the field files, various reports that document claimant history and past mining activities along with recommendations for clean-up and remediation have been generated for some of the mining properties judged to contain serious hazards. These studies include Site Discovery Project Summary Reports, DNR Problem Area Description (PAD) 76 report forms (forms required by the Office of Surface Mining to describe safety hazards), Removal Preliminary Assessment (PA) Reports, Engineering Evaluation / Cost Analysis (EE/CA) Reports, Investigation of Third Party Liability Reports (PRPs), and remediation work plans. Many of these reports contain information useful to an evaluator interested in assessing a mining properties' historic importance.

MINING PROPERTY INVENTORIES

One aspect of preparing this historic context involved understanding the variability in mining properties throughout Alaska's National Forests as well as their condition. This was accomplished by (1) examining records for the properties investigated by geologists and mining engineers during the AIM studies described above; and (2) examining records for mining properties recorded by archaeologists.

Summaries for a sample of the 246 AIM properties on the Tongass and Chugach National Forests were reviewed and the data are presented in Appendix C. A total of 212 records (over 85 percent) were reviewed. Appendix D presents a listing of mining properties in the AHRS database, which is maintained by the DNR, OHA. This list contains a sample of recorded mining properties in the Chugach National Forest, which was drawn by querying the database for records in which the words mine, mining or mineral appeared either in the site name or in the field for "resource nature," and where the "owner" was listed as USFS (United States Forest Service). Additional Chugach mining properties have almost certainly been recorded and included in the AHRS database, but there is no easy way to extract them. For the Chugach, therefore, 40 site records were reviewed. All 60 mining properties recorded and included in the AHRS database for the Tongass National Forest are listed in Appendix D. This was possible because the forms were extracted and supplied by Ketchikan Zone Archaeologist John Autrey. Mr. Autrey also supplied AHRS forms for 46 mining properties beyond but near the Tongass National Forest boundaries; these too are included in Appendix D. It was decided that the aggregate sample of 146 properties identified by these means would provide a reasonable look at how archaeologists have dealt with mining properties.

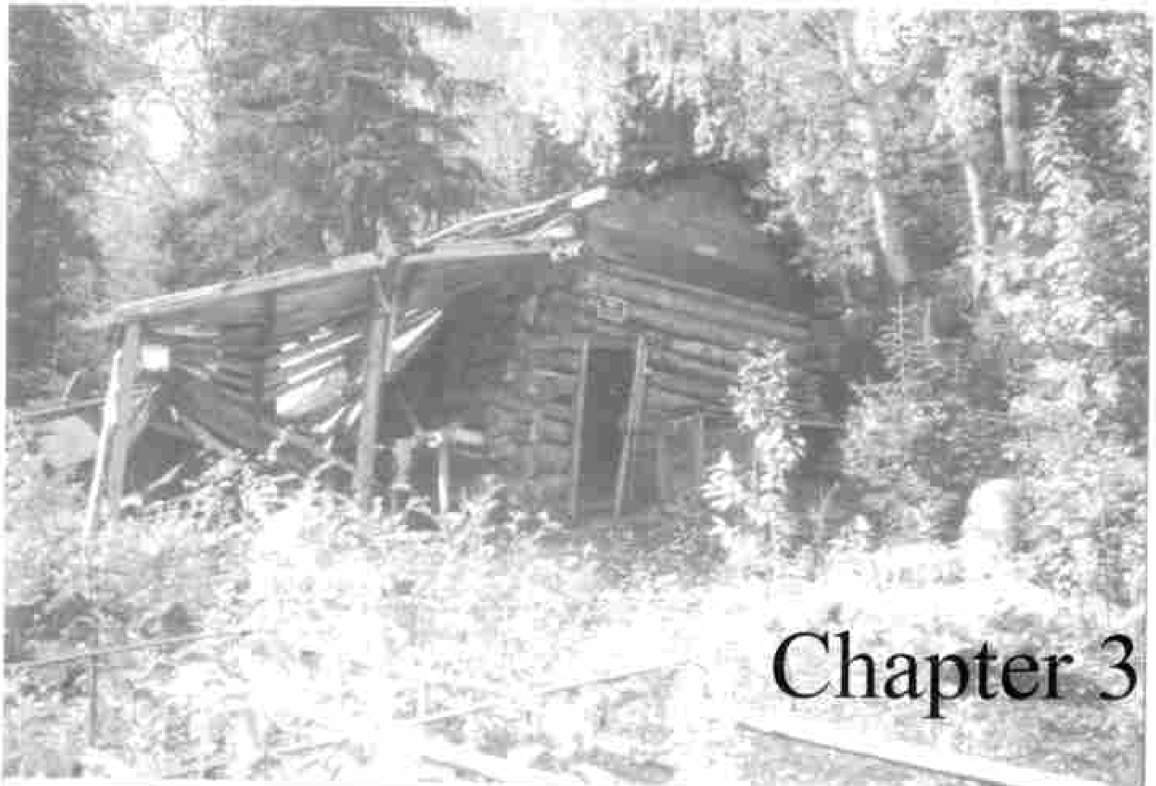
Recent consultant recommendations and Forest determinations of eligibility of mining properties also were examined in this regard. Specifically considered were Autrey and Stanford's (2001) evaluation of 13 mining properties on Gravina Island in the Ketchikan Mining District; Mobley's (2001) evaluation of the Gold Standard, Sealevel and Mahoney mines in the Ketchikan Mining District; Buzzell's (2001) evaluation of the Mckinley Lake Mine site near Cordova in Prince William Sound; and Yarborough's (1992) National Register of Historic Places registration form for the Mull Cabins, which are associated with placer mining on the Kenai Peninsula.

INTERVIEWS WITH KNOWLEDGEABLE INDIVIDUALS

The author interviewed a number of individuals connected in some fashion with, or knowledgeable about the mining industry (refer to Chapter 1, Table 1). She also made a brief presentation in May 2001 in order to solicit additional input at a combined meeting of the Alaska Miners Association and the Society for Mining, Metallurgy and Exploration. In December 2001, she was invited back to present the results of the in-progress study; additional information was obtained by this means. In part, of course, these interviews (all of which were documented in writing as either meeting notes or records of telephone conversations) were expected to provide information and advice concerning available resources for researching the historic context. It also was instructive, however, to compare and contrast attitudes and opinions of these varied members of both the general public and the cultural resources community regarding the importance and desirability of preserving different kinds of mining properties. Data and opinions obtained through interviews, meetings and informal conversations are reported in this document as personal communications where applicable.

Chapter 3

Environmental Setting



CHAPTER 3. ENVIRONMENTAL SETTING

(Contributor: Holly L. Morris)

"Like people everywhere, Alaskans are constantly interacting with their environment." (Pearson and Hermans 2000).

The natural environment creates a context for human use of any given landscape. Environmental factors may not determine the course of human history, but they do provide resources and challenges for human visitation, occupation, and enjoyment, and are important for understanding the cultural history of any given region. This was true for the men and women who prospected and mined the lands that would become Alaska's National Forests. And it is equally true for the people responsible for managing those lands today. If it is to be successful, historic preservation must have realistic and affordable goals. It must be undertaken in consideration of environmental opportunities and constraints. Thus the following discussion is provided as a backdrop for understanding the history of the mining efforts throughout Southeast Alaska, in Prince William Sound and the Copper River Delta, and on the Kenai Peninsula and Turnagain Arm. It also serves as a focus for later considerations of preservation potentials.

The Tongass National Forest comprises portions of the Yakutat, Skagway, Atlin, Mt. Fairweather, Juneau, Taku River, Sitka, Sumdum, Port Alexander, Petersburg, Bradfield Canal, Craig, Ketchikan, Dixon Entrance, and Prince Rupert 1:250,000 scale quadrangles. The Forest includes much of southeastern Alaska (Figure 7). The Chugach National Forest extends (from northwest to southeast) throughout portions of the Anchorage, Seward, Blying Sound, Valdez, Cordova, Middleton Island, Bering Glacier, and Icy Bay 1:250,000 scale quadrangles. It encompasses the northeastern portion of the Kenai Peninsula and all of Prince William Sound and the Copper River Delta (Figure 8).

Two ecoregions are found in the Tongass and Chugach National Forests, the Pacific Coastal Mountains ecoregion and the Coastal Western Hemlock–Sitka Spruce Forests ecoregion (Gallant and others 1995). Both regions were glaciated during the Pleistocene epoch and both have active glaciers and ice fields.

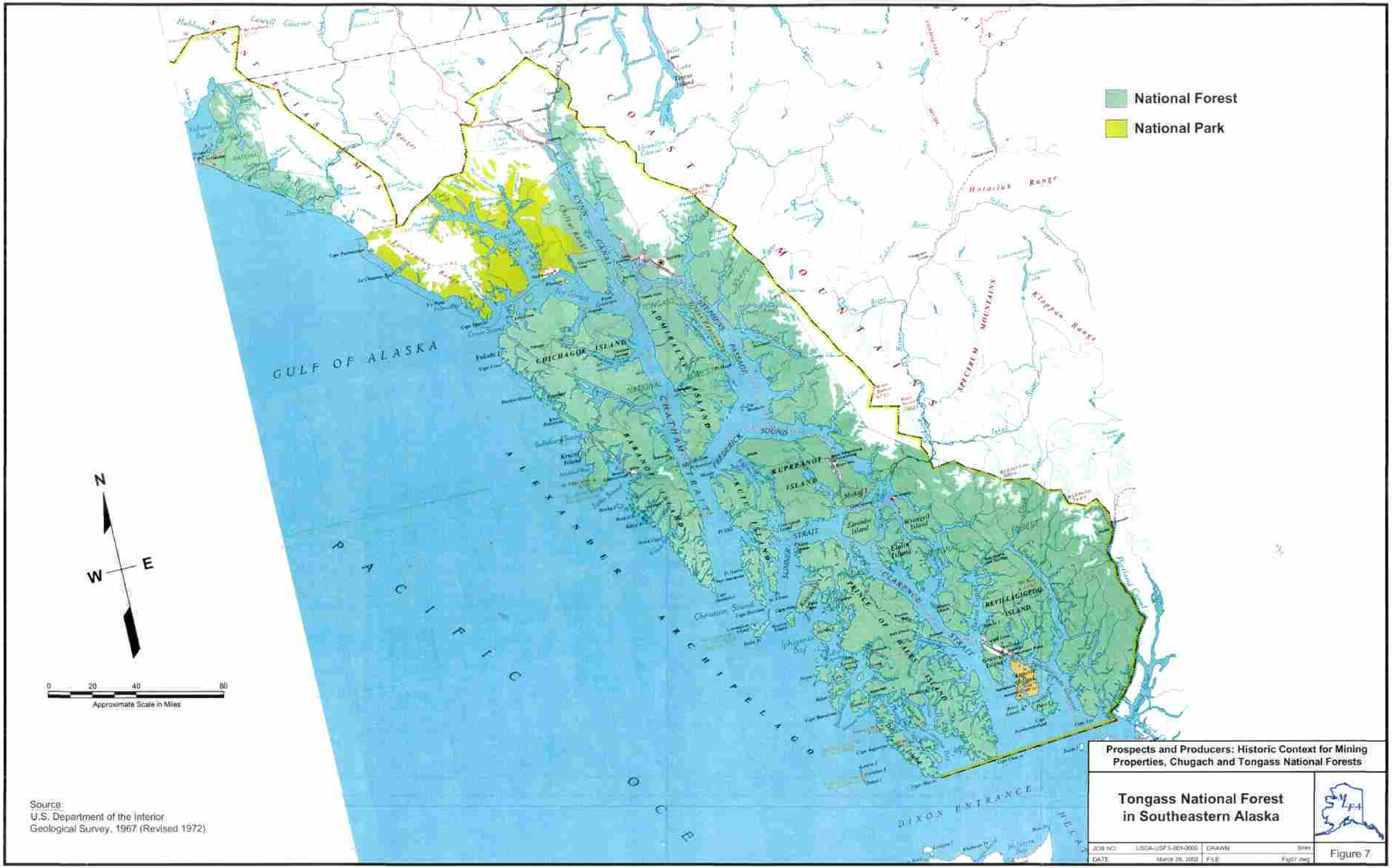
The Pacific Coastal Mountains ecoregion has steep and rugged mountains. Rocky slopes, glaciers and ice fields cover much of the region. Streams are short and swift and headwatered in glaciers. Lakes lie in ice-carved basins. Where soil development has occurred, soils have formed in gravelly till and colluvium. Soils on steep ridges are shallow and overlie bedrock. Dominant soils in the Pacific Coastal Mountains are Lithic Cryorthents, Andic Cryumbrepts, Pergelic Cryumbrepts, Typic Cryumbrepts, Typic Haplocryods, Andic Humicryods, Lithic Humicryods, and Typic Humicryods. Most of the area is barren of vegetation but where plants do occur, dwarf and low scrub communities dominate.

Climate for most of the ecoregion is transitional between maritime and continental influences. Permanent settlements are rare, primarily occurring at the lower elevations, and wildlife occurrence is very low. Moose, mountain goat, and smaller mammals are hunted in the mountains. Streams yield salmon and freshwater fish. Coastal areas provide marine resources as well as coastal birds and their eggs. Important economic activities of the region include subsistence and recreational hunting and fishing, along with mining and tourism.

As described by Gallant and others (1995) the Coastal Western Hemlock–Sitka Spruce Forests ecoregion has deep narrow bays, very irregular coastline, and high sea cliffs, mostly the result of intense Pleistocene glaciation. Steep valley walls expose bedrock, and there are many glacial moraine deposits. Most streams originate from the mountain glaciers of adjoining ecoregions; exceptions are streams on islands. Lakes are plentiful in some areas and absent in others. Flood plains and river deltas are present near sea level. Soils near the mountains formed in gravelly and stony moraine deposits or in a mantle of volcanic ash over the morainal deposits. Soils of river deltas, terraces, alluvial fans, and floodplains formed in waterlain silts and clays. Poorly drained depressions are filled with fibrous peat. Dominant soils of the Coastal Western Hemlock-Sitka Spruce Forests are Terric Cryohemists, Andic Cryaquods, Andic Humicryods, Lithic Humicryods, and Typic Humicryods. The region has a maritime climate, with cool summers and mildly cold winters. Moderate to heavy amounts of precipitation support widespread forests of western hemlock and Sitka spruce. There are also scrub and wetland communities. The population is concentrated along small stretches of flat coastal areas and commercial fishing, tourism, timber harvest, and mining are important economic activities. Large mammals include deer and brown bears and in some areas moose and mountain goats. Marine resources include salmon, herring, halibut, seaweed, and clams.

The geology and geomorphology of the two ecoregions is particularly significant to understanding the locations of mines and prospects and the mineral potential of the Tongass and Chugach National Forests. There are two types of mineral deposits, placer and lode, from which locatable minerals are mined. Placer deposits are formed when mechanical processes concentrate weathered mineral particles. Gold placers are found where alluvial processes have winnowed out lighter materials and concentrated heavy minerals in stream or beach environments. In Alaska, placer deposits are sometimes buried beneath glacial moraines and till when glaciers overtop old stream deposits. Placers are generally not found in the unworked glacial deposits and where glaciers scour bedrock, placer deposits are removed. Lode deposits are found in solid rock as veins or disseminations. Glacial processes may expose or remove lode deposits.

Historically, individuals who noticed a rock with an unusual color or characteristic often were responsible for initial placer and lode discoveries. Hunters, trappers, fishermen, and people resting beside a trail have found the majority of the world's mineral deposits. It is not necessary to be a geologist to locate mineral deposits. The search for minerals has, however, greatly advanced our understanding of the earth as recorded in the rocks. Today, miners, prospectors, and geologists use both geologic and historic information to locate and develop mineral resources. Nonetheless, world-class deposits continue to be found occasionally by individuals who simply examined a rock that appeared to be different.



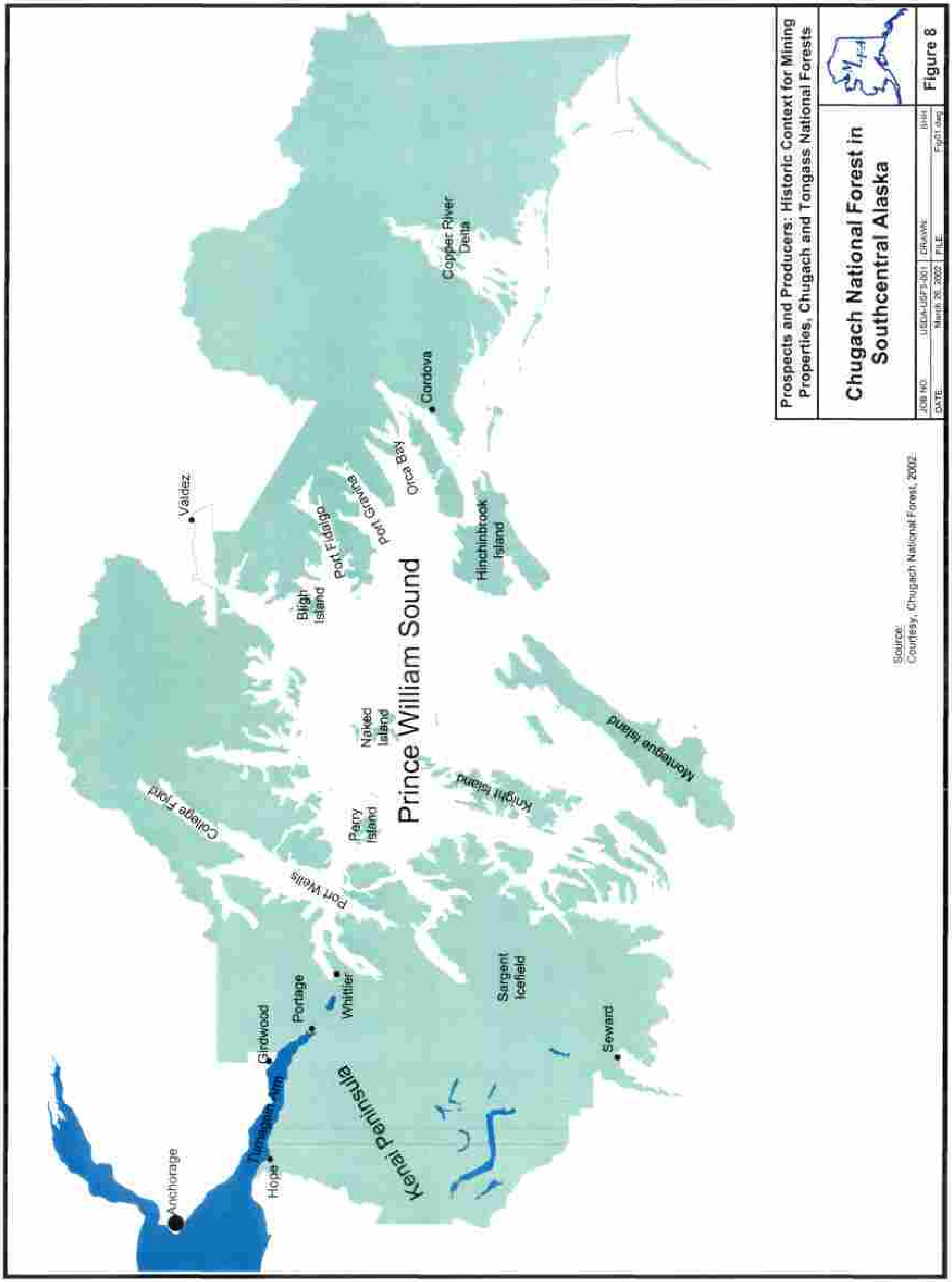
Source:
U.S. Department of the Interior
Geological Survey, 1967 (Revised 1972)

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Tongass National Forest in Southeastern Alaska

JOB NO: USDA-USFS-001-0000 DRAWN: SHH
DATE: March 28, 2002 FILE: Fig07.dwg

Figure 7



Source: Courtesy, Chugach National Forest, 2002

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Chugach National Forest in Southcentral Alaska

Figure 8

During the past 25 years, the development of plate tectonics concepts has led to significant advances in understanding the geologic evolution of Alaska and the recognition that much of Alaska comprises fault-bounded crustal fragments or terranes. With these new understandings come revised explanations of the spatial distribution of mineral resources (Goldfarb 1997).

It is now understood that many of Alaska's significant mineral deposits formed in oceanic settings, both within and distal to the continental margin. Some deposits developed far from North America and now occur throughout rocks of the accreted terranes. Others formed in synaccretionary to postaccretionary settings. For example, plate convergence and associated subduction led to the widespread development of Southeast Alaska's productive mesothermal gold vein systems (Goldfarb 1997).

More detailed descriptions of the geology and other environmental settings for the Tongass National Forest (Southeast Alaska), and the Chugach National Forest (Prince William Sound and the Copper River Delta, and the Kenai Peninsula and Turnagain Arm) are provided in the following sections.

SOUTHEAST

The following discussion is largely adapted from Arndt and others (1987:8-31), and Gallant and others (1995).

Physiography

Southeast Alaska includes a narrow strip of mainland coast and literally hundreds of islands to the west. Elevation ranges from sea level to 15,000 feet (in the St. Elias Range), but many mountains are lower, reaching from around 3,000 to 7,000 feet. The coastline is highly dissected and both the coastal zone and the islands feature generally rugged topography. All of Southeast Alaska lies within the Pacific Mountain System and can be divided into three physiographic provinces from east to west: the Coastal Mountains, the Coastal Trough, and the Pacific Border Ranges (Wahrhaftig 1965). The region's six largest rivers–the Alsek, Chilkat, Taku, Whiting, Stikine and Unuk–all originate in Canada to the east and cut through the coastal ranges to debouch into the sea.

Regional topography is largely the result of glaciation. Mountains at lower elevations tend to be rounded, and rock basin lakes and fjords are common. Glacial moraine deposits are apparent on many surfaces. The region is tectonically active today. Mineralized zones exploited historically occur, especially, adjacent to the Coast Range, along the west coast of Chichagof Island and on the Kasaan Peninsula of Prince of Wales Island.

Geology

The complex geology of Southeast Alaska is simplified in Figure 9, which depicts the relationships of twelve fault-bounded terranes. Some terranes are more likely to host specific types of mineral deposits. For example, some volcanogenic massive sulfide (VMS) deposits occur in Triassic rocks on the inboard margin of the Alexander terrane and are part of a 375-mile long belt that stretches the entire length of Southeast Alaska (Bittenbender and others 2000). Niblack and Hetta Inlet produced copper from Alexander terrane VMS deposits in the southern part of Prince of Wales Island (Maas and others 1995).

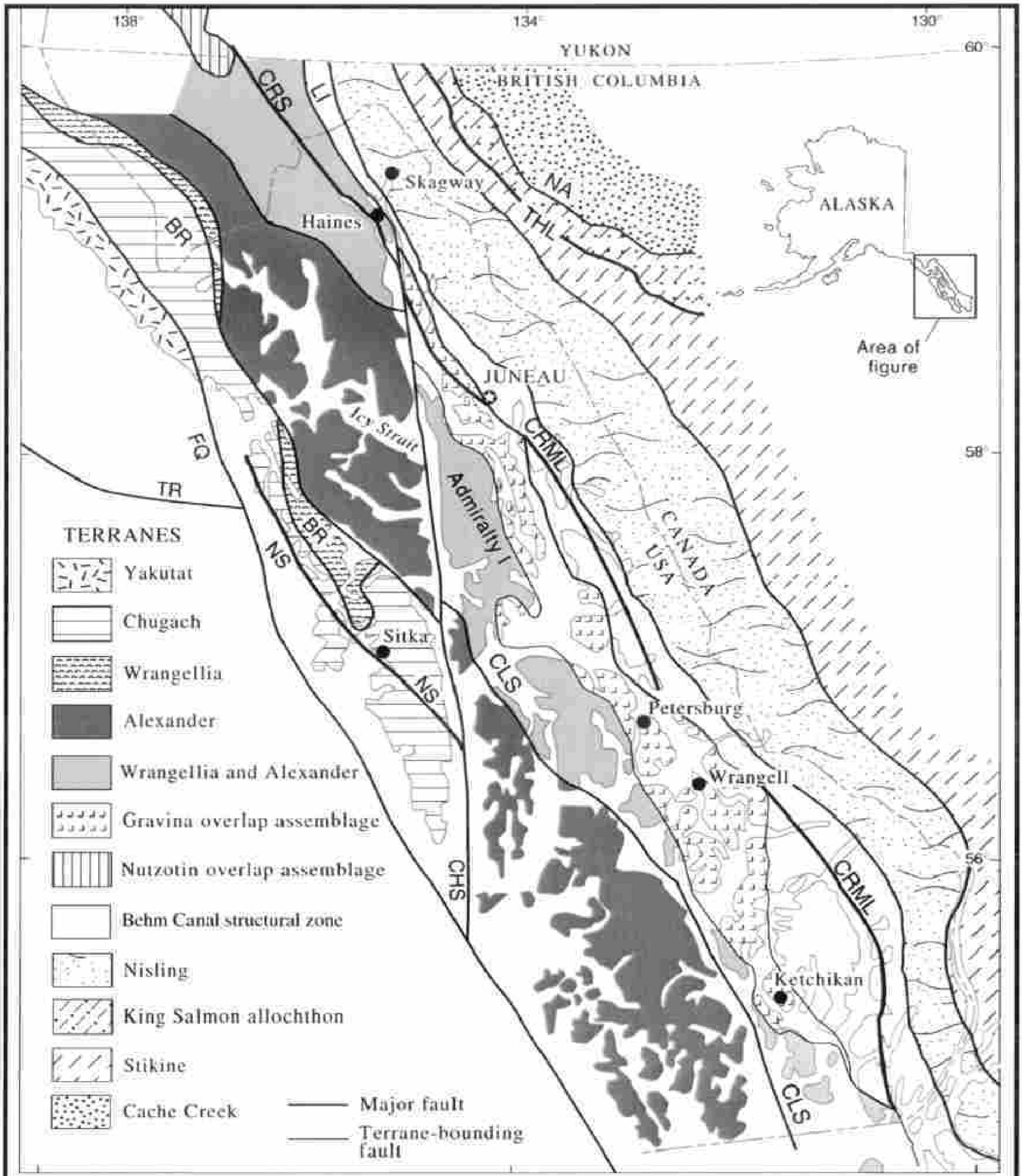
The following discussion is organized by the geographically defined mining districts and areas (regions) used by the BOM, BLM, and USGS that pertain to the Tongass National Forest. Figure 10 depicts the locations of all but the Yakutat area, which comprises the extreme northwestern portion of the Forest.

Yakutat Area: Yakutat and Chugach terranes are found in the Yakutat area. Rocks are described as graywacke, slate, argillite, minor conglomerate, volcanic detritus, and interbedded mafic volcanic rocks. Mapped stratigraphic units include the Valdez and part of the Yakutat Groups and Sitka Graywacke. Rocks are mildly metamorphosed (Beikman 1980). Historically, the Yakutat mining district is best known for placer gold deposits in beach sands of Yakutat and Lituya bays and at Yakataga (Arndt and others 1987:236).

Juneau Mining District: Five terranes are found in the Juneau Mining District: (1) the Alexander terrane, including the Craig and Admiralty subterrane, (2) Wrangellia, (3) the Gravina terrane, (4) the Chugach terrane, and (5) the Stikine terrane (U.S. Bureau of Mines 1989). Geologic descriptions for three district subareas located within the limits of the Tongass National Forest, are described below.

<u>West Lynn Canal subarea</u>: Alexander/Craig subterrane – These rocks are predominately metamorphosed Silurian and Devonian clastic sediments, limestone, and volcanic units with local areas of Permian limestone and siltstone. These rocks are intruded by a few scattered Cretaceous plutons. Potential deposit types in the West Lynn Canal subarea include volcanogenic massive sulfide, sediment-hosted massive sulfide, vein, skarn, and magmatic uranium (U.S. Bureau of Mines 1989:C).

<u>Juneau Gold Belt subarea</u>: Gravina terrane and Alexander/Coast Range plutonic complex – The Juneau Gold Belt is underlain by progressively metamorphosed metasedimentary, metavolcanic, and metaplutonic rocks. The eastern edge of the Gold Belt is roughly marked by a foliated quartz diorite (tonalite) that forms the western margin of the Coast Range plutonic complex. Black phyllite, mafic metavolcanic flows, metagrabbro sills, and diorite sills and plutons host the vein deposits in the Juneau Gold Belt. Rocks of the Gold Belt are bisected by the Coast Range megalineament, a major discontinuity and topographic lineament. The Juneau Gold Belt is delineated by the occurrence of gold-bearing quartz veins, which commonly carry silver, galena, sphalerite, and chalcopyrite as well as pyrite and pyrrhotite. Other sulfide minerals such as aresenopyrite, tellurides,

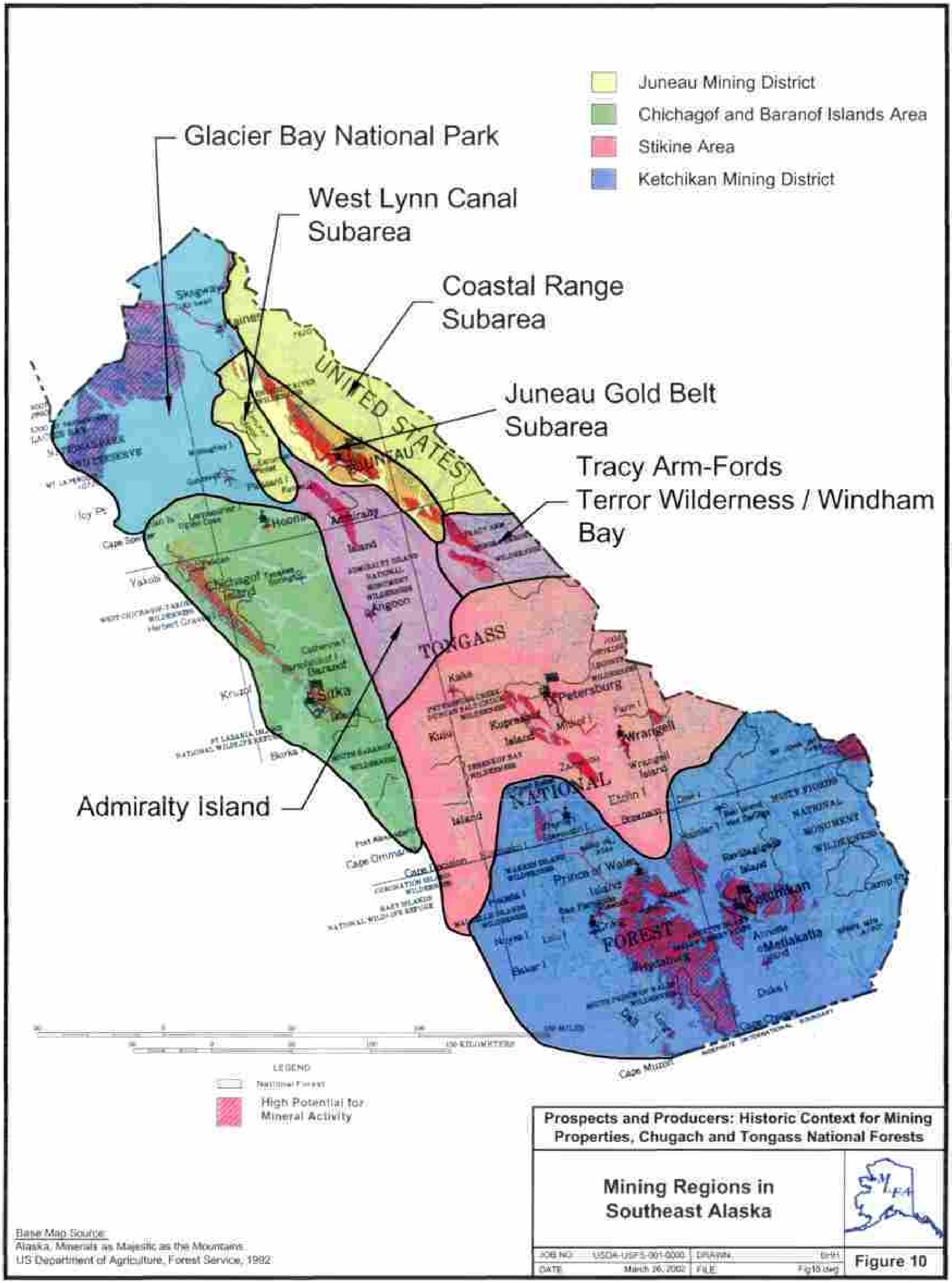


Source
Brew and others, 1991

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Continent Transect and Tectonostratigraphic Terrane Boundaries, Southeast Alaska

JOB NO:	USDA-USFS-001-0000	DRAWN:	BHH	**Figure 9**
DATE:	December 11, 2001	FILE:	Fig09.dwg	



Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Mining Regions in Southeast Alaska

JOB NO.	USDA-USFS-001-0000	DRAWN	SHH
DATE	March 26, 2002	FILE	Fig10.dwg

Figure 10

and molybdenite are also found in portions of the Gold Belt, as are volcanogenic sulfide bodies. Historically, the first recorded gold discoveries occurred as placer deposits in 1869. Lode deposits became increasingly important in the early 1880's. The Treadwell and Alaska Juneau Mines were the largest low-grade gold mines in the world while they were active (U.S. Bureau of Mines 1989:D).

Coast Range subarea: Stikine terrane and Alexander/Coast Range plutonic complex – The Coast Range subarea is dominated by rocks of the Coast Range plutonic complex (also referred to as the Coast Range Batholith or as the Nisling terrane). This is a complex belt of granitic rocks with ubiquitous gneisses, high-grade schists, and migmatites. Country rocks are locally preserved as roof pendants. The Stikine terrane (or Stikinia terrane) contains predominantly lower-grade metasedimentary and metavolcanic rocks. None of the mineral occurrences known in the Coast Range subarea are thought to represent a significant deposit when grade and tonnage parameters are considered. However, the molybdenum, magmatic oxide sulfide, vein gold, skarn, and volcanogenic massive sulfide occurrences are believed to be the most important (U.S. Bureau of Mines 1989:E).

Tracy Arm–Fords Terror Wilderness / Windham Bay Area: As shown on Figure 9, two terranes, the Behm Canal structural zone (also known as Taku terrane) and the Nisling (the Coast Range plutonic complex) are found in the Tracy Arm-Fords Terror Wilderness/Windham Bay Area. In this area, Brew and others (1984) described the Behm Canal structural zone as a western metamorphic belt parallel and adjacent to the southwestern side of the Coast Range plutonic complex. The western metamorphic belt is composed of complexly deformed metamorphic rocks that are locally intruded by granitic ad other rocks, including one ultramafic body. A long foliated tonalite sill separates the metamorphic belt from the Coast Range plutonic complex of granitic rocks with gneisses, schists and migmatites. The western metamorphic belt (a southern extension of the Juneau Gold belt) hosts almost all of the mineral occurrences in this area. Two important areas are recognized as having important gold, copper, zinc, and silver resources, the Sumdum Glacier mineral belt and the Endicott Peninsula area. Many of these mineral resources have been recognized since the early 1900's, or earlier.

Admiralty Island Area: The Alexander terrane and Gravina overlap assemblage are found in the Admiralty Island area. The Alexander terrane comprises a variety of stratified, metamorphic, and plutonic rocks that underlie much of Southeast Alaska. Volcaniclastic turbidites, shallow-marine carbonate rocks and subordinate polymictic conglomerate are the most widespread rock units in the terrane. The Gravina belt is comprised of marine argillite and graywacke, interbedded andesitic to basaltic volcanic and volcaniclastic rocks, conglomerates, and plutonic rocks (Gehrels and Berg 1994). Prospects and mines are distributed over most of the district. Historically, production was limited to gold, but deposits of other minerals are known. The only historic gold production occurred at the north end of Admiralty Island, near Funter Bay and Hawk Inlet (Arndt and others 1987:235).

Chichagof and Baranof Islands Area: Three terranes are found in the Chichagof-Baranof area, the Chugach, Wrangellia, and Alexander terranes. In this area Chugach terrane rocks are marine sedimentary and volcanic rocks interpreted as deformed flysch and melange sequence. Dominant units are the Kelp Bay Group (the melange) and the Sitka Graywacke flysch sequence. The Wrangellia terrane rocks consist of a sequence of marine sedimentary and volcanic rocks overlain by the Goon Dip Greenstone and Whitestripe marble. The Alexander terrane consists of sedimentary, volcanic, and intrusive rocks. Bedded units of the terrane include clastic sedimentary rocks, limestones, andesitic and basaltic volcanics, and intrusive alkalic rocks. All terrane units have been metamorphosed and intruded. The most recent volcanic activity ceased about 5,000 years ago. Known mineral deposits types found in the Chichagof-Baranof area are vein gold deposits, magmatic segregation deposits (nickel-copper-cobalt), porphyry copper-molybdenum deposits, and volcanic-related massive sulfide deposits (Bittenbender and others 1999). According to Arndt and others (1987) mineral deposits are scattered over the entire area, but are concentrated along the west sides of Chichagof and Baranof islands and on Yakobi Island. Historically, production was primarily gold, but an important base metal deposit is found at Bohemia Basin on Yakobi Island. The best-known and productive gold occurrences are located at the Chichagof and Hirst-Chichagof mines near Klag Bay and at Apex-El Nido mines to the north.

Stikine Area: Bittenbender and others (2000) identify three terranes (the Alexander, Taku, and Stikinia), the Gravina Belt overlap sequence, the Coast Range Batholith, and Tertiary rocks as tectonostratigraphic terranes and physiographic provinces in the Stikine area. As elsewhere in Southeast Alaska, the assemblages generally form elongate, northwest-trending belts. Mineral deposit types found in the Stikine area include volcanogenic massive sulfide deposits generally found on the inboard margin of the Alexander terrane; polymetallic replacement and polymetallic vein type deposits and porphyry molybdenum found in the Groundhog Basin area; replacement type deposits identified in the Cornwallis Peninsula area; and a variety of other mineral deposit types and occurrences including vein gold, skarn, magmatic segregation, and veins of barite (Bittenbender and others 2000). Historically, production has been limited to gold at the southern extent of the Juneau Gold Belt, at Thomas Bay, and at the Maid of Mexico mine on Woewodski Island (Arndt and others 1987).

Ketchikan Mining District: Maas and others (1995) identify five lithotectonic assemblages/terranes in the Ketchikan Mining District: (1) Alexander terrane, (2) Gravina belt, (3) Taku terrane, (4) Coast Mountains Batholith, and (5) Stikinia terrane. The following paragraphs provide general descriptions of the terranes and associated mineral potential within the Ketchikan Mining District.

Alexander terrane: Alexander terrane rocks are predominantly found west of Clarence Strait on Prince of Wales Islands and the smaller islands to the west. A sliver is also found on islands south of Ketchikan. Mineral deposit types include volcanogenic massive sulfide, polymetallic vein, skarn, low-sulfide and stratabound vein gold, magmatic uranium-rare earth, magmatic segregation, and porphyry copper/molybdenite (Maas and others 1995). Historically, Alexander terrane is known particularly for production of copper, but also for gold, uranium, and limestone/marble. The best known and most productive deposits are located in areas of Kasaan Peninsula/Karta Bay (copper), Hetta Inlet (copper), Niblack Arm/Moira Sound (copper, gold, silver), Dolomi/Cholmondeley Sound (gold), Bokan Mountain (uranium), and islands off the west coast of Prince of Wales Island, especially Dall Island (limestone/marble). Other historic deposits associated with Alexander terrane are found on Annette and Duke islands (Arndt and others 1987).

Gravina belt: Gravina belt rocks are found predominantly on Cleveland Peninsula, the western part of Revillagigedo Island, and the eastern part of Gravina Island. The overlap assemblage is primarily composed of marine argillite and graywacke, interbedded andesitic to basaltic volcanic and volcaniclastic rocks, and subordinate polymictic conglomerate. Several plutons are found within the Gravina belt. Mineral deposit types include low-sulfide vein gold, polymetallic vein, copper and molybdenum porphyry, and volcanogenic massive sulfide (Maas and others 1995). Historic mineral deposits are concentrated on Revillagigedo Island and the Cleveland Peninsula. The best known gold deposits are located on Helm Bay and near Ketchikan on Revillagigedo and Gravina islands (Arndt and others 1987).

Taku terrane: Taku terrane rocks lie east of the Gravina belt in the area described as the Behm Canal structural zone on Figure 9. As described by Maas and others (1995) Taku terrane rocks are metavolcanic and metasedimentary rocks with limited mineral deposit types. Deposit types present include polymetallic vein, porphyry molybdenum, low-sulfide vein gold, and volcanogenic massive sulfide.

Coast Mountains Batholith: The Coast Mountains Batholith (also referred to as the Coast Range plutonic complex or the Nisling terrane) is found on the eastern edge of the Ketchikan Mining District. As previously described, the batholith is a complex belt of granitic rocks with ubiquitous gneisses, high-grade schists, and migmatites. The world-class Quartz Hill molybdenum deposit discovered in 1974 is located in the batholith. Several minor mineralized occurrences have also been prospected. In the Ketchikan Mining District, the majority of the batholith is within the Misty Fjords National Monument Wilderness Area and is closed to mineral location and exploration (Maas and others 1995).

Stikinia terrane: A sliver of the Stikinia terrane (or Stikine terrane) is located near Hyder on the eastern side of the Ketchikan Mining District. The rocks exposed in this area are volcanic, plutonic, and clastic sedimentary rocks of the Hazelton Group, which have been intruded by granodiorites and quartz monzonites. Mineral deposit types include polymetallic vein, porphyry molybdenum, skarn, and volcanogenic massive sulfide (Maas and others 1995). Historic mines are concentrated near Hyder at the head of Portland Canal. The Hyder district historically produced gold, silver, copper, lead, zinc, and tungsten, nearly all which came from the Riverside Mine (Arndt and others 1987).

Soils

Surficial deposits in Southeast are dominantly coarse rubbly deposits associated with steep-sloped mountains with a high percentage of bedrock exposures. Some glacio-fluvial deposits also may be present. In the Yakutat area, surficial deposits are moraines and associated drift near existing glacial fronts; outwash and valley-train deposits graded to glacier fronts and recent moraines; modern coastal beaches, spits, and bars; and older coastal deposits of inter-stratified alluvial and marine sediments, including, locally, glacial drift (Kalstrom and others 1964). Soils in Southeast all are young, dating to the post-Pleistocene period, and generally consist of thick layers of highly acidic, partially decomposed organics with low nutrient values. These soils are not considered suitable for agriculture although small-scale gardening is reported (Selkregg 1976).

Climate

Most of Southeast Alaska is characterized by a cool, moist maritime climate with average summer temperatures that range from the 40s to the 60s (degrees Fahrenheit) and winter temperatures from the high teens to the low 40s (Selkregg 1976). Rain is common, with average annual precipitation ranging from 80 to 160 inches. The wettest months are October and November with frequent storms. Snowfall is greatest in the north; in the southern portion of Southeast Alaska, snowfall typically melts quickly at lower elevations.

Flora and Fauna

The Coastal Western Hemlock-Sitka Spruce Forest in Southeast supports a large variety of coastal forest, scrub, and wetland communities. As described by Arndt (1987), "True forest" is a continuation of the cool, moist rainforest, which extends from northern California to Alaska's Cook Inlet. The dominant tree species in Southeast are western hemlock and Sitka spruce, with mountain hemlock, and Alaska yellow cedar. Also present are black cottonwood, western paper birch, lodgepole pine, and Pacific yew. The western red cedar is limited to the southern half of Southeast Alaska. The rainforests are choked with a dense understory of alders, willows, small conifers, devils club, berry bushes, ferns, and mosses. True forest provides winter cover for Sitka black-tailed deer at lower elevations and for mountain goats at higher elevations, and year-round habitat for black bears, wolves and various small mammals.

Grass-sedge meadows occur within the forest at low elevations, often along the coast, and support moose, black and brown bears, river otters, and a variety of waterfowl. Muskegs develop in very poorly drained areas and provide habitat for Sitka black-tailed deer, and both bear species.

As described by Arndt (1987), the Alpine Tundra-Barren Grounds is the major vegetative unit above treeline (generally elevations above 2,500 feet). It is separated from the coastal forests by a narrow transitional zone of scrub mountain hemlock. Thin, stony soils support heaths, grasses, and other low-growing plants. Sitka black-tailed deer and mountain goats occupy Alpine Tundra zones in the summer along with black and brown bears, a number of small mammal species, white-tailed ptarmigan and spruce and ruffled grouse. Aquatic communities characteristic of Southeast Alaska are found in lakes, rivers and streams; estuaries; littoral (intertidal) zones; and nearshore (on and above the continental shelf) marine zones. These water bodies provide habitats for numerous fish species, crustaceans, marine invertebrates, mammals, and bird species.

Historic Population Centers

Historic mineral exploration in Southeast (which is considered in greater detail in the following chapter) had its start near the existing Russian settlement of Novo Arkhangelsk (today's Sitka) on Baranof Island. Gold was discovered in the Sitka vicinity in the 1870s, shortly after Russian rule ended (Maas and others 1995). The Juneau area was settled in association with mining efforts that began the following decade (for example, DeArmond 1980). A lode copper claim was located on Prince of Wales Island as early as 1867 (purported to be Alaska's first mining claim) at what became the Copper Queen Prospect (Mass and others 1995:17). Fishermen generally preceded miners to the Ketchikan area, however, with serious mining exploration getting underway in the 1890s. Ketchikan was founded in 1887 when a cannery was constructed and served as a port-of-entry and major supply center during gold rushes that began shortly thereafter (Orth 1971:511).

PRINCE WILLIAM SOUND AND THE COPPER RIVER DELTA

Principal sources used to compile the brief consideration of environmental variables in Prince William Sound and the Copper River Delta include: Wahrhaftig 1965, Gallant and others 1995, Jansons and others 1984, Nelson and others 1984, Pflaker and others 1994, Kalstrom and others 1964, and Lethcoe and Lethcoe 1998.

Physiography

Seemingly innumerable fjords, bays, and islands make up Prince William Sound. The coastline is lushly forested for the most part with glaciers on the high mountains above and extending to tidewater in several instances. The Sound is situated within the Kenai-Chugach Mountains physiographic province (Wahrhaftig 1965). The Chugach Mountains form a dramatic backdrop to Prince William Sound and tower above it. The tallest peak, Mount Marcus Baker, has an elevation of 13,175 feet.

In contrast to the Sound, the Copper River Delta is the largest contiguous wetland area on the west coast of North America (National Wildlife Federation 2001). The 700,000-acre wetland is formed by six glacial river systems stretching across a 60-mile arc from Point Whitshed on the west to Cape Suckling on the east. Located north of the Gulf of Alaska the Delta is characterized by a myriad of shallow ponds, intertidal sloughs, braided glacial streams, sedge marshes, willow thickets and stands of spruce and cottonwood. The flat Delta lands are backed by the Chugach Mountains where glaciers creep down many valleys and cling to mountainsides (Great Outdoor Recreation Pages 2001).

Geology

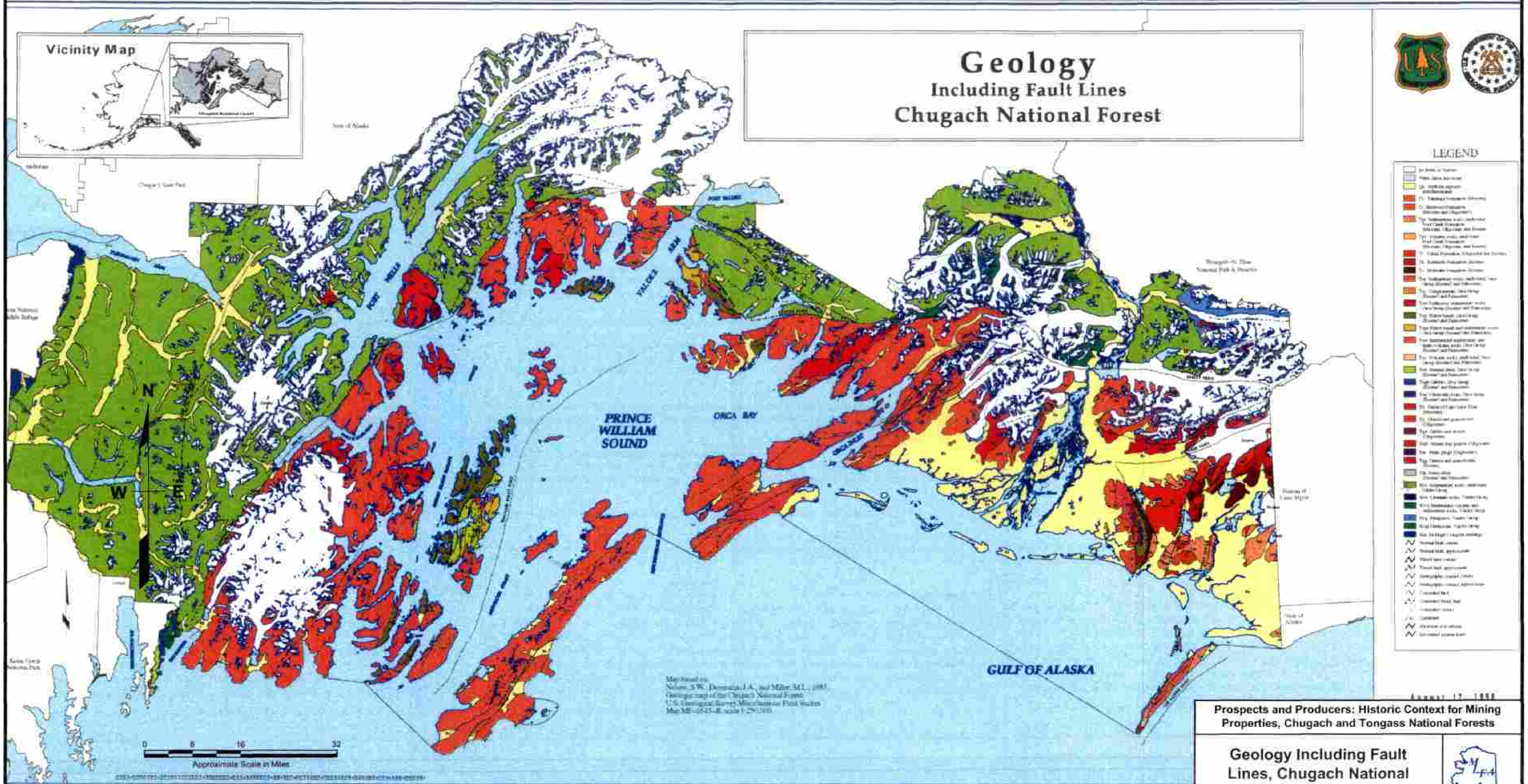
The geologic history of Prince William Sound and the Copper River Delta is complex (for example, Jansons and others 1984; Kurtak n.d.; Lethcoe 1990; Moffit 1954). Two major lithologic units are dominant: the Chugach terrane Late Cretaceous Valdez Group and the Prince William terrane Paleocene and possibly Eocene Orca Group (Figure 11). Both groups contain graywacke, siltstone and shale. Mafic volcanics and local conglomerate are present as well. Most copper deposits are believed to be related to mafic volcanism. Gold is found in quartz veins and related placer deposits, usually within the Valdez Group (Nelson and others 1984; Pflaker and others 1994). The 1964 Earthquake caused major subsidence in the northwestern portion of the Sound and uplifting in the eastern Sound and Copper River Delta.

Soils

Surficial deposits in the Prince William Sound area are dominantly coarse rubbly deposits associated with steep-sloped mountains with high percentage of bedrock exposures. Some glacio-fluvial deposits may also be present. In the Copper River Delta area, surficial deposits are outwash and valley-train deposits graded to glacier fronts and recent moraines; coastal delta deposits; older coastal deposits of inter-stratified alluvial and marine sediments, including, locally, glacial drift; and discontinuous alluvial deposits overlying dissected unconsolidated, semiconsolidated, and locally consolidated silt, sand, and gravel of Tertiary and younger age (Kalstrom and others 1964). Soils present in both areas are similar to those found in Southeast Alaska, young and generally consisting of thick layers of highly acidic, partially decomposed organics with low nutrient values. As in Southeast, these soils are not considered suitable for agriculture although small-scale gardening is reported.

Climate

Prince William Sound and the Copper River Delta experience a Maritime climate with relatively small temperature variations, high humidity, heavy precipitation, high cloud and fog frequencies, and strong, persistent surface winds (Hartman and Johnson 1984:60-61). Summers are relatively cool and winters are relatively warm. Weather records for Valdez document average summer high temperatures of 62 degrees Fahrenheit and lows of 47; winter highs average 26 degrees Fahrenheit, with lows averaging 15 degrees Fahrenheit (Weathernews Inc. 2001). Annual precipitation is 64 inches. Precipitation falls throughout the year.



Source:
Chugach National Forest, 1998

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Geology Including Fault Lines, Chugach National Forest

JOB NO.	USDA-USFS-001-0000	DRAWN	BHH	Figure 11
DATE	March 28, 2002	FILE	Fig11.dwg	

Flora and Fauna

Coastal rainforests in the Prince William Sound and Copper River Delta Coastal Western Hemlock-Sitka Spruce Forests ecoregion are similar to those found in Southeast. The rainforests are the northernmost extension of the North Pacific coastal rainforest (Lethcoe and Lethcoe 1998: 4). Trees found in this area include the western hemlock, mountain hemlock, Sitka spruce, Alaska cedar, black spruce, quaking aspen, balsam poplar, and black cottonwood (Alaska Geographic 1985). As in Southeast, the understory of these forests are also choked with a dense understory of alders, willows, small conifers, devils club, berry bushes, ferns, and mosses. As previously noted, areas within the Pacific Coastal Mountains ecoregion are often barren of vegetation (Gallant and others 1995).

Large terrestrial mammals include deer and black and brown bears and in some areas moose and mountain goats. River otters, mink, wolverines, and porcupines also are found throughout the Sound and Delta and hundreds of thousands of migrating birds pass through the Sound and Delta areas during the spring and fall. Marine mammals that inhabit the areas include harbor seals, Steller sea lions, sea otters, orca, humpback, minke and fin whales, and Dall and harbor porpoise. Other marine resources include rockfish, halibut, salmon, shrimp, dungeness and king crab, and a variety of clams and cockles.

Historic Population Centers

The entry of historic miners into Prince William Sound and the Copper River Delta was facilitated by the existence of trading posts initially established by the Russians, and American fishing villages and canneries as described in the following chapter. Prospectors entered the area initially in the 1880s.

KENAI PENINSULA AND TURNAGAIN ARM

Sources used to compile the following consideration of the environment of the Kenai Peninsula and Turnagain Arm include: Wahrhaftig 1965, Jansons and others 1984, Nelson and others 1984, Kalstrom and others 1964, Rieger and others 1979, Hartman and Johnson 1984, Viereck and Little 1972, Buzzell and McMahan 1986, Selkregg 1974, and Lutz 1955.

Physiography

The Kenai Peninsula is a study in topographic opposites. The Kenai Mountains dominate the northeastern peninsula, with ice fields lying to the south, and low-lying flats stretching toward Cook Inlet to the west. The Chugach National Forest extends only into the mountainous northeastern portion of the peninsula. The Kenai Peninsula's eastern coastline is jagged with numerous fjords. The northeastern coastline within the Chugach

National Forest forms a portion of Prince William Sound. The Turnagain Arm of Cook Inlet forms the Kenai Peninsula's northern border. The narrow, mountainous passage between Portage and Whittier, which separates the Kenai and Chugach mountain ranges, is the peninsula's only terrestrial connection to the Alaskan mainland. The Chugach Mountains border the northern shore of Turnagain Arm. The Kenai and Chugach mountains are part of the Pacific Border Ranges physiographic province, in turn a division of the Pacific Mountain System (Wahrhaftig 1965).

Streams that were the focus of placer mining dissect the Kenai Mountains. These include Canyon Creek, Resurrection Creek, Palmer Creek, Lynx Creek, Bear Creek, Mills Creek, Gulch Creek, Sixmile Creek, and Cooper Creek among others. North of Turnagain Arm, principal streams on the flanks of the Chugach Mountains within the forest are Crow Creek, Winner Creek, Kern Creek and the Twentymile River.

Geology

A single lithologic unit—the Chugach terrane Late Cretaceous Valdez Group—is dominant throughout the mountains of the peninsula and Turnagain Arm (refer to Figure 10). The mountains are composed of limestone, chert, and tuff overlying older volcanic and clastic rocks. Younger, possibly Tertiary age intrusives also are present and outcrop near Hope on the peninsula's northern coast. Mineral resources identified on the Kenai Peninsula include placer and lode gold, and base metals (silver and copper). Historic production on the Peninsula was from placer and lode gold deposits (Jansons and others 1984; Nelson and others 1984).

Soils

Surficial deposits in the Kenai Peninsula and Turnagain Arm area are dominantly coarse rubbly deposits associated with steep-sloped mountains with high percentage of bedrock exposures. Some outwash and valley-train deposits graded to glacier fronts and recent moraines may also be present. Higher terrace deposits on valley margins and discontinuous terrace deposits may be found in valleys with small flood plains (Kalstrom and others 1964). Bench deposits containing glacio-fluvial sediments along many of the streams on the peninsula and north of Turnagain Arm, and younger alluvial deposits along active stream channels in both locations have produced free gold. Lode gold deposits also are known in the Hope-Moose Pass area on the peninsula and near Girdwood north of Turnagain Arm. What little soils are present in the mountainous terrain are described as humic lithic cryorthods, well-drained, very gravelly soils on very steep hillsides (Rieger and others 1979).

Climate

The climate of the Kenai Peninsula and Turnagain Arm varies from Continental to Transitional to Maritime, with Continental conditions characterizing the interior Kenai Mountains (Hartman and Johnson 1984:60-61). Continental climatic conditions include great diurnal and annual temperature variations, low precipitation, low cloudiness, and low humidity. Surface winds are generally light. Transitional climates are characterized by somewhat higher precipitation and humidity. Temperature records for Anchorage to the north document moderate summers (with average highs and lows of 65 and 51 degrees Fahrenheit) to moderately severe winters (with average highs and lows of 21 and 8 degrees Fahrenheit). Precipitation in Anchorage averages 16 inches annually, with the highest numbers of rain or snow days occurring during July through October.

Flora and Fauna

Coastal spruce-hemlock forests blanket the lower mountain slopes; Alpine tundra occurs at higher elevations (Viereck and Little 1972). The forests are generally dense and comprised of Sitka spruce, western hemlock, other conifers, and black cottonwood. Well-drained slopes support stands of white spruce, paper birch, and quaking aspen with an understory of blueberry, roses, currents, high-bush cranberry, red raspberry, devil's club, and various herbaceous species; alder and willow are characteristic in disturbed areas (Buzzell and McMahan 1986:4). Open bogs occur sporadically surrounded by forest. Large mammals include black and brown bears, moose (which winter in the major valleys), mountain goats in the Kenai Mountains east of Sixmile Creek, and Dall sheep in the Chugach Mountains and in the Kenai Mountains east of Canyon Creek (Selkregg 1974). A variety of smaller animals also inhabit the area, and caribou are reported to have been present on the Kenai Peninsula as late as the first decade of the twentieth century (Lutz 1955). Various fish species are present in the mountain streams.

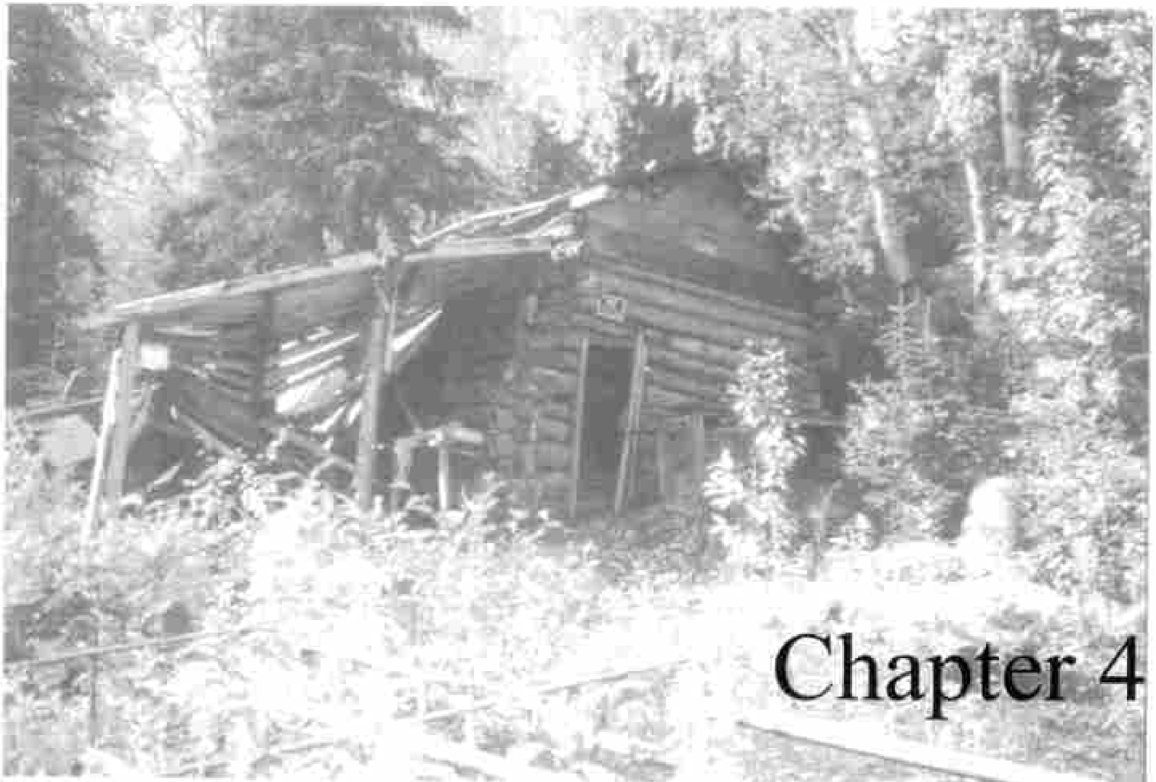
Historic Population Centers

Historic-era mining efforts on the Kenai Peninsula were initiated prior to the American period by the Russian-American Company in the early 1850s as discussed in the following chapter. These efforts were undertaken with the Russian fort known today as the town of Kenai as a base. American prospecting began in the 1880s, also using the town of Kenai as a staging area. Thereafter, in the late 1890s the boomtowns of Hope and Sunrise were established during the Turnagain Arm gold rush. The ice-free port of Seward, variously understood to have been established as early as 1895 or as late as 1902 according to Orth (1971:857), was the beginning of the Iditarod Trail, which was used to access a number of mines on the peninsula as well as the gold fields farther north in the Interior.

Page intentionally left blank.

Chapter 4

Historical Context



CHAPTER 4. HISTORICAL CONTEXT

"Much of the way Alaska is today can be traced to its minerals ... The search for them opened the land to settlements, some still thriving, others nothing but ruins in the grass. Humans took on audacious challenges against nature to reach these minerals, bridging rushing rivers, blasting rock walls, traversing glaciers, tunneling through frozen ground, trying the untried in a gamble for success." (Campbell 1995).

The aboriginal inhabitants of Alaska are known to have obtained nuggets of native copper, which were widely traded, from the Copper River Valley (Buzzell 2001a:12; de Laguna 1934:118). The use of gold nuggets for ornamentation is reported as well (Luciw and Luciw 1963 cited by Barry 1997:5). Various authors have speculated that aboriginal groups also may have employed smelting techniques to extract copper from sulfides, but archaeological evidence is lacking (Barry 1997:4-5). In any case, widespread mineral exploration and production did not get underway until the late 1800s after the United States purchase of Alaska from Russia in 1867. Thus, Alaska's contribution to the history of precious and base metal mining lagged behind efforts throughout the rest of the United States and must be understood in the context of those earlier events. This is true with respect to the sociological phenomenon termed "gold fever," as well as technological advances in the Lower 48 and, indeed, elsewhere in the world. While late in its inception, Alaskan mining history is not, however, unimportant.

Historic mining in the Eastern and Midwestern United States focused primarily on the exploitation of coal and iron deposits, with more restricted extraction of copper in Upper Michigan and lead and zinc in several Midwestern states (Francaviglia 1991:6-7). In the western United States, however, mineralogy dictated an emphasis on gold, silver and copper; and the success (or at least allure) of these mining ventures led to an interest in more northerly exploration, first into British Columbia and thereafter into Southeast when Alaska became a part of the United States.

The lure of precious metals was a major impetus to initial Spanish incursions into lands we know today as the Southwest. Throughout the 1700s, first Spanish, them Mexican gold seekers entered the territory; in 1736 a major silver strike was made in today's Sonora just south of the Arizona border (Keane and Rogge 1992). Keen interest in mineral exploration throughout the West continued throughout the first half of the 1800s and gold, silver and copper mines were established in the Rocky Mountain Region, the intermountain area to the west, and in California (Francaviglia 1991:6). In 1848, the country witnessed the beginning of the Great California Gold Rush, with Forty-Niners stampeding west the following season. The Comstoke Lode was discovered 10 years later in Nevada, sparking the Nevada Silver Rush. Copper mining too was being vigorously pursued throughout the West, with major copper production underway in Arizona, for example, by the 1880s.

This review begins with an explanation of pertinent mining law and a very brief consideration of the salient aspects of Alaskan mining history writ large. Thereafter the history of mining in Southeast, Prince William Sound and the Copper River Delta, and the Kenai Peninsula and Turnagain Arm is related. Alaska's mining history is dominated by the search for, and exploitation of gold and copper deposits. Silver, lead, zinc, palladium and tungsten also were sought or recovered as by-products of gold and copper mining enterprises. Historic events and activities are emphasized in this chapter along with historic production records. Gold and silver production is typically described using Troy ounces. Copper production is characterized in terms of Troy pounds of extracted metal and ore tonnage. Some descriptive information on the constituent elements of individual mines is included here. A glossary of mining terminology is provided in Appendix B and a review of mining technology is presented in Chapter 5.

MINING LAW

With the exception of minor Russian exploration on the Kenai Peninsula and prospecting near Sitka and on the Kasaan Peninsula in Southeast, Alaskan mining efforts did not get underway until after passage of the General Mining Act of 1872 (30 USC 21 *et seq.*). However, the authority of that law was not extended to Alaska until 1885 by order of the Secretary of the Interior (Purington 1905:257 cited by Saleeby 2000:5). Thus it is important to understand that prior to 1885, mining claims were held by common consent and squatter's title. Thereafter, Alaskan miners were governed by the same basic statutory requirements that governed the rest of the nation. The following discussion, which is confined to considerations that affect the exploitation of locatable minerals, follows Saleeby (2000:2-5) and United States Department of the Interior Bureau of Land Management (BLM) (1996).

The Mining Law of 1872, as it is usually known, has been revised and amended several times since its passage over a century and a quarter ago, but its basic precepts have not been altered. An excellent source for all aspects of mining law is Maley (1996). The law entitles prospectors (citizens or individuals planning to become citizens, and corporations) to search for valuable minerals on public land, and to stake a claim when such a discovery is made. A "mining claim" is "a particular parcel of Federal land ... for which an individual has asserted a right of possession. The right is restricted to the extraction and development of a mineral deposit" (BLM 1996:7). Title to the parcel in question continues to be held by the Federal government unless the claim is subsequently patented.

The law distinguishes between placer and lode claims along with two other types of mineral entry: mill sites and tunnel sites. Lode claims are staked along the length of a vein or other zone of mineralized rock and cannot be larger than 600 by 1500 feet (about 20 acres). Locations are described by metes and bounds surveys. Placer claims are staked parallel to the targeted alluvial deposit, that is, typically parallel to a creek bed, and also encompass 20 acres. They are located by legal subdivision where possible (described in terms of Township, Range, and Section subdivision). An individual locator may stake a single, 20-acre placer claim. But an association of two locators may locate 40 acres; three locators may locate 60 acres and so forth, up to a total of 160 acres. In Alaska, however, association placer claims have been limited to 40 acres since 1939 when the territorial legislature passed a State law to that effect. When researching claims, it is well to remember that erroneous locational information in the records must be expected. It is the actual staked location of a claim on the ground to which a claimant had rights of possession (personal communication, Carol Huber 2001). As mentioned earlier, it is also quite common for the names of claims to be distinct from that of the mines developed on them.

Mill sites must be located on non-mineral land and are intended for support facilities. They are located by metes and bounds survey and cannot be larger than 5 acres. Tunnel sites are used for exploration where a mineral deposit is suspected but has not been demonstrated to exist. They may be 3,000 feet long and lode claims may be staked perpendicular to the tunnel and on either side of it.

Today, a prospector may locate as many individual claims as he or she wishes. Prior to 1923, however, this was not the case. Then individuals were allowed to stake just a single claim on any given vein or placer creek. To circumvent this restriction (especially during a gold rush), sometimes prospectors would obtain power of attorney for other individuals and claim large areas to keep other gold seekers out. This practice was outlawed in 1912. After that, the only way to consolidate a number of claims was to acquire patents, that is, purchase the land from the Federal government. In order to retain an unpatented claim, it was (and is) necessary to do a minimal amount ($100 worth) of assessment work (or improvements at mill sites, for example) annually. This requirement resulted in the excavation of myriad pits and trenches in some cases, and fraudulent claims of work in others. Today miners also must pay an annual $100 maintenance fee per claim to the BLM, or they must obtain a small miner's waiver.

It should be obvious from this discussion that the history of claim ownership can be complex. Claims were staked, sold, traded, in some cases divided, abandoned, restaked, patented and so forth. Thus mining history is replete with stories of the intertwined business affairs initially of individual fortune seekers, but eventually also of small mining companies, and then industrial conglomerates.

Production figures are derived from a variety of sources including commonly available literature, company files, files at the Technical Data Section of the USGS at Menlo Park, California, records of the Assay Office of the U.S. Mint at Seattle, Washington, and the BOM's (now BLM's) MAS/MILS files in Juneau, Alaska as described by Jansons and others (1984:5-6). "Recorded" production figures can generally be independently verified using records maintained by smelters and refineries, or the reports of publicly traded companies, which are subject to audit. Mines on private or state lands also may be subject to royalty payment requirements based on production figures. Aside from publicly traded companies, however, production reporting from mines on federally administered lands is strictly voluntary. "Reported" production figures are less reliable than "recorded" figures, and may be either too high or too low dependent on the "spin" desired by the reporter. Nonetheless, "reported" production figures are generally regarded as reasonably reliable because vastly inflated or deflated numbers were generally discovered eventually and not included in the summaries upon which this historic context relied.

Production figures for lode exploitation typically are reported for individual mines, or sometimes for an aggregate of several mines that were exploited by a single operator. Placer mining production figures, in contrast, are reported by streams, combinations of streams, or portions thereof. The reason for this is a function of the mining mentality. Placer miners tended to be small, individual operators less interested in attracting investors than in working their own claims and keeping their earnings and claim locations to themselves. In order to convince placer miners to (voluntarily) provide production figures, they are promised that the earnings from a specific claim will be kept confidential (Marti Miller, USGS, personal communication 2001). Thus placer production figures are reported as aggregated sums from a given stream or stream system.

A BRIEF CONSIDERATION OF ALASKAN MINING HISTORY

Like the Lower 48, the Alaska Territory also experienced numerous "boom and bust" cycles as fortune seekers "rushed" from one gold discovery to the next and as technological advances and global fluctuations in the prices of precious and base metals affected the mining industry. Prospectors searching for gold were present in Southeast, Prince William Sound and the Copper River Delta, and the Kenai Peninsula and Turnagain Arm prior to that most famous of gold stampedes, the Klondike Gold Rush of 1896-98, in which Alaskan and Canadian history is inextricably intertwined. The following discussions typically are organized by commodity, especially gold and copper. The reader should be aware, however, that mineral deposits are often complex. Copper mines often also produce gold and silver, and gold mines typically also produce silver. Lead and other metals also can be by-products of gold mining.

Gold Rushes

The very first reported gold discovery in what would become Alaska occurred in 1850-1851 on the Kenai Peninsula when placer gold was found by Peter Doroshin, an employee of the Russian-American Company (Johnson 1915 cited by Buzzell 1998:3). Some years later, in 1866 a construction crew reported a gold discovery on the Seward Peninsula in northwestern Alaska (*ibid.*). Neither of these discoveries received any immediate follow-up. American gold seekers ventured into the Sitka area in the 1860s (Campbell 1995:35) and began to stake claims by the early 1870s (Bittenbender and others 1999). Also, in the 1870s a larger influx of prospectors drawn northward by the Cassiar gold strike of 1873 in British Columbia, ventured into Southeastern Alaska and found gold deposits at Sumdum and Windham bays. Soon thereafter, the first Alaskan gold rush ensued, resulting in discoveries that eventually led to major commercial developments within the Juneau Gold Belt (for example, Stone and Stone 1980). The deposits were world class in nature and attracted attention for over 30 years.

Gold seekers were active elsewhere in Alaska and neighboring Canada as well, shortly after the United States acquisition of Alaska. Three prospectors from British Columbia (Arthur Harper, "Jack" McQuesten, and Al Mayo) set out for the Yukon Territory in

1873. Harper prospected on the Fortymile, Sixtymile, Tanana and Klondike rivers while his two compatriots established the first trading post on the Yukon River at Fort Reliance and also began operating a steamboat on the river (Emanuel 1997:41). A second riverboat began operating in 1879. Gold seekers from Southeast also sought entry to the Interior overland beginning in 1880 and making use of the Chilkoot Trail. By 1886, some 200 prospectors had entered the Yukon Territory, and by the following year, the Fortymile stampede was underway (*ibid*: 45). In 1893, the first rich strike in the Alaskan Interior occurred at Birch Creek; the boomtown of Circle sprang up nearby and by 1896 had a population of over one thousand along with all the accoutrements of a "roaring American Wild West town" (*ibid*:47). This stood in sharp contrast to the well-governed, law-abiding settlements in the Canadian Yukon Territory (Berton 1972).

Then in 1896-1897, Turnagain Arm and the Kenai Peninsula experienced a gold rush that resulted from discoveries beginning in the late 1880s (for example, Barry 1997; Buzzell in press). This little appreciated rush actually preceded the Klondike Gold Rush and is described more fully under the history of mining on the Kenai Peninsula.

The Klondike River is in Canada, but the history of the Klondike Gold Rush, among the world's most famous rushes, is directly related to Alaskan mining history. The Klondike Gold Rush was spurred by the discovery of gold along a tributary of the Klondike River on August 16, 1896 by George Carmack and his partners Dawson Charley and Skookum Jim Mason. The stampede to the Klondike took place during 1897-1898, with would-be miners struggling over the coastal mountains through the Chilkoot and White passes from Skagway or over the glaciers off Prince William Sound from Valdez or by boat up the Yukon River from the Bering Sea (for example, Emanuel 1997; Campbell 1995). Within the next five years, additional strikes and stampedes to Nome, the Tanana Valley, the Yetna River, the Innoko River, Otter Creek (a tributary of the Iditarod River) and elsewhere scattered would-be gold seekers throughout much of Alaska. By 1911, the Iditarod Trail, which stretched from the ice-free port in Seward on the Kenai Peninsula to the boomtown of Iditarod, had been improved with funds appropriated by Congress. Local stampedes in other parts of Alaska continued into the 1920s (Emanuel 1997).

Copper Production

In 1867, the Copper Queen claim was staked on Prince of Wales Island by Charles Baranovich. This claim is generally understood as the first lode claim (for any mineral) to be staked in Alaska (Maas and others 1995:17). Mass and others (1995:51) explain that, "Nearly 30 years passed before more discoveries were made as copper demand was met by the vast Lake Superior deposits and local prospectors were more interested in satisfying gold-fever in the world-class Juneau Gold Belt to the north." Serious copper production was not pursued in Southeast until the beginning of the twentieth century when commercial copper mines were in production on Prince of Wales Island. By 1908, however, copper production had shifted to Prince William Sound. During the early decades of the twentieth century, the Alaska Territory was among the nation's top-ten copper producers. Copper commanded higher prices than any other mineral between

1916 and 1920 (Campbell 1995:52). In 1918, the Beatson Mine on Latouche Island was the territory's largest copper mine (*ibid*).

Unquestionably, however, Alaska's most famous copper mines are the Kennecott complex in the Wrangell Mountains (a National Historic Landmark today). The Kennecott mines operated from 1911 to 1938 producing some of the world's richest copper ore. They were owned by the Guggenheims and financed, in part, by the international banker, J.P. Morgan. The ore was transported from the mining complex to Cordova on the Copper River & Northwestern Railway, then shipped to Seattle where the Guggenheims owned smelting facilities (*ibid*:53). In terms of production, copper mines in Southeast and Prince William Sound paled in comparison to the Kennecott complex, which produced more than a billion pounds of copper, worth an estimated 200 to 300 million dollars (Saleeby 2000:316).

Alaskan Conditions

Alaskan miners faced and attempted to overcome a variety of adverse conditions not necessarily shared by their contemporaries in the Lower 48. Saleeby (2001) discusses the 10 most critical: a short season in which to work, lack of appropriate stream gradients, poor water supply, few timber resources, high labor and transportation costs, gold that occurred in lode rather than placer deposits, thick overburden, frozen or half frozen ground, lack of roads and trails, and inadequate regulations. Some of these conditions apply principally to the Interior and were less of an issue in regions that would be incorporated into the Chugach and Tongass National Parks.

At least in Southeast and Prince William Sound and the Copper River Delta, mining was often conducted year round. Stream gradients and water supplies in the Forests tended to be adequate for power production and the exploitation of placer deposits where they occurred. Nor was lack of timber a problem. High labor and transportation costs definitely were an issue, however. Except on the Kenai Peninsula, lode gold production (a considerably more complex endeavor than placer mining) outweighed the exploitation of placer deposits throughout the Forests. In some cases, production was further complicated by the existence of extremely low-grade ore. Thick overburden was definitely problematic on the Kenai Peninsula where frozen stream gravels also impeded placer mining efforts for a good part of the year.

Lack of roads was less an issue in Southeast and Prince William Sound where mines and mills tended to be situated near tidewater and most transport was by water. But trail development did play an important part in the history of mining on the Kenai Peninsula and Turnagain Arm. Inadequate regulations were endemic throughout Alaska, in part the result of inattention and neglect on the part of the American government especially during the first three decades after the territory had been purchased from Russia (Emanuel 1997:7).

SOUTHEAST

1804 (old Sitka in 1799 -1802)

Russians entered Southeast in the late sixteenth century and founded Sitka (which they called Novo Arkhangelsk or New Archangel) in 1797. They retained tenure until 1867 when the United States purchased the Alaskan territory. In 1840, Sitka was a city of 2,000 inhabitants and boasted an industrial forge, shipwrights, a scientific station, and a cathedral (City and Borough of Sitka 2001). The settlement was an important waystation for American traders and whalers. It was the mining and fishing industries that developed under American stewardship, however, which seriously prompted non-Native settlement and development throughout Southeast.

Mineral exploration and extraction were vital aspects of Southeast's development from the 1880s until World War II. Exploration began again in the 1950s and picked up considerably in the 1970s and 1980s (Roppel 1991). Aside from the search for uranium and development of Alaska's only uranium mine in the 1950s, these recent efforts are not considered here. The following discussion is organized by geographically defined mining districts and areas (regions) used by the BOM and BLM that pertain to the Tongass National Forest. These include portions of the Juneau Mining District, The Tracy Arm-Fords Terror Wilderness / Windham Bay Area, the Chichagof and Baranof Islands Area, the Stikine Area, and the Ketchikan Mining District (refer to Figure 10 in Chapter 3). (Refer to Chapter 1 for an explanation of the distinction between mining districts established by groups of miners and those defined by economic geologists and minerals specialists.)

Gold mining is discussed first, followed by a consideration of copper and other metals (palladium, lead, zinc and uranium). Claims have been staked and explored for deposits of iron, antimony, molybdenum, beryllium, thorium, rare earth metals, and chromite as well (Roppel 1991), but there has been no production and most of these exploratory activities are too recent to be considered here.

Juneau Mining District

The following history is adapted principally from Campbell (1995), Redman and others (1989), Stone and Stone (1980), and BOM (1989). The Juneau Mining District is comprised of five subareas: the Juneau Gold Belt subarea, the West Lynn Canal subarea, the Coast Range subarea, and two subareas beyond the borders of the Tongass National Forest (Glacier Bay and Haines-Klukwan-Porcupine subareas).

The Juneau Gold Belt subarea brackets present-day Juneau, stretching for 125 miles from just north of Windham Bay to Berners Bay. Productive mines in the Juneau Gold Belt subarea are called out on Figure 12. Placer gold was initially discovered immediately south of the Juneau Gold Belt subarea (as currently defined) in the 1870s in Windham Bay and Sumdum Bay. Eventually miners organized six mining districts: Berners Bay, Eagle River, Auke Bay, Gold Creek, Douglas Island, and Windham Bay. Gold Creek and Douglas Island were by far the most developed. Over a span of 64 years, these two areas witnessed expansion and development from early placer mining efforts to increasingly sophisticated lode gold production.

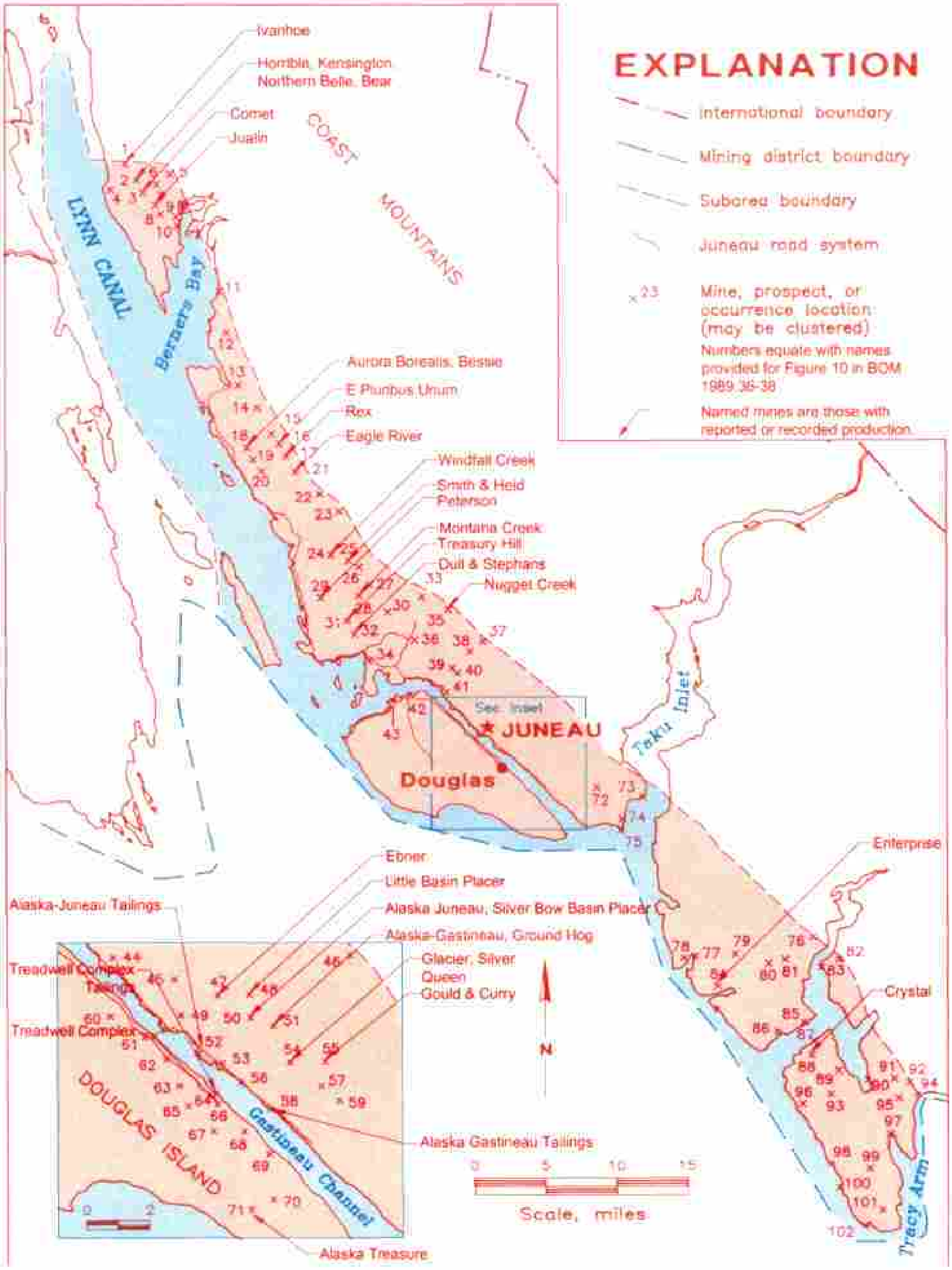
Placer gold was discovered by Joseph Juneau and Richard Harris with the help of local Natives in the Silver Bow Basin along Gold Creek, which flows through present day Juneau, in 1880. The preceding year, the naturalist John Muir had noted promising mineralization in Gastineau Channel. He brought this to the attention of a Sitka mining engineer, George Pilz, who in turn offered payment for ore. He received a positive response from a Tlingit leader named Kawa.ée (the currently preferred spelling) and grubstaked Juneau and Harris. This discovery sparked Alaska's initial gold rush and extensive placer mining ensued, quickly followed by lode gold discovery and production. On Douglas Island across Gastineau Channel from Juneau, the Treadwell complex of four mines were "world-class" underground mines as were the Alaska-Gastineau (or Perseverance) and the Alaska-Juneau (A-J) on the mainland. These mines successfully exploited very low-grade gold deposits by adopting and developing technology and the necessary organizational structure to process huge volumes of ore.

Juneau was the "lode gold capital of the world" in the early decades of the twentieth century (Stone and Stone 1980). Widely known and hugely powerful financiers, promoters and engineers were involved in Juneau's mining industry. These men included the Rothchilds, Bernard Baruch, Thomas Mein, F.W. Bradley and Bart Thane. Together, the Treadwell complex, Alaska Gastineau, and A-J are reported to have produced $158,000,000 in gold.

Although the initial gold production from the Juneau Gold Belt came from placer mines, they were quickly superceded by lode gold production. The first stamp mills were erected at the Treadwell mine by 1882 (Redman and others 1989:D-3). The entire Treadwell complex was in operation by 1887 and reached peak productivity in 1915. Three of the four mines (the Treadwell, 700 Foot, and Mexican) that made up the complex were closed after a disastrous cave-in followed by flooding in 1917. The forth mine, the Ready Bullion, remained in production until 1922 at which point it was essentially played out.

According to Campbell (1995:46), during its 35-year production history, the Treadwell complex "produced more than 3 million ounces [actually 3.2 million ounces] of gold from 28.8 million tons of ore, employing some 2,000 miners in three shifts almost every day of the year." Ore from the Treadwell mines averaged just 0.13 ounces per ton of gold (Redman and others 1989:D-3).

Mining efforts at the Treadwell complex began with the development of an open pit, which operated from the early 1880s to 1906 and resulted eventually in the excavation of an enormous glory hole and thereafter, hugely complicated and extensive underground workings. The Treadwell complex and similar complexes developed to support the Alaska Gastineau and A-J mines contained a wide array of ancillary facilities including ever more sophisticated processing equipment in consideration of the extremely low-grade ore. Above ground aspects of the workings themselves included tunnels, adits and shafts, headframes, and so forth. In addition, however, support facilities included power



Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Productive Mines in the Juneau Gold Belt Subarea

JOB NO:	USDA-USFS-001-0000	DRAWN:	RHH
DATE:	December 11, 2001	FILE:	Fig12.dwg

Figure 12

Base Map Source:
Mineral Investigations in the Juneau Mining District, Alaska, 1984 - 1988
US Department of the Interior, Bureau of Mines 1989

houses, a dam (which still serves Juneau's power requirements), mills, fuel tanks, cyanide tanks, flumes, railroads and trestles, wharfs, warehouses, compressor housings, machine shops, superintendents' offices, assay offices, machine shops, woodworking shops, and various residential and commercial establishments like shops, offices, boarding houses, bunkhouses, a natatorium, schools, cabins and cottages, and dining halls.

The eventual demise of the Treadwell complex was noted above. The Alaska Gastineau, which was under the supervision of the highly regarded mining engineer Bart Thane, ultimately failed financially due to a combination of circumstances including a labor shortage during the First World War, problems with massive caving within the underground workings, and ultimately the extremely low-grade of the ore. Nonetheless, the Alaska Gastineau was a "successful failure" according to Stone and Stone (1980), because of the highly innovative advances in organization, engineering, and economical production developed and explored by Bart Thane and his staff as they struggled to make the mine profitable. Ball mills that were actually patterned after those being used to process porphyry copper deposits in the American Southwest were employed, for example (Redman and others 1989:D-4), a "first" for Alaska, and just one of many "firsts" pioneered at the Alaska Gastineau. The Alaska Gastineau closed in 1921, but the A-J benefited greatly from "the great experiment" and what had been learned across the channel at the Treadwell complex, and also employed the ball mill technique.

The A-J, which was created by consolidating a number of individual holdings in the vicinity of Gold Creek, was operated initially from 1897 to 1910 (BOM 1989:7). Then the company began excavation of the Gold Creek Adit and four years later had a mill in operation, but was struggling financially. In 1924 the mine was processing 13,000 tons of ore daily during peak production (Campbell 1995:47). Much of present-day Juneau is constructed on fill produced by the A-J, which closed for good in 1944 because of labor shortages and the high cost of labor occasioned by World War II. The A-J was Alaska's largest single-mine lode producer (*ibid.*), with total production exceeding 2.9 million ounces of gold (BOM 1989:41).

The A-J was established initially in Silver Bow Basin in 1897. F.W. Bradley came on board to supervise and direct operations in 1900; Bradley had previously been with the Treadwell Mining Company. He confronted and eventually overcame a variety of technical and economic problems until 1928 when the A-J could honestly be said to turn a profit. In the 1930s, the A-J experienced a favorable chain of events. An ore body considerably richer than the less deeply buried deposits was discovered at 1,000 feet below the surface and gold prices were increased from $20.67 per ounce to $35 per ounce by President Roosevelt in his efforts to combat the Great Depression. In 1934, the A-J's owners acquired the Alaska Gastineau Mine and support facilities including the massive hydroelectric facilities. The mining camp in Jualpa Basin along Gold Creek (now the Juneau Mining Museum) housed miners employed at the A-J.

Peak production at the A-J was achieved in the late 1930s. The last profitable year was 1941. Many employees left to join the war effort eventually or to take advantage of higher wages elsewhere. The A-J was judged to be an exception, and not closed by

Limitation Order L208 issued by the War Production Board, which mandated closure of major gold mines (Campbell 1995:47). The A-J was excepted because its lead production was judged to be essential to the war effort, and also because it was recognized as Juneau's major economic mainstay. Nonetheless, the A-J closed for good in 1944 because of increasing financial difficulties; its owners did, however, continue to sell hydroelectric power to the City and Borough of Juneau. The mine is estimated to still contain 28,903,000 tons of measured gold reserves with a grade of 0.04 ounces/ton and 100,000,000 tons of geologically inferred ore with a similar grade (Redman and others 1989:D-23).

Stone and Stone (1980:71) conclude their Juneau area mining history by noting that all told, the A-J's miners extracted almost 90 million tons of ore (and waste rock), which generated $80,000,000 in gold. They state, "No other company has ever mined ore so low in grade, so long, underground, and made it pay." They also describe the gradual degradation of the A-J and its support facilities since its abandonment.

Stone and Stone (1980) indicate that there were hundreds of small mining operations in the Juneau area, and very briefly describe 25 of them, which they characterize as "serious and substantial enterprise[s]" based on the presence of milling equipment, in the Juneau Gold Belt. These and other small mines were subsequently researched as part of the BOM's investigation of mineral resource potential throughout the Juneau Mining District in the mid 1980s. Redman and others (1989:D-3) report that the heyday for the smaller Juneau area mines coincided with the time of greatest production at the Treadwell complex, 1890 to 1915. Important among the smaller enterprises were the Comet, Jualin, Silver Queen, and Eagle River Mines (*ibid.*). The Ebner Mine and the Silver Bow Basin placer operations also were among the important smaller enterprises (BOM 1989:40-42).

BOM (1989:7) summarized Juneau Mining District production history thus: "Mines in the [Juneau Mining District] have produced more than 6.7 million ounces of gold, 3.1 silver, and 45 million pounds of lead. The vast bulk of this production came from the Treadwell and Alaska Juneau mines, both of which were the largest and lowest-grade gold mines in the world when they were active." Next in importance was the Alaska Gastineau (Perseverance), which produced 500,900 ounces of gold, 482,279 ounces of silver, and 4.8 million ounces of lead (BOM 1989:40-42). The remaining 99,100 ounces of gold were produced by numerous smaller mining operations scattered throughout five subareas: the Juneau Gold Belt subarea; the West Lynn Canal subarea; the Coast Range subarea; and the Haines-Klukwan-Porcupine and Glacier Bay subareas, which are not within the National Forest. Figure 13 illustrates the locations of productive mines in the West Lynn Canal and Coast Range subareas along with additional mines located in several of the regions discussed below. Lode gold production throughout the Juneau Mining District is summarized in Figure 14 and production records for individual mines are provided on Table 2.

It may be instructive here to compare gold production from the Juneau Mining District, by far the most important gold production area in Southeast, with gold production elsewhere in Alaska to provide some perspective (refer also to Figure 4 in Chapter 1).

Emanuel (1997) summarizes Alaska gold production up until 1997 thus. The Fairbanks District has produced over 8 million ounces, which amounts to one-quarter of the State's gold production. Only the Klondike's total is higher. The Juneau District is second behind Fairbanks in production at about 7 million ounces. The Nome District produced 4 million ounces of gold. Production figures for other important gold mining districts in Alaska demonstrate that less than 8 million ounces were produced in an aggregate total by the Circle, Fortymile, Innoko, Iditarod, Council and Solomon, Chichagof, Livengood, Willow-Hatcher Pass, Valdez (Prince William Sound), and Kenai Peninsula (Hope-Sunrise-Seward) districts. Thus there is no question that the Juneau Mining District and especially the Juneau Gold Belt were significant mining areas. The Treadwell complex, Alaska Gastineau and A-J were world famous, and justly so, for their innovative exploitation of exceedingly low-grade gold deposits.

Several additional technological innovations from the Juneau Gold Belt are worth mentioning. The Jualin Mine was the first Alaskan mine to benefit from installation and use of a diesel engine. This important piece of equipment is still in place (David Stone, personal communication, 2001). The Kensington Mine was the site of the first locomotive ever to be used in Alaska; this structure, however, is now in Juneau (Ken Maas, personal communication, 2001).

A single productive mine is reported from the Coast Range subarea by the BOM (1989). This is the Inspiration silver mine, which produced a total of 54.9 ounces of silver. Two producers are reported by the BOM (1989) from the West Lynn Canal subarea: the Alaska Endicott Mine, which produced 48 ounces of gold and 20 ounces of silver between 1915 and 1925, and the Howard Bay Prospect, which produced 0.49 ounces of gold and 308 ounces of silver prior to 1921.

Roppel (1991) mentions a copper mine in the William Henry Bay area of the West Lynn Canal subarea, but characterizes it as too small to be able to ship ore at a profit, even with the installation of a flotation mill in 1918. Apparently, this was the Alaska Endicott (Ken Maas, personal communication, 2002). The A-J was Alaska's major lead producer from the 1920s to the 1940s (Roppel 1991). Lead was produced as a by-product from concentrates generated by the flotation mill. A production rate of 900 tons annually was typical although by 1943, one year prior to the A-J's closure, lead production had dropped to 200 tons per year. In total, the A-J produced 40 million pounds of lead (Redman and others 1989:D-4).

Tracy Arm-Fords Terror Wilderness / Windham Bay Area

Minerals specialists are inconsistent in their consideration of this area. Redman and others (1989) tabulate three productive mines— the Sumdum Chief, Redwing and Marty mines—from Windham Bay in their treatment of the Juneau Goldbelt subarea as shown in Table 2, but the mines are not included in their discussions, nor could they be shown on Figure 12 because it does not extend far enough south. Therefore, it seemed best to briefly address this as a separate region. The following discussion is abstracted from

Table 2
Production Records from the Juneau Gold Belt and Windham Bay Area (1880-1954)

Mine	Years Active	Gold (oz)	Silver (oz)	Lead (lb)
Juneau Area				
Alaska Juneau	1880-1944	2.9M	1.9M	40.0M
Perseverance [Alaska Gastineau]	1886-1921	500,900	482,279	4.8M
Ebner	1888-1907	32,000	987	
Silver Bow Basin placer	1889-1912	26,000	577	
Little Basin placer	Pre-1900	2,400		
Ground Hog	1892-1895	150		
Glacier/Silver Queen	1888-1906	$500,000 combined gold and silver		
Gould & Curry	1895	1,250		
Alaska Juneau tailings	1948-1954, 1981-83	7,106	1,663	2,800
Alaska Gastineau tailings	1937-1948	1,105	273	
Alaska Treasure	1906, 1909, 1915-16	532		
Treadwell complex	1881-1921	3.2M	181,301	
Treadwell complex tailings	1922-1949	312	12	
Berners Bay Area				
Ivanhoe	1898-1903	340		
Horrible	1896-1900, 1912	<75		
Kensington	1897-1900	2,600		
Northern Belle	1896-1897	940		
Bear	1891-1897	800		
Comet	1893-1900	22,485		
Jualin	1896-1919, 1928	37,913	12,640	
Eagle River Area				
E Pluribus Unum	1904-1909, 1935-1940	154	34	100
Aurora Borealis	1895	150		
Bessie	1902-1903	150		
Rex	1904	145		
Eagle River	1902-1915	19,451	8,865	
Windfall Creek	1903-1908	249		
Smith & Heid	1897-1904, 1933-1934	205		
Montana Creek	1882-1936	46		
Peterson	1903-1922	211	8	
Treasury Hill	1908-1909	302		
Dull & Stephens	1908-1909	32		
Nugget Creek	1900	20		
Port Snettisham-Windham Bay Areas				
Enterprise	1906-1916	100		

Mine	Years Active	Gold (oz)	Silver (oz)	Lead (lb)
Crystal	1899-1909	3,441	204	
Sumdum Chief*	1890-1903	24,000	24,000	
Redwing*	1897, 1901-02	3,000		
Marty*	1925-1927	55		
Totals		**6.8M**	**2.7M**	**45.6M**
M = million				
Source: Redman and others 1989; BOM 1989				

* Located south of the Juneau Gold Belt in the Windham Bay area.

Kimball and others, which is a chapter in Brew and others (1984:105-210). Productive Mines in this area are depicted on Figure 13. Historic mining in this area concentrated along the coastline in the vicinity of Windham Bay and Spruce Creek, which empties into the bay from the east, on the Endicott Peninsula, and in the vicinity of Powers Creek, which drains the slopes of Sumdum Mountain on the opposite (northeastern) side of the Endicott Arm. Two historic mining camps—Sumdum and Windham—were established during the historic mining era; both are located on the Endicott Peninsula. Kimball and others (1984:153 citing Spencer 1906) report that placer gold was discovered near Windham Bay in 1869, probably on Spruce Creek. By the late 1800s, several placer mining plants were in operation along Spruce Creek basins; sporadic placer operations continued into the 1950s. In combination Spruce Creek and Powers Creek are reported by Spencer (1906 cited by Kimball and others 1984:113) to have produced nearly 2,000 ounces of placer gold by 1871; subsequent placer production is not reported.

Since 1880, well over 600 mining claims have been located in the Tracy Arm-Fords Terror Wilderness / Windham Bay area according to records in the Juneau recording precinct examined by Kimball and others (1984:115). Most were located prior to the 1930s, and at least 90 percent were lode claims. Total production from the entire Tracy Arm-Fords Terror Wilderness / Windham Bay area is estimated at about 27,000 to 28,000 ounces of gold (Kimball and others 1984:113). The Sumdum Chief Mine accounted for the bulk of this production with 24,000 ounces of gold along with an equal quantity of silver reported (Redman and others 1989). The Sumdum Chief Mine, which is situated south of Sanford Cove, was located in 1890 and operated until 1903. The mining camp of Sumdum, located near the Sumdum Chief Mine and named for Sumdum Glacier, was in existence at least by 1890 when it had a population of 42 (Orth 1971:927). A post office was maintained intermittently between 1897 and 1942 (Ricks 1965:62).

Other productive mines in the area clustered in the vicinity of Windham Bay. Redman and others (1989) report that the Redwing (or Red Wing) Mine, located in 1897 and operated from 1901 to 1902, produced 3,000 ounces of gold; and the nearby Marty Mine (1925-1927) produced 55 ounces of gold. Kimball and other (1984:113 citing Willis 1926) also report production of 50 ounces of gold at the Jensen Mine, which is located just south of the Redwing and Marty Mines. Kimball and others (1984:113) comment that in addition to the mill at the Sumdum Chief Mine, at least five other mills (none of which apparently operated for more than a year or two) were constructed in the area. A Chilean mill at the Jenson Mine is the only one of its kind in Southeast (Ken Maas, personal communication, 2001). The mining camp of Windham, which is located on Spruce Creek at the head of Windham Bay, was established around 1900 in response to an upsurge in placer mining along Spruce Creek. A post office was maintained in Windham from 1903 to 1956 (Ricks 1965:71). Orth (1971:1052) reported that the population of Windham in 1940 was 20.

Chichagof and Baranof Islands Area

The following discussion is abstracted from Bittenbender and others (1999). Like the Juneau Mining District and Tracy Arm-Fords Terror Wilderness / Windham Bay area, just a handful of mines account for the bulk of gold production from the Chichagof and Baranof Islands area, which comprises over 2.5 million acres (3,906 square miles). Together, the historic Chichagof and Hirst-Chichagof mines produced 791,000 ounces of gold and 228,000 ounces of silver between 1906 and 1943. Both mines are located on the west side of Chichagof Island. A summary of mine production in the Chichagof and Baranof Islands Area is provided in Table 3. Refer to Figure 13 for the locations of productive mines.

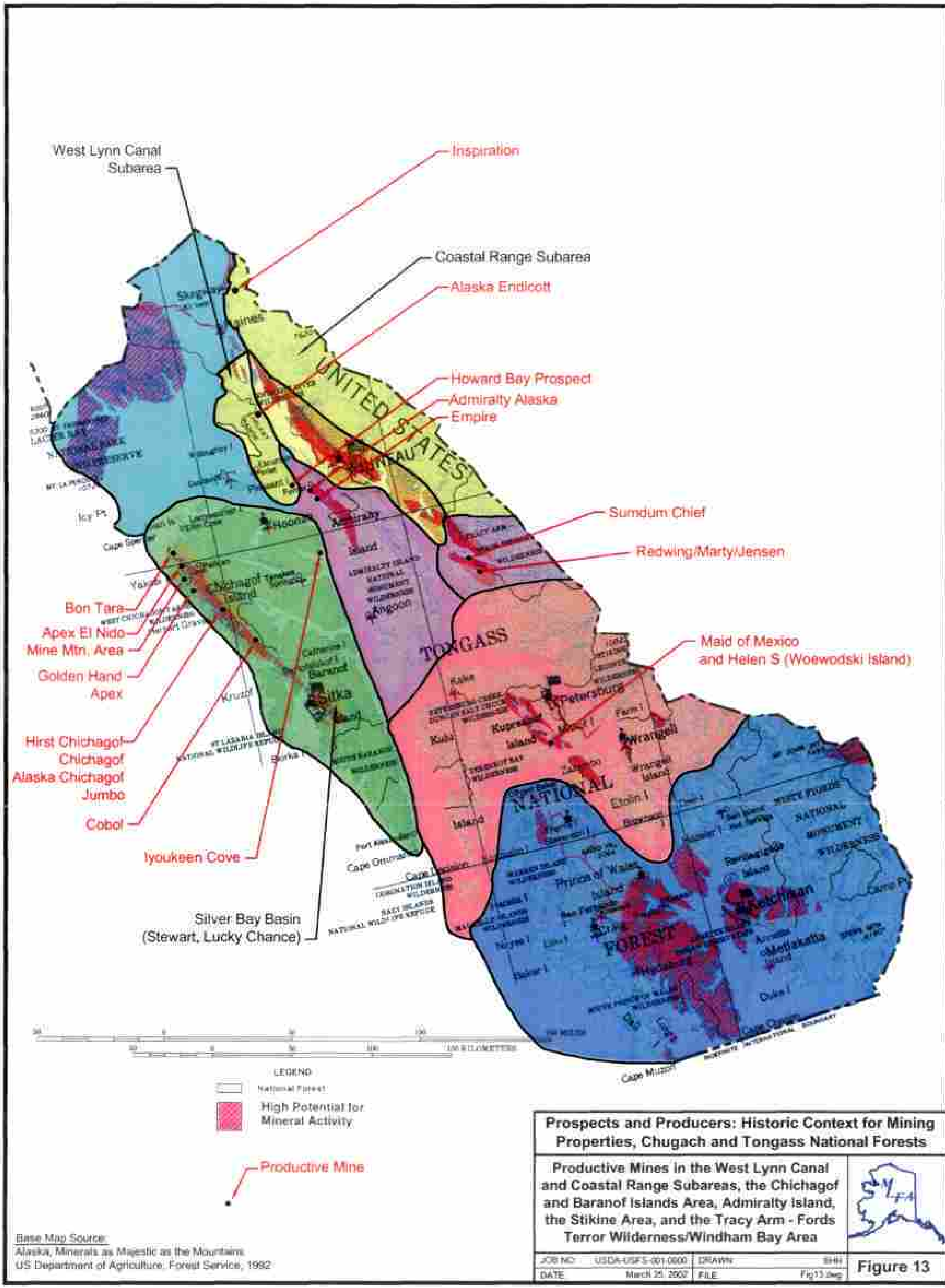
The Silver Bay and Indian River basins east of Sitka witnessed the earliest mining activity in the region in 1871, with additional discoveries in Silver Bay at the Stewart property southeast of Sitka the following year (DeArmond 1997, Knopf 1912). The Stewart Mine was the first lode *gold* mine in Alaska (Bittenbender and others 1999:47 citing the Alaska Yukon Mining Journal, 1901). By 1879 two stamp mills had been constructed in the area, one on the Stewart property and another at the nearby Lucky Chance Mine (Knopf 1912, Roehm 1940). Arrastras also may have been used according to DeArmond (1997). These early efforts were slowed considerably, however, when miners left the Sitka area in a stampede to the Juneau Gold Belt in 1880-1881. In 1887 gold was discovered on Yakobi Island and the Bon Tara Mine, which produced 55 ounces of gold in total, was established (Overbeck 1919).

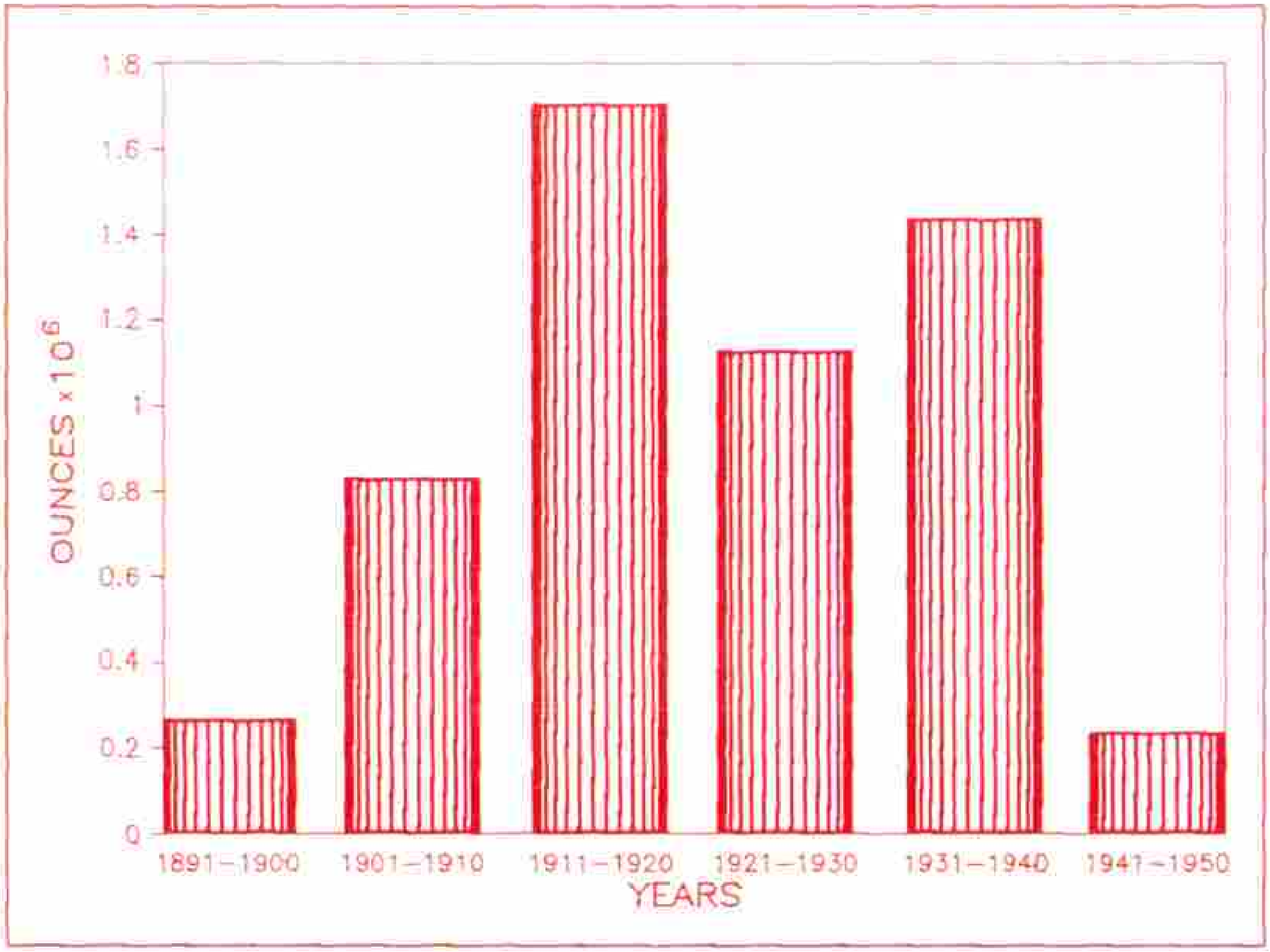
Table 3
Production Records from the Chichagof and Baranof Islands Area

Mine	Activity Years	Gold (oz)	Silver (oz)	Gypsum (tons)
Bon Tara	1887	55		
Apex El Nido	1924-28, 1934-35, 1937-39	17,000	2,400	
Mine Mountain	1933-35	100-150		
Jumbo	1909	1,450		
Chichagof	1912-1942	659,955	195,000	
Hirst-Chichagof	1922-1943	131,000	33,000	
Alaska Chichagof	1936	660		
Cobol	1926-1959	100		
Iyoukeen Cove	1906-23			500,000
Totals		**810,370**	**230,400**	**500,000**

Source: Bittenbender and others 1999:22; apparently no production records for the Silver Bay area are available.

Gold was discovered at Klag Bay in 1905 (Knopf 1912) at the Degroff Mine (later renamed the Chichagof Mine) and the Golden Gate Mine. The ore found initially at the


West Lynn Canal Subarea
Inspiration
Coastal Range Subarea
Alaska Endicott
Howard Bay Prospect
Admiralty Alaska
Empire
Sumdum Chief
Redwing/Marty/Jensen
Bon Tara
Apex El Nido
Mine Mtn. Area
Golden Hand
Apex
Hirst Chichagof
Chichagof
Alaska Chichagof
Jumbo
Cobol
Iyoukeen Cove
Silver Bay Basin
(Stewart, Lucky Chance)
Maid of Mexico
and Helen S (Woewodski Island)
UNITED STATES
TONGASS
NATIONAL
FOREST
Chichagof Island
Baranof
Sitka
Petersburg
Wrangell
Ketchikan
LEGEND
National Forest
High Potential for Mineral Activity
Productive Mine
Base Map Source:
Alaska, Minerals as Majestic as the Mountains
US Department of Agriculture, Forest Service, 1992
Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Productive Mines in the West Lynn Canal and Coastal Range Subareas, the Chichagof and Baranof Islands Area, Admiralty Island, the Stikine Area, and the Tracy Arm - Fords Terror Wilderness/Windham Bay Area
JOB NO: USDA-USFS-001-0000
DATE March 25, 2002
DRAWN SHH
FILE Fig13.dwg
Figure 13



Source:
Bureau of Mines, 1989
Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988
Volume 1 - Exectutive Summary

Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Lode Gold Production from the Juneau Mining District

JOB NO:	USDA-USFS-001-0000	DRAWN:	BHH	**Figure 14**
DATE:	December 17, 2001	FILE:	Fig14.dwg	

Chichagof Mine was so rich it was not milled, but instead shipped directly to a smelter in Tacoma, Washington (Still and Weir 1981). In 1909, the Jumbo Mine was discovered and immediately produced 1,450 ounces of gold from a high-grade pocket of ore (*ibid*). The Chichagof Mining Company operated the Chichagof and Golden Gate mines after 1911; prior to the consolidation, a power plant had been installed at Sister Lake to service both mines (Reed and Coats 1941). The Chichagof and Golden Gate mines operated almost continuously until 1942, producing nearly 660,000 ounces of gold and 195,000 ounces of silver (Still and Weir 1981). Both mines continued to be worked intermittently (clean-up and reworking of tailings) into the 1970s (*ibid.*).

Also located near Klag Bay is the Alaska Chichagof Mine, which was discovered in 1928. The Chichagof Mining Company optioned the property in 1936; eventually the mine produced 660 ounces of gold (Reed and Coats 1941, Still and Weir 1981). The Hirst-Chichagof Mine is situated north of Klag Bay in Kimshan Cove. The Hirst-Chichagof Mine was discovered in 1905, but operations did not get underway until 1922. Thereafter the mine was in continuous operation until 1943, and in total produced about 131,000 ounces of gold and 33,000 ounces of silver (Still and Weir 1981). The Chichagof and Hirst-Chichagof mines contained the highest grade gold ore ever recovered in Alaska. The ore averaged nearly 1 ounce/ton of gold.

Next in production behind the Klag Bay area mines were the Apex and El Nido properties west of Pelican. These mines were discovered by J. Cann in 1919 and 1920 respectively and operated from 1924 to 1939. The Apex property proved more productive, but together the two mines produced more than 17,000 ounces of gold and 2,400 ounces of silver (Holmes 1941). Bittenbender and others (1999 citing Kimball 1982) report that the Mine Mountain veins, discovered in 1921, produced about 100 to 150 ounces of gold between 1933 and 1935. They also mention the Koby gold prospect, discovered in 1933 and developed in 1936, but indicate that no production ever took place. The Cobol Mine, which was operated between 1926-1959, is reported to have produced just 100 ounces of gold (Bittenbender and others (1999:22). Finally, Bittenbender and others (1999:22 citing Stewart 1932) report that close to 500,000 tons of gypsum were recovered from Iyoukeen Cove between 1902 and 1923.

Bittenbender and others (1999) mention one additional discovery of locatable minerals that has been at least explored in the Chichagof and Baranof Island area. The Bohemia Basin nickel-copper-cobalt deposit, which has been extensively explored, but never developed for production, is located on Yakobi Island. The initial discovery was in 1919, but most exploration took place during World War II and later, during the 1970s.

Stikine Area

The BLM is in the process of assessing mineral resource potential in the Stikine area and thus far has published just two interim reports (Bittenbender and others 2000; McDonald and others 1998). Thus, summary historical information on mining efforts in the area is less complete than for much of the rest of Southeast.

Bittenbender and others (2000:4) report, however, that mineral production in the area has been quite limited. The only production of locatable minerals that they mention was at the Maid of Mexico and Helen S mines, both situated on Woewodski Island (refer to Figure 13). These mines are believed to have produced minor amounts of gold between about 1902 and 1933, but specific figures are unknown (Chapin 1918, Wright and Wright 1908). The Maid of Mexico boasts a unique, 10-stamp mill; instead of two arrays of five stamps as is the usual arrangement, this mill has a circular array of 10 stamps (Ken Maas, personal communication, 2001). Bittenbender and others (2000:4) also note that the Cascade Mine, situated on Thomas Bay, is reported to have shipped a small amount of gold-bearing ore to be tested in 1948 according to BOM production records.

In addition to the Maid of Mexico and Helen S mines, the BLM selected six other prospects for evaluation during the hazardous mining properties assessment. These properties had the greatest potential to contain chemical or physical hazards because their workings are described in the literature, and complex sulfide mineralogy is present. By the same token, these properties also have some potential to be of historic importance if they are more than 50 years old. The six prospects include: Berg Basin (lead/zinc), Glacier Basin (lead), Groundhog Basin (lead/zinc), Hattie Prospect (gold), Lake (lead/zinc), and Taylor Creek (undetermined). All pertain to lode deposits and are understood to have contained various pits, trenches, adits, and drill holes (some no longer observable according to the BLM field notes). Roppel (1991) indicates that Glacier Basin and Groundhog Basin witnessed considerable exploration for lead especially, and even some development efforts, but the miners experienced problems because of extremely difficult access and no production is reported.

Finally, it should be said that Wrangell, which is within the Stikine area, experienced short-lived explosions of prosperity that began with the Cassiar gold rush in nearby British Columbia and ended during the Klondike gold rush when Wrangell served as a jumping off point for miners taking riverboats up the Stikine River to an overland route to the Yukon in the 1890s. Those efforts proved uneconomical and with them, Wrangell's "mining boom" (USDA Forest Service 2000). Wrangell did, however, persist as a scaled down mining supply center in later years. Roppel (1991:1) mentions development of a small copper mine (not identified by name) near Wrangell, but indicates it was too small to be able to profitably ship ore.

Ketchikan Mining District

Prince of Wales Island was an important mining area in Southeast, with the Copper Queen claim on the Kasaan Peninsula established as early as 1867. Text on the USDA Forest Service (1994) Prince of Wales Island Road Guide map indicates that the Copper Queen was "productive" and "in operation until 1902," but this appears to be an error. The Copper Queen never became a producing mine according to Ken Maas (personal communication 2001). In addition to copper, mines on Prince of Wales Island have produced gold, silver, palladium, lead, zinc, uranium, marble and iron (Ken Maas, personal communication, 2001; Roppel 1991). Productive mines in the Ketchikan Mining District are called out on Figure 15.

Gold and Other Minerals: The following discussion is based largely on Maas and others (1995) and Roppel (1991). Although gold was discovered on the Unuk River in the 1870s and 1880, gold seekers operated primarily on the Canadian side of the border in its pursuit (Maas and others 1995:17 citing Mertie 1921 and Wright and Wright 1908). Ketchikan fishermen are also reported to have located quartz veins with gold potential and copper deposits at about that same time, eventually leading to exploration on the United States side of the border.

A gold deposit was found by a miner named James Bawden on Annette Island in 1892. Five or six years later gold was discovered on Gravina Island and at Thorne Arm on Prince of Wales Island as well as in the Helm Bay vicinity (Maas and others 1995:17 citing Brooks 1902 and Roehm 1938). The Valpariso and Golden Fleece deposits were discovered in the Dolomi area in 1899 and gold was discovered near Hollis the following year. Maas and others (1995:17) report that many of the gold finds made during the last decade of the nineteenth century were further explored and developed to become small, producing mines. These include the Crackerjack, Harris River, Lucky Nell, Flagstaff, and Puyallup mines, and the Dawson Mine, which was discovered in 1908 (refer to Figure 15).

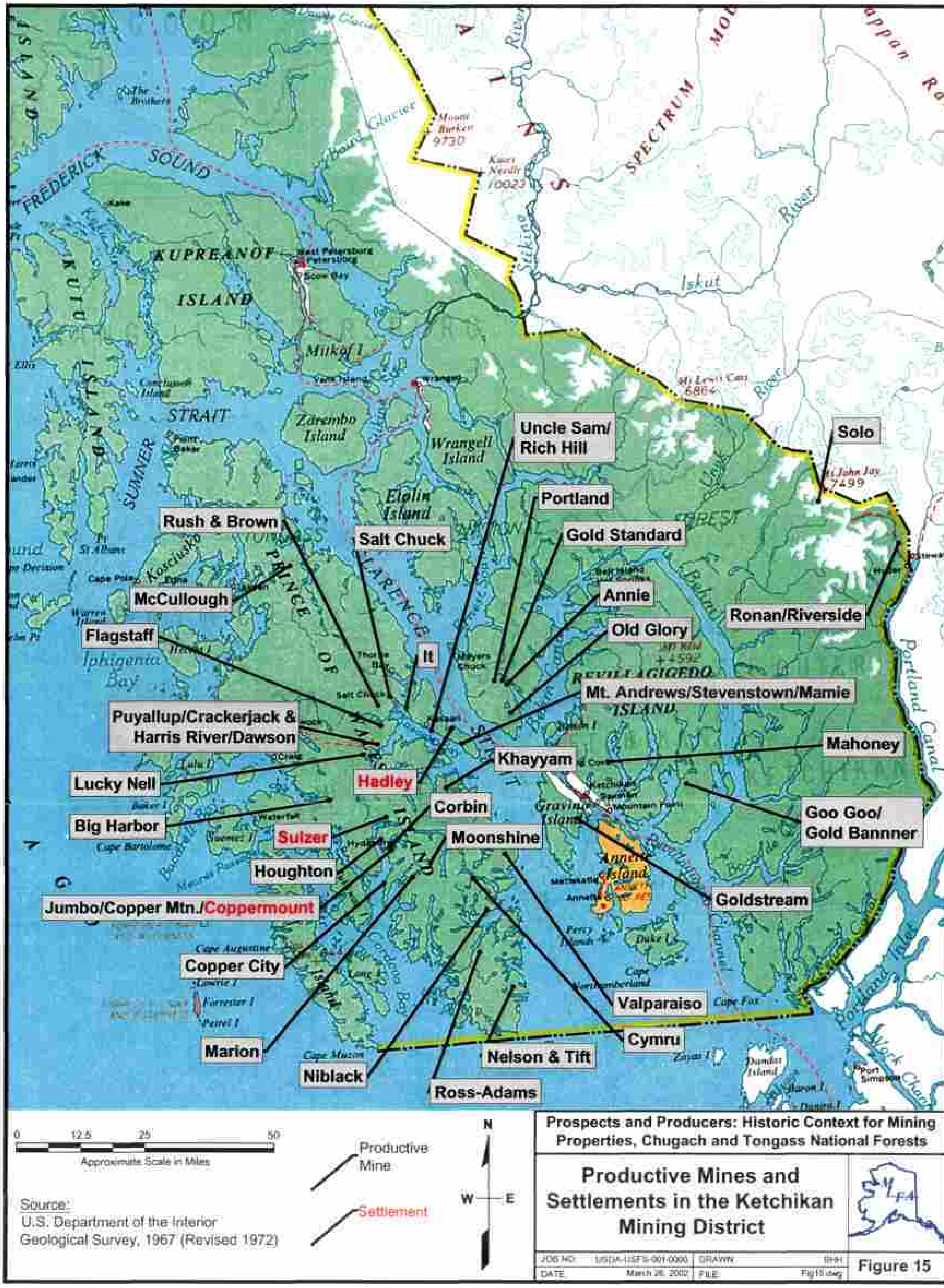
Gold seekers were also drawn to the Hyder area on the mainland in the late 1890s, and are reported to have searched for placer deposits in the Salmon River valley and along Bear Creek on the Canadian side of the border where just minor amounts of gold were recovered (Maas and others 1995:17 citing Hutchings 1976). Interest in the area was renewed in 1910 when the Silbak-Premier ore body was discovered in Canada. Maas and others (1995:17 citing Chapin 1916) indicate that while a fair amount of prospecting occurred near Hyder and numerous claims were staked between 1910 and 1930, just a single major discovery appears to have been made on the United States side of the border. This was the Riverside Mine, which was located in 1915 and operated from 1925 to 1950. Roppel (1991) reports that the Riverside mine was developed to target tungsten, lead and zinc, and that the mine produced just a modest amount of silver as a by-product. The Riverside Mine produced 2.7 million pounds of lead, 85,760 pounds of tungsten, and 21,708 pounds of zinc. The Riverside is Alaska's only tungsten mine; the tungsten processing method employed at the mine, therefore is unique within the state.

Copper: The Ketchikan Mining District is notable above all else for copper production (Roppel 1991:1-51). Copper deposits were located on Gravina Island near Dall Bay in 1898, and important copper deposits also were found on the Kasaan Peninsula and in the Jumbo Mountain area on Prince of Wales Island between 1867 and 1907 (Maas and others 1995:17 citing Wright and Wright 1908; Roppel 1991). Roppel (1991) identifies the most important copper mines in the Ketchikan Mining District as follows (not necessarily in order of importance): mines on the Kasaan Peninsula (including the Salt Chuck and Rush and Brown mines) and at Kiam (Khayyam), Big Harbor, Cymru, Niblack, and Hetta Inlet (Jumbo Mountain area) in the southern part of Prince of Wales Island; and on Seal Harbor, Gravina Island.

Roppel (1991) equates serious copper prospecting on the Kasaan Peninsula at the turn of the century with a rise in the price of copper from between 1 and 7 cents per pound to 17 cents per pound. The "golden years" of copper production in the Ketchikan Mining District were short-lived indeed, 1905-1906 when it was profitable to ship ore as low in grade as 59 pounds per ton of rock (2.95 percent). During this time, two smelters were established on Prince of Wales Island, one at Hadley on the eastern shore of the Kasaan Peninsula and the other at Coppermount, Hetta Inlet. By 1908, both smelters were permanently closed. Thereafter, just a few copper mines remained in operation and shipped their ore for smelting to the Britannia Smelting Company smelter at Crofton, British Columbia, the Tyee Copper Company's smelter at Ladysmith near Nanaimo, British Columbia or the American Smelting and Refining Company smelter in Tacoma, Washington.

The market for copper was good again by 1911, but it was then that the Kennecott Mines in the Wrangell Mountains went into production, thwarting an immediate resurgence in the Ketchikan Mining District. The Kennecott ore was exceptionally high grade, up to 70 percent or 1,400 pounds of copper per ton of rock. The opening and expansion of a smelter in British Columbia, however, soon made it profitable to ship ore as low in grade as 70 pounds per ton. Roppel (1991) reports that seven copper mines shipped ore from the Ketchikan Mining District in 1914. By 1916, 12 mines were in operation and the price of copper stood at 27.2 cents per pound. The price for copper was frozen by the Federal government in 1917 at 23.5 cents per pound. By 1922, the operation of copper mines in the Ketchikan Mining District had been largely suspended because of precipitous declines in price and market demand worldwide. Roppel (1991:3) reports that few Southeastern mines survived these impacts.

However, Roppel (1991) reports that in 1918 the owners of the Salt Chuck Mine at the head of Kasaan Bay decided to install flotation equipment (refer to discussion of mining technology in Chapter 5). This new milling process allowed profitable production of low-grade copper ore as well as the extraction from the copper concentrate of palladium, which was recovered at the Irvington Smelting and Refining Company in New Jersey (Montgomery Watson 1999:1-5). But by World War II, all copper production in Southeast had ceased except where the metal was recovered as a by-product in the processing of another commodity. Total copper production from the Kasaan Peninsula is valued at $6,200,000; just a few mines account for almost all of this production according to Roppel (1991:3). The Kasaan Peninsula's largest copper producers according to Maas and others (1995) were the Mamie (7.6 million pounds), Salt Chuck (7.5 million pounds), Mount Andrew (5.3 million pounds), Rush and Brown (5.2 million pounds), and It (4.9 million pounds) mines. The Jumbo Mine on Hetta Inlet produced $1,800,000 in saleable copper according to Roppel (*ibid*). Maas and others (1995) report that a total of 12.4 million pounds of copper was recovered from the Jumbo Mine.


Uncle Sam/
Rich Hill
Solo
Portland
Rush & Brown
Salt Chuck
Gold Standard
McCullough
Annie
Ronan/Riverside
Old Glory
Flagstaff
It
Mt. Andrews/Stevenstown/Mamie
Puyallup/Crackerjack &
Harris River/Dawson
Mahoney
Khayyam
Lucky Nell
Hadley
Corbin
Goo Goo/
Gold Bannner
Big Harbor
Sulzer
Moonshine
Houghton
Goldstream
Jumbo/Copper Mtn./Coppermount
Copper City
Valparaiso
Cymru
Marion
Nelson & Tift
Niblack
Ross-Adams
KUPREANOF ISLAND
FREDERICK SOUND
STRAIT
SUMNER
Zarembo Island
Wrangell Island
Etolin Island
Iphigenia Bay
REVILLAGIGEDO ISLAND
Gravina Island
Annette Island
Portland Canal
Stikine River
Iskut
SPECTRUM
0
12.5
25
50
Approximate Scale in Miles
Productive Mine
Settlement
N
W
E
Source:
U.S. Department of the Interior
Geological Survey, 1967 (Revised 1972)
Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Productive Mines and Settlements in the Ketchikan Mining District
JOB NO. USDA-USFS-001-0000
DRAWN BHH
DATE March 26, 2002
FILE Fig15.dwg
Figure 15

Roppel (1991) provides a conservative estimate of total copper production from Southeast at 140,000 tons. This contrasts with the 592,000 tons produced by the Kennecott Mines in the Wrangell Mountains.

Lead: In addition to the lead production reported from the Juneau Gold Belt, lead mines also were established on Coronation Island and on Cholmondeley Sound in the Ketchikan Mining District. Roppel (1991) reports that these mines were established prior to 1910 and the lead was derived from galena. The Riverside Mine near Hyder was by far the premier lead producer in the region, with 2.7 million pounds recovered (Maas and others 1995). Other lead producers in the Ketchikan Mining District included the Mahoney, Flagstaff, Harris River and Dawson, Nelson and Tift, and Marion mines.

Zinc: Zinc frequently occurs in combination with lead, copper, and other metals, but often is not recovered because it requires a distinct extraction process. While zinc is known to occur in various spots throughout Southeast, the only reported historic production was from the Mahoney Mine east of Ketchikan. (Mobley 2001; Roppel 1991). The Mahoney Mine was briefly productive in the 1940s when the price of zinc rose in conjunction with World War II. Later the Riverside Mine also produced zinc according to Maas and others (1995).

Uranium: Roppel (1991) presents a detailed account of the discovery, exploration, development and exploitation of uranium at Bokan Mountain at the south end of Prince of Wales Island. The Ross-Adams mine was found and exploited as an aspect of the Cold War. The Atomic Energy Commission offered a bonus for the first 20 tons of 20-percent uranium oxide from a single mine in 1951. By 1955, prospectors were aware that radioactive deposits were present in the Ketchikan Mining District and it was possible to detect them from the air. This is how the Ross-Adams mine was discovered. It was an open-pit mine that began production in July, 1957. By September of that year, the Ross-Adams had produced approximately 15,000 tons of 0.80-percent uranium oxide. The ore was shipped to Spokane for smelting. The mine was eventually converted to an underground operation and continued in operation sporadically, and under a variety of owners. The mine closed in 1971, when the targeted deposit had been completely recovered.

Summary: In sum, the most productive mining areas in the Ketchikan Mining District were discovered and developed in the last decade of the nineteenth century and the first several decades of the twentieth century. The single exception is the Ross-Adams Mine at Bokan Mountain in the southern part of Prince of Wales Island; this is Alaska's only uranium mine and was discovered and developed in the 1950s. Production figures and years of activity for producing mines in the Ketchikan area are summarized by Maas and others (1995:17-19) and included here in Table 4.

Table 4
Production Records from the Ketchikan Mining District (1899-1971)

(Quantities are in Kilograms with Conversion to Troy Ounces for Gold, Silver and Palladium and Conversion to Troy Pounds for the Other Minerals in Parentheses.)

Mine	Activity Years	Gold	Silver	Copper	Lead	Zinc	Palladium	Tungsten
Annie	1900-01	7.9 (254)						
Big Harbor	1913, 16			8,567 (22,960)				
Copper Mountain	1902-06	4.5 (145)	321.3 (10,328)	101,734 (272,647)				
Copper City	1906-08	10.5 (338)	146.5 (4,709)	76,746 (205,679)				
Corbin	1906	0.47 (15)	142.9 (4,594)	9,697 (25,988)				
Cymru	1906, 15	0.88 (28)	46.2 (1,485)	68,615 (183,888)				
Flagstaff	1937-41	8.0 (257)	61.6 (1,980)	1,299 (3,481)	2,688 (7,204)			
Gold Banner	1939-40	0.3 (10)	0.2 (6)					
Gold Standard	1899-1907, 1915, 1922-42	310+ (9,965+)	33+ (1,061+)					
Gold Stream	1906, 08	8.1 (260)	15 (482)					
Goo Goo	1915, 35	1.4 (45)						
Harris River (includes Dawson Mine)	1909-10, 1914-21, 1923-25, 1927-29, 1935-42, 1946-51	204 (6,558)	162 (5,208)	103 (276)	894 (2,396)			
Houghton	1917	0.1 (3)	1.3 (42)	2,180 (5,842)				
It	1908-12, 1914-18	111.8 (3,594)	714.6 (22,971)	1.83M (4,904,400)				
Jumbo	1907-18, 1923	220 (7,072)	2,730 (87,756)	4.63M (12,408,400)				
Khayyam	1906-09	4.0 (129)	53.2 (1,710)	80,635 (216,102)				
Lucky Nell	1905, 12, 14	$1,062 combined value gold, silver, lead						
Mahoney	1947-49	0.25 (8)	11.6 (373)	1,270 (3,404)	18,053 (48,382)	33,112 (88,740)		
Mamie	1905-08, 1915-18	107.2 (3,446)	659.2 (21,190)	2.826M (7,573,680)				
Marion	1938	0.16 (5)	0.09 (3)		16.3 (44)			
McCullough	1905-06			181 (485)				
Moonshine	?	Limited tonnage of high-grade lead-silver ore sacked.						
Mount Andrew	1906-11, 1916-17	58 (1,864)	697 (22,405)	1.973M (5,287,640)				
Nelson and Tift	1936-40, 1942	108.3 (3,481)	19.8 (637)	32,335 (86,658)	315 (844)			
Niblack	1905-08	41.7	622.1	889,040				

Mine	Activity Years	Gold	Silver	Copper	Lead	Zinc	Palladium	Tungsten
		(1,341)	(19,997)	(2,382,627)				
Old Glory	1908	0.3 (10)	0.8 (26)					
Portland	1923, 25, 1939-41	2.5 (80)	1.2 (39)	11 (30)				
Puyallup (includes Crackerjack)	Pre 1915(?), 1915-16, 1934, 45, 46	20.2 (649)	14.7 (473)					
Rich Hill	1917-18, 28	1.98 (64)	13.2 (424)	42,793 (114,685)				
Riverside	1925-50	76 (2,443)	2,700 (86,792)	34,300 (91,924)	1.024 M (27 M)	8,100 (21,708)		32,000 (85,760)
Ronan	1920-present	<15 (<418)						
Ross-Adams	1957-71	79,392 metric tons produced @ 0.76 percent U_3O_8 (uranium)						
Rush & Brown	1905-08, 1910, 1912-23, 1929	209.4 (6,731)	1,262.4 (40,580)	1.96M (5,252,800)				
Salt Chuck	1916-24, 1934-41, 1943	365 (11,733)	1,728.9 (55,576)	2.81M (7,530,800)			638.8 (20,540)	
Solo	1930-50	12 (386)						
Stevenstown	1906-08	50.6 (1,627)	383.5 (12,328)	929,864 (2,492,036)				
Uncle Sam	1907			11,975 (32,093)				
Valparaiso	1913, 33	22.7 (730)	16.2 (521)					
Totals		**1,983.2 (63,750)**	**12,558 (403,677)**	**18.3M (49,044,000)**	**1,046M (25,058,870)**	**41,100 (110,448)**	**638.8 (20,540)**	**32,000 (85,760)**
M = million								

Source: Maas and others 1995; parenthetical conversions by the author.

PRINCE WILLIAM SOUND AND THE COPPER RIVER DELTA

European settlement in Prince William Sound was initiated by the Russians who established a long-lived and successful trading post at Nuchek in 1785. Even after 1867, this post continued in operation under the Alaska Commercial Company (Buzzell 2001b:12; Lethcoe and Lethcoe 1994:31-32). Nuchek was eventually eclipsed by newer American settlements as salmon fishing and canneries, fur farms, and mining operations were established in the Sound in the 1880s and 1890s. Canneries at Odiak (later Eyak) and Orca near present day Cordova served as staging areas for fur farmers and prospectors (Buzzell 2001b:13).

Prince William Sound is better known for its copper mines, but prospectors entered the region originally in the grip of gold fever. By the 1880s, gold seekers had spread to Prince William Sound, mostly from other parts of Alaska. Some of these people were miners who had worked in the Juneau Gold Belt or had prospected along the Yukon River in the interior. They had formed the Prince William Sound mining district by 1883 after the discovery of gold on Middleton Island in the Gulf of Alaska south of Prince William Sound a year earlier. The discovery of lode gold at Galena Bay in 1895 and 1896 heightened prospectors' interest (Buzzell 2001b:13). Copper, too, was discovered in the vicinity of Port Fidalgo near present day Valdez and on Latouche Island in 1897 (Buzzell 2001b:13; Lethcoe and Lethcoe 1994:43-44; Lethcoe and Lethcoe 1998:18-19). But the "golden period" for mining in the Sound was 1900-1917. During this time all major discoveries were made and the region witnessed the bulk of its mineral production (Lethcoe and Lethcoe 1994:70).

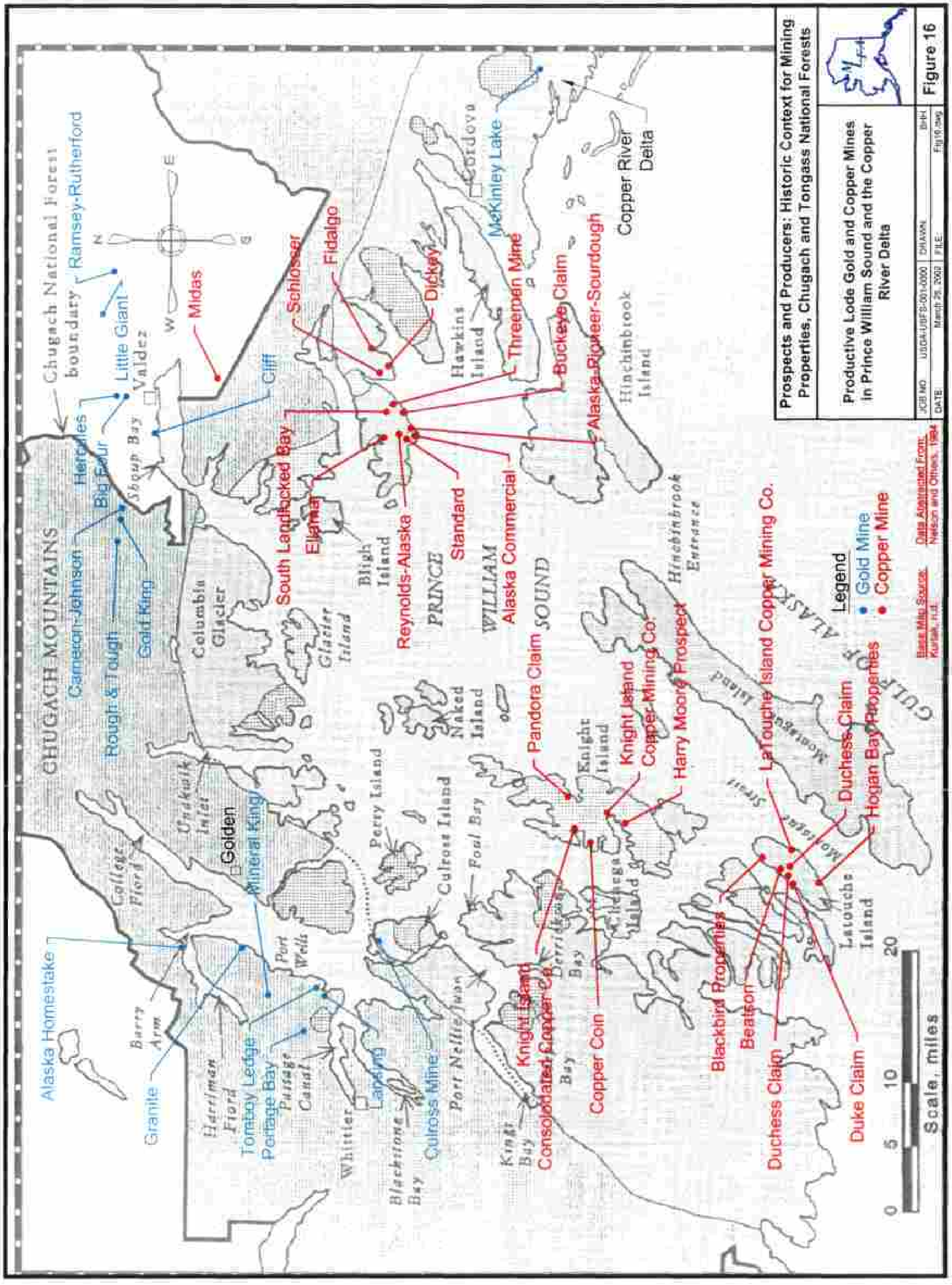
Lode gold mining operations in Prince William Sound were relatively small scale, with just a few mines accounting for most of the recorded production (Figure 16). Gold mining persisted in Prince William Sound, although the intensity fluctuated, until after the Great Depression. The productive gold mines are located in two clusters: the Port Wells vicinity on the western edge of the Sound, and north of Valdez. Peak copper production occurred from 1900-1907 and ended when venture capital was diverted to other endeavors because of World War I. The principal copper production areas were the Port Fidalgo vicinity and Solomon Gulch south of Port Valdez in the eastern portion of the Sound, and Knight and Latouche islands in the southwestern portion of the Sound (refer to Figure 16).

Mining developments in the Alaskan Interior affected Prince William Sound in two major ways in addition to bringing miners to the area. During the Klondike gold rush, gold seekers attempted several routes in their stampede to the north as mentioned above. One of these routes crossed the Valdez and Klutina glaciers with Orca (near present day Valdez) as the jumping off point. Buzzell (2001b:13) reports that an estimated 3,000 stampeders attempted this horrific crossing, though many turned back in defeat, and some instead became Sound prospectors. The discovery and development of the Kennecott Mines in the Wrangell Mountains also had a profound effect on Prince William Sound because the mines' owners eventually developed Cordova as the southern terminus for the Copper River & Northwestern Railroad, which was used to transport copper ore for shipment to the Lower 48.

The following summary of mining history in Prince William Sound is adapted primarily from Lethcoe and Lethcoe (1994) and Nelson and others (1984).

Gold Mines

Some gold seekers, shying from the northward trek to join the successive stampedes during the late 1800s and early 1900s, instead prospected in Prince William Sound. By 1912 their efforts had produced the Valdez Gold District, with 48 prospects or mines



Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Productive Lode Gold and Copper Mines in Prince William Sound and the Copper River Delta
Figure 16
Legend
Gold Mine
Copper Mine
Scale, miles
0
5
10
20
CHUGACH MOUNTAINS
Chugach National Forest boundary
PRINCE WILLIAM SOUND
GULF OF ALASKA
Valdez
Cordova
Whittier
Golden
Alaska Homestake
Granite
Tomboy Ledge
Portage Bay
Mineral King
Cameron-Johnson
Rough & Tough
Gold King
Big Four
Hercules
Little Giant
Ramsey-Rutherford
Cliff
Midas
Culross Mine
Landlock
McKinley Lake
Schlosser
Fidalgo
Dickey
Threeman Mine
Buckeye Claim
Alaska-Pioneer-Sourdough
South Landlocked Bay
Ellamar
Reynolds-Alaska
Standard
Alaska Commercial
Pandora Claim
Knight Island Copper Mining Co.
Harry Moore Prospect
LaTouche Island Copper Mining Co.
Duchess Claim
Hogan Bay Properties
Knight Island Consolidated Copper Co.
Copper Coin
Blackbird Properties
Beatson
Duke Claim
Copper River Delta
Hawkins Island
Hinchinbrook Island
Hinchinbrook Entrance
Bligh Island
Columbia Glacier
Glacier Island
Naked Island
Knight Island
Perry Island
Culross Island
Montague Island
Montague Strait
Latouche Island
Chenega Island
Shoup Bay
Port Wells
Passage Canal
Harriman Fiord
Barry Arm
College Fiord
Unakwik Inlet
Blackstone Bay
Port Nellie Juan
Foul Bay
Kings Bay
Derickson Bay

stretching in a 26-mile long arch from Valdez to Columbia Glacier. Nelson and others (1984) depict a few placer streams, but report no production figures for them, suggesting that most of the focus in Prince William Sound was on lode gold. Production records for gold mines in Prince William Sound and the Copper River Delta are summarized in Table 5. By 1914 there were nine mills in operation and ores were being routinely shipped to Tacoma for smelting.

In 1911 a mini-rush ensued on the west side of Prince William Sound when a 1.5-ton gold-bearing quartz boulder was discovered at the future site of the boomtown of Golden on the eastern side of Port Wells. Miners streamed over Portage Pass from the Turnagain Arm gold fields and also arrived by sea, debarking at Valdez. The Golden and Avery River districts, however, were a disappointment and the boomtown of Golden was all but abandoned by 1914 when, in fact, the post office was relocated to the Granite Mine. The Granite Mine on the western shore of Port Wells was discovered in 1912, and a mill was erected in 1913-1914. Most of the Port Wells mines were played out or abandoned by 1915, but the Granite was actually at peak production by then and continued in operation until 1922.

A curious aspect of mining history on the Copper River Delta involved the 70-year effort to exploit lode gold in the McKinley Lake area, which is situated east of Cordova. This history was recently researched and reported in considerable detail by Buzzell (2001b). Briefly, lode gold was discovered in the area in 1898 and the McKinley Lake Mining District established. Attempts at development took place during two distinct episodes: 1898-1917 and 1926-1942. Mills were constructed in 1906 and in the early 1940s. Principal development dollars came from Cordova merchants and professionals including Dr. Will Chase, who was a prominent Cordova physician, businessman and politician and served as general manager of the McKinley Lake Mine at Mill Creek for many years (Buzzell 2001b:60). Despite having produced just 16 ounces of gold in total, development of the McKinley Lake Mine was a fairly elaborate endeavor.

By far the largest gold producer in Prince William Sound was the Cliff Mine located on the northern shore of Port Valdez and in fulltime operation from 1910 to 1913 and sporadically thereafter. In all, the Cliff Mine yielded 51,740 oz of gold and 8,153 oz of silver. Second in gold production was the Granite Mine on Port Wells, which yielded a total of 24,940 oz of gold and 2,492 oz of silver (Nelson and others (1984:17). The reader will note that these production records are equaled or exceeded at the Ellamar and Midas copper mines discussed below. And, of course, they pale in comparison to the major Juneau Gold Belt workings. A few gold mines remained in operation into the 1940s. In 1942 Public Law L208 closed all large gold mines to release men and materials for the World War II war effort; small mines like those in Prince William Sound were permitted to stay in operation as long as production was kept low. But the Granite, Mineral King, Culross and Cliff mines succumbed shortly thereafter. Although desultory assessment work persisted at properties south of Port Wells for a time (at Poe, Pirate and Pigot bays), the 1950s effectively marked the end of gold mining in Prince William Sound.

Copper Mines

Copper production from mines throughout Prince William Sound and the Copper River Delta is summarized in Table 6 and discussed here chronologically (that is, from early to later discoveries). The Ellamar Mine near Port Fidalgo was the second largest copper producer in Prince William Sound (behind the Beatson Mine, which is discussed below). Operation of the mine was initiated at the beginning of the twentieth century and by 1929, when the ore was exhausted, the Ellamar had produced 15,761,337 pounds of copper, 51,305 oz of gold, and 191,615 oz of silver. The boomtown of Ellamar provided goods and services to a number of other Port Fidalgo Mines, which also were noteworthy producers.

Table 5
Production Records for Lode Gold Mines
In Prince William Sound (1910-1982)

Mine	Reported/Recorded* Gold Production (Ounces)	Reported/Recorded* Silver Production (Ounces)
Cliff	51,740	8,153
Granite	24,940*	2,492*
Ramsey-Rutherford	5,375	1,194
Mineral King	2,783*	826*
Gold King	1,997	187
Big Four	846	371
Cameron-Johnson	585	18
Portage Bay	490*	60*
Little Giant	367	152
Hercules	269	44
Tomboy Ledge	219*	902*
Alaska Homestake	83*	33*
Lansing	81	81
Rough & Tough	76	20
Culross Mine	62	62
McKinley Lake	16	
Totals	**89,929**	**14,595**
* Production records available.		

Source: Nelson and others 1984:17; Jansons and others 1984.

The Midas Mine, which would become the fourth largest copper producer in Prince William Sound, was discovered in 1901 on Solomon Gulch south of Port Valdez and northeast of Fidalgo Bay. (The Schlosser Mine was the third largest copper producer in the Sound.) The Midas Mine produced until 1920 when it was effectively closed by the Jones Act, which was designed to protect American shipping and ship building interests.

The Jones Act restricted cargo shipments between Alaska and the Lower 48 to American-built vessels. This meant Prince William Sound miners could no longer ship their ores for smelting on Canadian owned steamships, thereby drastically curtailing production by those miners without access to the Kennecott-owned steamship lines.

Knight and Latouche islands were heavily staked by eager copper prospectors, but just two small mines on Knight Island ever shipped ore: the Harry Moore Prospect and the Knight Island Copper Mining Company. In contrast, Latouche Island boasted the richest claims in Prince William Sound and was the site of the boomtown of Latouche. The Latouche Island claims were quickly acquired by the Kennecott Copper Corporation. By

Table 6
Production Records for Copper Mines in Prince William Sound

Mine	Ore Produced or Sold (tons)	Copper Produced (pounds)	Gold Produced (ounces)	Silver Produced (ounces)
Beatson Copper Co.	5,992,941	182,600,000	484	1,466,649
Ellamar Mining Co.	301,835	15,761,337*	51,305*	191,615*
Schlosser Mine	21,434	4,160,820		1,384
Midas Mine	49,350	3,385,680*	2,569*	15,157*
Threeman Mine	6,196.5	1,159,660*	101*	5,308*
Blackbird Properties				
Latouche Mining Co.	29,209*	52,000*		
Blackbird Mine	5,150*	547,118*		
Girdwood, Barrack	600*	72,510*		
Fidalgo Copper Co.	2,747	360,376		1,202
Reynolds-Alaska	2,850	215,000		
Duchess Claims	2,850	215,000		
South Landlocked Bay Mining Co.	928	74,240		
Standard Copper Co.	1,100	32,000	36	518
Dickey Copper Co.	293*	29,346*		
Harry Moore Prospect	20	1,452		
Alaska-Pioneer-Sourdough	6	720		
Knight Island Copper Mining Co.	1	240	2	3
Hogan Bay Properties				
Patten Cooperating Co.	0.3	57		
Happy Jack Mining and Development	+			
Copper Queen Mine	+			
Alaska Commercial Co.	70			
Pandora Claim	+			
Latouche Island Copper Mining Co. Ltd.	+			

Mine	Ore Produced or Sold (tons)	Copper Produced (pounds)	Gold Produced (ounces)	Silver Produced (ounces)
Knight Island Consolidated Copper Co.	+			
Copper Coin	+			
Buckeye Claim	+			
Duke Claim	+			
Totals	**12,789,336.8**	**208,667,556**	**54,497**	**1,681,836**

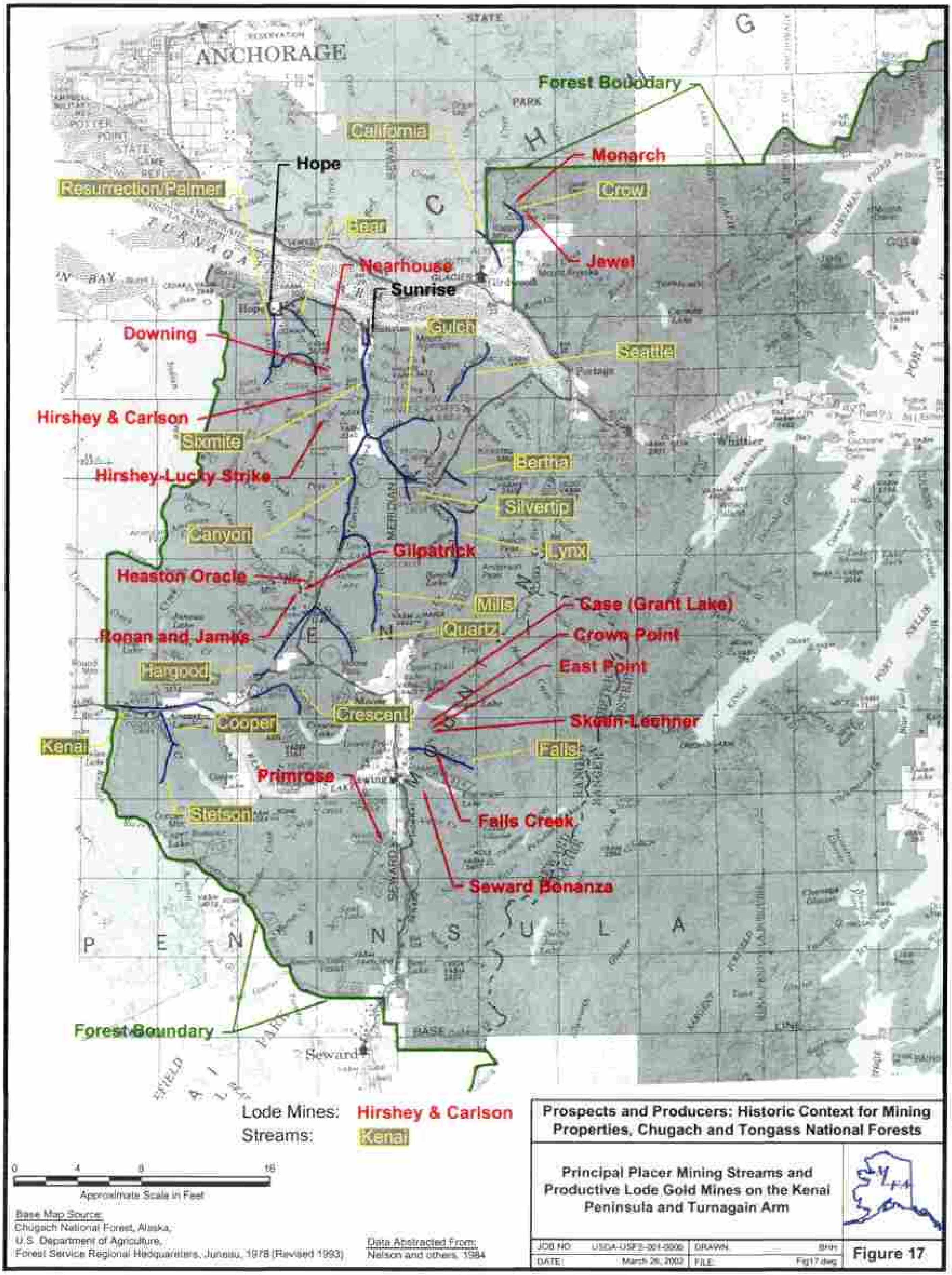
* Estimated
+ Indicated in Publications to have shipped some ore
Source: Nelson and others 1984:18; Jansons and others 1984.

far the most important copper mine in the Sound was the Beatson Mine located on Powder Point on Latouche Island. Within Alaska, the Beatson's production record is second only to the world famous Kennecott Mines in the Wrangell Mountains. The Beatson mine produced 182,600,000 pounds of copper, 484 ounces of gold, and 1,466,649 ounces of silver. The Beatson Mine was discovered in 1897 and began ore shipments the following year. Beatson copper ore was mined using the open pit method and shipped regularly to the Tacoma smelter from 1904 to 1930 when the mine closed after its reserves were completely exhausted. The Beatson was the last copper mine in the Sound to close.

The copper boom in Prince William Sound ended with the advent of World War I. At that time many of the smaller copper ore bodies had been exhausted plus copper prices fell precipitously in response to two factors: (1) tightened money markets occasioned by the war effort, and (2) a glutted copper market caused by heightened output of Kennecott's Chilean mines in South America. In addition, by then the Kennecott Syndicate held a virtually monopoly on ore shipments to their smelter in Tacoma. Just the Beatson and other Latouche Island mines along with the Ellamar and Midas survived after World War I although speculation in the 1920s led to the installation of fairly elaborate new equipment including stamp mills in some areas of the Sound. In 1929, however, the stock market crash ended those efforts.

KENAI PENINSULA AND TURNAGAIN ARM

The history of mining on the Kenai Peninsula is related in considerable detail by Mary Barry (1997). More synthetic treatments have been prepared by Buzzell (1997, 1998, 2001a). The following discussion relies heavily on these accounts along with summary data compiled by Nelson and others (1984) regarding mining history and gold production throughout the Chugach National Forest. Important placer mining streams and lode gold mines are called out on Figure 17. (Refer to the section on Mining Law earlier in this Chapter for an explanation of why production figures for lode and placer mines are reported differently.)



Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests

Principal Placer Mining Streams and Productive Lode Gold Mines on the Kenai Peninsula and Turnagain Arm

Figure 17

Unsuccessful efforts by Russian settlers to smelt iron, possibly from the Kenai Mountains are reported (Barry 1997:10 citing personal communications), but a single well-documented prospecting venture in Alaska is definitely known to have occurred prior to the territory's acquisition by the United States. (The reader will recall that this context is limited to a consideration of "locatable minerals." Russian coal mining efforts prior to 1867 are well documented.) This involves Peter Doroshin's explorations along the Kenai and Russian rivers on the Kenai Peninsula for the Russian-American Company in 1850-1851 (Johnson 1915:181-182). Doroshin recovered just a few ounces of placer gold in two seasons of prospecting. No further efforts are documented despite intriguing references to "Russian mining artifacts" having been seen along the Kenai River and Resurrection Creek (Barry 1997:8 and 13, citing personal communications and Moffit 1906; Jansons and others 1984:8).

Beginning in the early 1880s and continuing into the 1930s, placer mining was undertaken in the beach sands along the western coast of the Kenai Peninsula but production was never large enough to spark a gold rush (Barry 1997:25-30). Sydney Lawrence, sometimes hailed as one of Alaska's greatest landscape painters, was one of those prospectors in 1912.

In 1888, a prospector named Alexander King, who had worked in the Yukon earlier, obtained a stake in the town of Kenai and paid it off two years later with four pokes of placer gold from the vicinity of Turnagain Arm. King would not reveal the location of his discovery, but his success lured other prospectors and in 1893 placer claims were filed on Resurrection Creek by Charles Miller. Additional claims were filed on Resurrection, Bear and Palmer creeks soon thereafter and the Turnagain Arm Mining District was formed. Word of these finds spread quickly and by 1894, 300 prospectors had begun to explore other drainages. In 1895 over 100 claims were filed on Sixmile and Canyon creeks and the Sunrise Mining District had been formed. In 1895, several young prospectors including Chris Spillum located claims on the north side of Turnagain Arm near present-day Girdwood and this area was added to the Turnagain Arm Mining District.

The Turnagain Arm Gold Rush, 1896-1898

The Turnagain Arm gold rush ensued in earnest in the spring of 1896. The hopeful gold seekers used several routes, embarking from Juneau, Seattle and San Francisco among other places. Some crossed Portage Glacier after landing near present-day Whittier. Others came in ocean-going craft to Tyonek on the north shore of Cook Inlet where they transferred to the shallow-draft vessels required to reach the north coast of the Kenai Peninsula. It was here that the mining camps of Hope and Sunrise were established. Both mining camps were small collections of perhaps a dozen log cabins and tent frames originally. Hope served as a supply center for miners on Resurrection Creek. Sunrise served a similar function for the miners of Sixmile Creek and its tributaries. Buzzell (1998) reports that about 1,500 miners were at work along Sixmile Creek and its tributaries in 1896 although few actually located rich claims.

In the spring of 1896, miners and the people who supported their efforts with goods and services organized the rapidly expanding towns of Hope and Sunrise. They laid out streets and began selling lots for businesses and residences. Sixty settlers purchased lots in Sunrise (Buzzell 1998). Sunrise eventually grew to be the larger settlement because the diggings on Sixmile Creek and its upper tributaries were richer than those on Resurrection Creek. In its heyday, Sunrise boasted three general stores, three saloons, a billiards hall, a restaurant, a hotel, a community hall, a post office, docks and warehouses connected to the main town by a rail tramway, a cemetery, and ferry service across Sixmile Creek (Buzzell 1997; 1998). Hope and Sunrise were the first Euroamerican settlements in the area. Sunrise became the judicial center of the Cook Inlet area in 1900-1902 when Alaska's governor appointed a U.S. Commissioner and U.S. Marshall for the settlement.

In later years, people came to realize that the potentially productive, vast gravel deposits of Turnagain Arm are best exploited by hydraulic means. The rushers in 1896, however, were working with more primitive means (sluice boxes, picks and shovels) and thus, were able to sift through just a fraction of the surface stream gravels within their claims. By mid-season, many had given up and left the area. Fewer than 300 people remained in Hope and Sunrise over the winter (Barry 1997:38), but a number of miners with active claims returned to try again in the spring of 1887. Some began to experiment with hydraulic methods.

Then in August 1897, word of the Klondike strike reached the area and many miners abandoned their claims to join the stampede north. The Klondike Gold Rush by its very fame, however, also increased "gold fever" nationwide, prompting more gold seekers to try their luck in Turnagain Arm, which was much easier and less expensive to reach than the upper Yukon. An estimated 3,000 prospectors occupied Turnagain Arm and the Kenai Peninsula in 1898 according to Barry (1997:77). Buzzell (1998) estimates that perhaps 600 miners were working in the Hope-Sunrise area that year. Overall, however, returns were disappointing and 1898 marked the end of the Turnagain Arm Gold Rush.

A few "old-timers" with reasonably profitable claims remained and continued their mining efforts. Some began to employ more sophisticated extractive technologies as well in order to exploit placer deposits in the vast, but deeply buried bench gravels. This required significant capital outlay for the purchase and installation of hydraulic equipment, however, and few miners could afford the expense. Successful miners also bought and consolidated the most promising claims. Thus, by 1899, just a few miners continued their efforts and there was little opportunity for newcomers. In all, an estimated $1 million dollars in gold was extracted from the Kenai Peninsula and Turnagain Arm between 1895 and 1899 (Moffit 1906:9).

The Post-Gold Rush Era (Contributor: Traci R. Bradford)

The following summary of post-gold rush mining on the Kenai Peninsula is abstracted from Barry (1997) unless otherwise noted. Even though the fevered influx of the Gold

Rush to the Turnagain Arm area had abated by the mid 1900s, prospectors did continue to explore the Kenai Peninsula. The boomtowns of Hope and Sunrise persisted for some years as mining continued on Resurrection and Sixmile creeks, but Sunrise ultimately succumbed. Mining related transportation routes through the Kenai Peninsula and northward along Turnagain Arm also became important during the first decades of the twentieth century.

Established placer mines became more mechanized and elaborate in their operations. Gold-rich quartz veins had been discovered on Palmer, Bear, and Sawmill creeks in 1898 (Huber and Kurtak 2001), but it was some years before there was any follow-up. After 1910, non-Alaskan investment in mining projects on the Kenai Peninsula had increased. The lode mining potential was still largely unknown at this time, but several mines displayed promising assays. The largest placer producers by 1914 were on Crow, Resurrection, Bear, and Canyon Creeks. The largest hydraulic plants were at the Nutter and Dawson Company mine on Crow Creek, the Mathison Mining Company on Resurrection Creek, and the Kenai Mining and Milling Company on Cooper Creek (a tributary of the Kenai River). Gold exploration and production continued in the area until the entrance of the United States into the First World War. The participation of the United States in the First World War adversely affected gold mining in Alaska. Many men entered the army, and most never returned. The costs of mining increased while the relative value of gold decreased until, by 1920, the situation was considered a depression. The quantity of gold produced throughout Alaska in 1920 was half of the 1916 production quantity.

Transportation Routes: As mining on the Kenai Peninsula abated at the end of the Turnagain Arm Gold Rush, the transportation of goods and people from the ice-free port of Seward to mining camps in the Susitna Valley and western Alaska became an important element of the economy of Sunrise. Pack horses carried passengers and freight from Mile 34 of the Alaska Central Railway over the Johnson Pass Trail to Sunrise. From there, travelers continued to various destinations including Yentna, Willow Creek, Innoko, and Iditarod mining districts. The overland link between Seward and Sunrise became part of the Iditarod Trail system.

The Alaska Road Commission, created in January 1905, also built a wagon road from Mile 34 on the railroad line through Moose Pass to a point near Summit Creek. By 1909, the miners had accessible transportation, lowering the cost of freight and allowing the miners to bring in more hydraulic plants. In 1909, the Alaska Road Commission completed a trail from Mile 29 on the railroad line approximately 15 miles from Moose Pass to Gilpatrick. In 1913, the Alaska Road Commission constructed a road from Sunrise to Mile 34 of the railway. These roads were built to support the miners of the area. Sunrise remained an important seasonal link in the Iditarod Trail system until 1917 when the federal government took over the bankrupted Alaska Northern Railway and completed track along the north side of Turnagain Arm and into the Susitna Valley. After that, only local traffic used the trail to Sunrise and Hope, which contributed to the decline of the towns.

Placer Mining Near Hope and Sunrise, 1900-1914: The placer mines of the Hope-Sunrise district remained a productive part of the Kenai Peninsula. Many producers had taken part in the Turnagain Arm gold rush and had remained in the area. Sam Wible's mine on Canyon Creek continued to outproduce all but the Mathison mine on Resurrection Creek. Since the inception of the mine in 1898, he had put in a large complex of ditches to bring water to the hydraulic plants. He also had a Pelton wheel installed.

Robert Mathison was mining on Resurrection Creek during 1911 and continued to be the dominant mining group of the area, with their Resurrection River mine yielding good profits. By June 1912, the Mathisons' hydraulic operation was averaging $100 per day. By August 1912, they had deposited $10,000 in gold dust from Resurrection Creek. In 1913, the Mathisons reported running into coarse gold and expected the season output to reach $17,000. John Mathison, head of the Mathison Mining Company, died in 1915, and the company began to deteriorate.

By 1900, miners had exhausted the more easily accessible gold of most placer claims on the Sixmile drainage south of Sunrise. Miners were also lured away by news of richer strikes in the Klondike and in Nome, while others returned to the states. The miners who remained invested in larger-scale hydraulic equipment to recover the remaining gold buried under tons of gravel in stream and bench deposits. Several miners attempted to mine Sixmile Creek. The most productive area was known as "the Forks," where Canyon Creek and East Fork Creek converge to form Sixmile Creek. Most of the mining of Sixmile Creek occurred above the canyon, four or five miles from Sunrise. Large-scale mining on lower Sixmile Creek proved unfeasible, mainly due to the depth of overburden in the streambed. Mining below the canyon was limited to pick and shovel operations. Piles of hand-stacked tailings remaining along the west bank of Sixmile Creek attest to the strenuous work required to recover merely a few ounces of gold.

In 1914, extensive prospecting was conducted on lower Sixmile Creek upstream from Sunrise to determine the feasibility of dredging. The following year, the American Dredge Building & Construction Company of Seattle erected a flume dredge on Sixmile Creek just upstream from Sunrise. Crews took one month to construct the Herron-Barnes dredge, capable of handling 1,000 cubic yards of gravel daily. The dredge was operated briefly in 1915, until operations were discontinued due to the number of large boulders in the creek bed. Crews later stripped the dredge of usable equipment, left the superstructure on the east-side of the creek about three-quarters of a mile from Sunrise, where it remained until the late 1970's when it was swept away by flood.

Placer Mining in the Moose Pass Area, 1909-1914: The Moose Pass district was also the site of several placer mines during this period. The area near Quartz Creek was a productive location. Four quartz locations prompted the formation of the Quartz Creek Mining Company in 1909. In 1910, the company installed a hydraulic plant and accessories. As a result of the death of one of the leading stockholders, the company dissolved and was eventually worked by others.

James H. Houston managed some placer claims near Falls Creek under the Houston Dredge Company in 1910. They prospected on lower Falls Creek during 1911, and Houston also interested some English capitalists in the Falls Creek placers. In 1912, Houston and his crew diverted the water of Falls Creek so they could mine the ground on the lower portion of the creek. A 1500-foot long flume diverted water from Clear Creek to Falls Creek. In 1914, the company installed a dredge, a hydraulic plant, and 50,000 feet of lumber for the company. The company's holdings encompassed 40,000 acres.

Placer Mining on the Kenai River, 1911-1914: Many placer claims were located along the Kenai River and its tributaries of Cooper Creek and Russian River between 1911 and 1914. Charles Cunningham staked numerous placer claims on the Kenai River, about a mile below Cooper Creek. The gold was observed in a formation of loose, black slate that early prospectors had failed to notice. Shortly after, all of the ground bordering the river from Kenai Lake to Cook Inlet was staked as possible dredging ground. The Cunningham property was bonded to Charles Hubbard, who acted as manager of the Kenai Dredging Company. In January 1911, Hubbard sold the Cunningham group of placer mines to British financiers, the Pierson syndicate. The British group in turn sold to the Oroville, California dredging company. Two dredges were ordered for the Kenai Dredging Company. The smaller one arrived in June 1911, but was ineffective due to its size, and a larger one was needed. A larger dredge was ordered. The dredge presented challenges to install, mainly due to its size, but was installed during the summer of 1911. The dredge operated to expectation during the 1912 season by processing 700 cubic yards of gravel per day.

Hubbard had aroused the interest of several German barons with his mining property. By the end of June 1912, they had obtained 320 acres of dredging ground on the Kenai River. By October, excitement had spread over the Kenai River prospects so much so that some individuals rushed in to relocate and jump claims. However, the onset of World War I prevented any significant gold recovery on the upper Kenai River. The number of miners dropped off with the rising costs of supplies and labor. A small group of miners operated the claims on a small scale.

Lode Mining Near Hope and Sunrise, 1911-1914: Although some miners had located quartz lodes in the Hope-Sunrise district, no historically significant lode mining occurred until John Hirshey discovered four quartz claims at the head of Palmer Creek in 1911, where he uncovered a six-foot vein with gold visible in all the quartz. The news of this discovery set off a stampede of miners from Hope and Sunrise to the area. In October of 1911, Hirshey staked off another quartz claim and a mill site. From this small start, he developed the Lucky Strike, also known as Hirshey, mine into the most consistent lode gold producer of the Kenai Peninsula.

Lode Mining in the Moose Pass Area, 1906-1915: The California-Alaska Mining Company of Falls Creek assumed the Skeen-Lechner property on Falls Creek in 1908. In 1911, they installed the first stamp mill to operate on the Kenai Peninsula. Other equipment obtained included a Ford crusher, automatic feeder for the stamp mill, and a concentrator. A Pelton waterwheel furnished power to the machinery. However, because the company had no experienced mill man, the mill operated sporadically. The company was finally foreclosed upon, and Frank P. Skeen and John Lechner recovered the property.

The nearby Kenai Quartz group was discovered by John and Charles Stevenson and owned by the Stevensons and A.C. Gould of Seward. The Stevensons originally staked the Black Butte vein in 1906. In 1907, they staked two other veins, the Moon Anchor veins, but never developed them.

In July 1910, James R. Hayden and his associates took an option on the property and let a contract to L. Walker and Albert Roberts to run a 200-foot tunnel on the lowest outcrop of the Black Butte Number Two claim. In November 1910, the Hayden consortium organized these and other claims into the Kenai-Alaska Gold Company, or the Crown Point Mine. The property consisted of two 20-acre quartz-mining claims, three 160-acre placer claims, and an option to purchase four more mining claims. A five- stamp mill was installed June 1911. Other machinery installed included an ore crusher, an automatic ore feeder, and a grizzly ore screen. The stamp mill became operational in August. The mill crushed and treated five to six tons of ore in an 8-hour shift. The ore was estimated in excess of $100 per ton. By the time the mill closed, in October 1911, it had yielded approximately $10,000. In early 1912, the company purchased equipment for an aerial tram. By September, the first aerial tram system was in operation on the Kenai Peninsula. During 1913, the stamp mill operated 24 hours a day. A snow slide damaged the tram system during the winter of 1913-1914. It was repaired and restarted in June 1914. Twenty men were hired for the summer operations.

A third mine was established at Falls Creek during the early 1910s. This was the remaining property of Frank Skeen, John Lechner, and L.F. Shaw, after they sold some of their claims to the California-Alaska Mining Company. The mine lay between the Alaska-California Mine and the Crown Point Mine and retained the name Skeen-Lechner Mine. Work continued on developing the mine in 1911. In 1911, work consisted mainly of tunneling, setting up a camp, and building a road from the California-Alaska mining camp to the Skeen-Lechner Company. A quartz mill was bought from the Seward Gold Company and moved to Falls Creek. The company was incorporated in 1912. During 1913, two stamp mills and a 3,000-foot tram system were installed from the mine portal to the processing plant. Thirty men worked through the winter of 1913-1914. A roller mill was added in 1914. This processed tailings left by the stamp mill. This enabled the company to produce a brick of gold bullion each month.

Several mines were in operation northwest of Moose Pass in 1910. Considerable activity occurred on the claim called Meat-in-the-Pot, located by John Gilpatrick and A.F. Sprague. In 1910, the owners incorporated and the mine became known as the Wanowky Gold Mine. The mine encompassed an area of 820 acres, with 340 acres in quartz claims and 480 acres in placers. Three veins had been analyzed in 1910, a large vein of blue quartz, a smaller parallel vein of rose quartz, and a ledge of decomposed quartz between the two. An extremely valuable rose quartz vein intersected all three. A prospectus estimated the total value of the claim at $13 million. By August of 1910, the company had completed 650 feet of tunnel work, and in 1911, a five-stamp mill was added. In April 1912, the mine was assumed by several men from Victoria, B.C. and renamed the Kenai Moose Company.

John Gilpatrick was involved with another quartz claim at Moose Pass, along with John Baughman. This claim was called the Lisbon. They used an arrastra to process gold. Felix Brown mined on the Gilpatrick claims in 1915. He brought one and one-half tons of ore to Seward that fall. Jack Ronan also operated a mine in the Moose Pass district. He processed four and one-half tons of quartz yielding more than 80 ounces of gold.

In 1909, staking began in a new area near Grant Lake. Frank Skeen recorded two quartz claims in 1909; however, no further claims were staked there until 1911 when Frank Case and his partner, Clarence Whitney, recorded five quartz claims, one placer claim, and a water right on Grant Lake. The Grant Lake Mine was incorporated in 1912. Five gold bearing veins had been located on the property. The Grant Lake property passed to Frank Case, Clarence Whitney, Alfred Harper, and G.L. Judson, each having one-quarter interest in the mine. In 1914, James Hayden had a crew of men working for him at the Case-Whitney mine at Grant Lake. He shipped three tons of ore to Seattle, yielding $234 per ton.

Lode Mining on Porcupine Creek, 1911-1914: A new area of lode exploration opened around the end of 1911. E.E. Schoonover located two quartz claims on Porcupine Creek, at the south end of Kenai Lake. The claims were named Primrose 1 and 2. He deeded half of his interest to Herman Waugh in January 1912. In February, he deeded another fourth interest to Alfred Rosness.

Schoonover owned other claims on Porcupine Creek in partnership with Dan Rice. Rice had staked his claims in 1911. It was reported that two tons of ore from the Schooner-Rice property yielded nine ounces of gold. Schoonover sold half his interest in that property to Mrs. A.C. Gould. In April, E.E. Schoonover and H.D. Waugh sold the claims Primrose 1 and 2 to Emily Gould. Herbert Tozier became the mining superintendent of mining operations at Primrose. With the addition of more ore-crushing machinery, the mine was milling three to four tons of ore each day. By October 1912, the Primrose mine had five tunnels and an inclined shaft. Several additional improvements including the construction of three and one-half miles of road from Kenai Lake to the mine, addition of a stamp mill and concentrator, 300 feet of track connecting the mine with the mill, a waterpower installation, and five permanent buildings were incorporated into the property. The Primrose worked through 1913, processing ore with its small mill.

After selling out his share of the Primrose mine, Dan Rice devoted his efforts developing the Bluebell lode mine, also found on Porcupine Creek. Rice installed a Little Giant stamp mill and other equipment on the property. In February 1913, the Eureka Mining and Development Company of Seward, Alaska was organized. It assumed control of the Bluebell Mine at Porcupine Creek. A small mill, operated by one person was installed at the Bluebell in 1914. It operated day and night through the season. Charles Hubbard obtained ownership of the claims in 1914.

Post-World War I Mining Activity on the Kenai Peninsula and Turnagain Arm: Mining activity was depressed in Alaska after the First World War. However, some mine owners did manage to improve their properties. The producing placer mines in the Kenai Peninsula region were mostly situated in the vicinity of Hope, Sunrise, and Girdwood, all considered small operations. The largest camp yielded only a few thousand dollars each year, and some only yielded hundreds of dollars per year. During the 1920s and 1930s some activity also took place on the placer mines of the Moose Pass area, most notably on Canyon and Mills Creeks. Huber and Kurtak (2001) report that, "[B]y 1931, only about 20 men were actively engaged in placer mining on local creeks."

A group of Californians arrived in Alaska to participate in mining one of the Mathisons' properties in 1936; these were the old Knight Association Claims, originally located in 1909. The group consisted of Leo Sears, Donald Warth, Fred Mill, Louis Alves, Louis Tustin, and Irvin and Joyce Rheingans. They called the claims they worked, which were situated on Rimrock and Resurrection Creeks about five and one half miles south of Hope, the Highland [Hiland] Creek Mining Company. The Californians built three cabins, which are largely extant today, on the proximal Bench Claim No. 1 west of Resurrection Creek. These claims are known today as Mull Claims (named for a claimant in the 1970s) and also referenced as the Pearson Mine (for a claimant in the 1950s and 1960s). Hydraulic giants were used at the Highland Mining Company claims for two years, but the pay streak was never located. Therefore, the group decided to return home.

The great interest in large consolidations and corporate financing had dissipated with the end of the First World War. But several miners continued their placer operations along the Kenai River and its tributaries on an individual basis. In the later 1930s, Charles Hubbard re-staked some of the original Cunningham claims on the upper Kenai River, the property he had owned earlier. But the onset of World War II prevented any substantial gold production. During the 1920s and 1930s, a small amount of placer mining also took place in the Seward area. Some placer mining also occurred on the lower Cook Inlet beach during that time period.

Lode mining also continued in the time period between the First World War and World War II. John Hirshey's mine, the Lucky Strike (or Hirshey-Lucky Strike), located on Palmer Creek in the Hope-Sunrise mining district, was the most prominent lode mine during the period between the world wars. The mine, which employed the cyanide leaching technique, operated until 1939, with its most productive years being 1924 and 1929.

John Gilpatrick remained active in the Moose Pass District. In 1938, Robert L. Hatcher, one of the best-known prospectors and mine owners of Alaska, bought out the Gilpatrick property. However, the entrance of the United States into World War II in 1941 precluded this mine from becoming as productive as thought possible. Grant Lake was also the site of lode mining during the 1920s and 1930s. Al Soller had four quartz claims at the lake, and the Grant Lake Mining Company had two claims above the lake at the alder line of the mountain. Frank Case had worked these claims 28 years earlier.

In the spring of 1933, several Californians invested money in the hard-rock claims of Falls Creek, particularly the Discovery Claims 1, 2, 3, and 4. The mine could be found just above the timberline at the head of the canyon. In the spring of 1934, the Old Greek Mine (Falls Creek) also reopened under the new ownership of Wyman Anderson, Ivan Wilson, and Marvin Wilson, after a twenty-year shutdown. They installed a Rib-Cone ball mill, which was rated to process two tons of ore daily. Other lode mines in operation prior to World War II included the Crown Point mine, operated by the Tulare brothers, and the East Point Mine, discovered by John Dryer. Dryer had previously been a packer for the Crown Point mine. He performed some development work on the East Point Mine and recovered a few ounces of gold. Charles Hubbard and his wife Ora eventually obtained the Primrose mine located along a trail that took off from what was then the end of the Seward-Kenai Lake Road. Litigation with the Primrose Mining Company and the lack of improved roads to the mine precluded any real production until August 1935.

Small-scale mining activities on the Kenai Peninsula and Turnagain Arm persisted through the 1930s although some companies ceased operations because of insufficient return on investments or other problems. The United State's entry into World War II brought a virtual end, not only to Kenai Peninsula gold mining, but to commercial gold mining throughout Alaska. Many gold mines were closed during the war to allow for mining of strategic metals, such as copper, tin, lead, and zinc. Also, placer gold miners were specifically excluded from obtaining equipment or supplies to maintain or repair their machinery under Preference Rating Order No. P-56. After the war, wage scales increased due to the postwar economic boom, while the price of gold remained constant at $34 per ounce. Interest in placer mining in the area did not pickup again until the 1970s and 1980s. Today Kenai Peninsula and Turnagain Arm mining is largely recreational in nature (Huber and Kurtak 2001).

Production Records

Nelson and others (1984:8) report that 67,450 ounces of placer gold was recovered from the north-central Kenai Peninsula and Girdwood area between 1895 and 1910. In order of descending importance, the principal streams known to have produced placer gold between 1885 and 1982 on the Kenai Peninsula and the northern side of Turnagain Arm are Crow Creek, Canyon Creek, Resurrection Creek, Palmer Creek, Lynx Creek, Bear Creek, Mills Creek, Gulch Creek, Sixmile Creek and Cooper Creek. Smaller production figures are reported from Quartz Creek, Bertha Creek, Silvertip Creek, Crescent Creek, California Creek, Hargood Creek, Seattle Creek, Falls Creek, Stetson Creek and the Kenai River (Nelson and others 1984:17). Production estimates as of 1982 are summarized in Table 7.

Nelson and others (1984) list 13 lode gold mines with known production records on the Kenai Peninsula and 2 situated north of Turnagain Arm in the vicinity of present day Girdwood (refer to Figure 17; Table 8). Girdwood's original location (the town was moved after the 1964 Earthquake) was initially called Glacier and developed as a boomtown associated with the historic mining era. The largest producers on the Kenai Peninsula and Turnagain Arm were the Hirshey-Lucky Strike, the Monarch and Jewel in combination, the Primrose, the Gilpatrick, and the Crown Point mines. Lode gold production from the Kenai Peninsula and Turnagain Arm mines was modest, indeed, when compared to the output of Southeast and Prince William Sound. The region's largest producer was the Hirshey-Lucky Strike, which yielded just 5,545 ounces of gold.

Table 7
Production Estimates for Principal Streams Producing Placer Gold on the Kenai Peninsula and Turnagain Arm (1895-1982)

Stream	**Estimated Production (Ounces)**
Crow Creek*	42,500
Canyon Creek	37,700
Resurrection Creek/Palmer Creek	26,800
Lynx Creek	7,500
Bear Creek	5,000
Mills Creek	4,000
Gulch Creek	2,150
Sixmile Creek	1,750
Cooper Creek	1,150
Quartz Creek	800
Bertha Creek	700
Silvertip Creek	650
Crescent Creek	350
California Creek*	300
Hargood Creek	300
Seattle Creek	200
Falls Creek	200
Stetson Creek	200
Kenai River	100
Others	650
Total	**133,000**
* Streams located north of Turnagain Arm.	
Source: Nelson and others 1984:17	

Table 8
Production Records for Lode Gold Mines on the Kenai Peninsula and Turnagain Arm (1910-1982)

Mine	Reported/Recorded* Gold Production (Ounces)	Reported/Recorded* Silver Production (Ounces)
Hirshey-Lucky Strike**	5,545	4,699
Monarch and Jewel***	4,932	996
Primrose	4,000	
Gilpatrick	3,405*	1,099*
Crown Point	3,125*	634*
Skeen-Lechner	1,796*	582*
East Point	1,725*	479*
Heaston-Oracle	1,274*	256*
Case (Grant Lake)	792*	123*
Ronan & James	557*	137*
Hirshey & Carlson**	408*	24*
Downing	150*	
Nearhouse	102	3
Falls Creek	65	13
Seward Bonanza	65	
Totals	**27,941**	**9,045**

* Production records available.
** Both the Hirshey-Lucky Strike and Hirshey & Carlson Mines have Swetman or Swetmann as alternate names.
*** Located north of Turnagain Arm.
Source: Nelson and others 1984:17; Jansons and others 1984.

A COMPARISON OF PRODUCTION HISTORIES

Mineral production throughout the regions considered above varied greatly. Aggregated production histories for each region are provided in Table 9. (Uranium is discussed in the text but not included in Table 9.)

Gold: The Juneau Mining District was, by far, the leader in gold production (6.8 million ounces) followed in decreasing order of importance by the Chichagof and Baranof Islands Area (810,370 ounces), the Kenai Peninsula and Turnagain Arm (160,941 ounces) and Prince William Sound (144,426 ounces). It will be recalled (as discussed above) that the Juneau Mining District is second only to the Fairbanks District, which produced over 8 million ounces of gold, in terms of statewide gold production. Total statewide production between 1880 and 2000 is estimated at 35.8 million ounces of gold (Szumigala and others 2000:63-64). Thus, gold extracted from the Juneau Mining District accounts for close to 20 percent of Alaska's total gold production through 2000.

Table 9
Comparative Production Histories (M = Million)

Gold (oz)		Silver (oz)		Copper (lb)		Lead (lb)		Zinc (lb)		Palladium (oz)		Tungsten (lb)		Gypsum (tons)	
Total	**FS (%)**	**Total**	**FS (%)**	**Total**	**FS (%)**	**Total**	**FS (%)**	**Total**	**FS (%)**	**Total**	**FS (%)**	**Total**	**FS (%)**	**Total**	**FS (%)**
Juneau Mining District (37 past producers, 11 appear to be within the Tongass National Forest)															
6.8M	51,864 (0.8)	2.7M	9,111 (0.3)			45.6 M	100 (0.0002)								
Tracy Arm-Fords Terror Wilderness / Windham Bay Area (6 past producers, all appear to be within the Tongass National Forest)															
28,000	28,000 (100)														
Stikine Area (2 past producers, both appear to be within the Tongass National Forest)															
+	+ (100)														
Chichagof and Baranof Islands Area (9 past producers, all appear to be within the Tongass National Forest)															
810,370	810,370 (100)	230,400	230,400 (100)											500,000	500,000 (100)
Ketchikan Mining District (38 past producers, 32 appear to be within the Tongass National Forest)															
63,750	58,914 (92)	403,677	364,121 (90)	49 M	43.9 M (90)	27 M	27 M (100)	110,448	110,448 (100)	20,540	20,540 (100)	85,760	85,760 (100)		
TOTALS															
7.7 M	**949,148 (12)**	**3.3 M**	**603,632 (18)**	**49 M**	**43.9 M (90)**	**72.6 M**	**27 M (37)**	**110,448**	**110,448 (100)**	**20,540**	**20,540 (100)**	**85,760**	**85,760 (100)**	**500,000**	**500,000 (100)**
Prince William Sound and the Copper River Delta (43 past producers, 20 appear to be within the Chugach National Forest)															
144,426	31,334 (22)	1.7 M	5,886 (0.4)	208.7 M	391,414 (0.03)										
Kenai Peninsula and Turnagain Arm (34 past producers, 32 appear to be entirely within the Chugach National Forest)															
160,941	160,541 (99.8)	9,045	9,045 (100)												
TOTALS															
305,367	**191,875 (63)**	**1.7 M**	**14,931 (0.9)**	**208.7 M**	**391,414 (0.03)**										
GRAND TOTAL															
8.8 M	**1.1 M (13)**	**5 M**	**618,563 (12)**	**257.7 M**	**44.3 M (17)**	**72.6 M**	**27 M (37)**	**110,448**	**110,448 (100)**	**20,540**	**20,540 (100)**	**85,760**	**85,760 (100)**	**500,000**	**500,000 (100)**
TOTAL STATEWIDE PRODUCTION															
35.8 M		**130 M**		**1.4 Billion**		**1.7 Billion**		**8.7 Billion**		**Undetermined***		**85,760**		**Undetermined**	

* Aside from possible minor placer production, the Salt Chuck Mine is likely Alaska's only (and definitely the state's most important) palladium producer.

Silver: The Juneau Mining District also led in silver production (2.7 million ounces) among the regions considered, followed by Prince William Sound (1.7 million ounces), the Ketchikan Mining District (403,677 ounces), and the Chichagof and Baranof Islands Area (230,400 ounces). Total statewide production of silver between 1880 and 2000 was 130 million ounces (*ibid.*). The Juneau Mining District produced about 2 percent of that total.

Copper: Prince William Sound mines produced 208.7 million pounds of copper. The Ketchikan Mining District produced only about one quarter of that amount (49 million pounds). In contrast as noted above, the Kennecott mines complex produced over a billion pounds of copper. Total statewide copper production between 1880 and 2000 is estimated to aggregate to 1.4 billion pounds (*ibid.*). Prince William Sound mines accounted for close to 15 percent of that total.

Lead: The Juneau and Ketchikan Mining Districts are the only regions under consideration where lead was recovered. Respectively these two regions produced 45.6 million and 27 million pounds of lead. Total statewide lead production between 1880 and 2000 is estimated at 1.7 billion pounds; most of this production post-dates 1988 and thus, did not occur historically (*ibid.*). The Juneau Mining District accounts for 2.7 percent of the state's total lead production through 2000.

Zinc, Tungsten, Uranium, and Palladium: The Ketchikan Mining District was alone among the regions considered in producing zinc (110,448 pounds), tungsten (85,760 pounds), uranium (1,330,000 pounds), and palladium (20,540 ounces). Total statewide zinc production (most of which occurred post-1988 and thus is not historic) is estimated at 8.7 billion pounds (*ibid.*). The Ketchikan Mining District accounts for just a minute fraction of a percent of this total. The Riverside Mine in the Ketchikan Mining District is understood to be Alaska's only productive tungsten mine (Maas and others 1995; Roppel 1991:113). The Ross-Adams Mine on Prince of Wales Island in the state's only uranium mine (Maas and others 1995).

Szumigala and others (2000:63-64) include platinum but not palladium among the primary metals produced in Alaska between 1880 and 2000. Thus, we are unable to provide a comparable statewide total production of palladium to contrast with the output from the Ketchikan Mining District (all from the Salt Chuck Mine). However, Freeman (2002:4-5) reports that there are 203 known mines, prospects, and unworked occurrences throughout Alaska that reportedly contain platinum group elements (PGEs). PGEs include platinum, palladium, rhodium, iridium, osmium and ruthenium. Of the known sources, 116 are alluvial in nature and associated primarily with placer gold prospects. The most important of these is Goodnews Bay in Western Alaska, which was the United States' "primary domestic source of platinum from the mid-1930s through the mid-1970s" (*ibid.*, citing Mertie 1969). Of the 87 known lode PGE sources in Alaska, only the Salt Chuck Mine is reported to have been productive to date (Freeman 2002:4). Thus, it would appear that Salt Chuck in the Ketchikan Mining District is Alaska's only hard rock palladium producer. Salt Chuck also produced 2,500 ounces of platinum (*ibid.*).

Gypsum: A single mine in the Chichagof and Baranof Islands Area produced 500,000 tons of gypsum. Szumigala and others (2000) do not include gypsum among the specific industrial minerals for which they tabulate production. Thus, a statewide comparison is not provided here.

Determining the current ownership of mines and prospects within the regions considered was beyond the scope of this project. We did, however, have jurisdictional information for mines included in the hazards evaluation and for mines recorded in the AHRS system. Forest maps, which delineate private and state in-holdings, also were examined in order to obtain a rough count of the numbers of productive mines that appear to fall within the current Forest boundaries. We estimate that there are 60 past producers within the Tongass National Forest and 52 past producers within the Chugach National Forest. These include both lode mines and placer streams.

Tongass National Forest

There are 37 past producers (the majority are lode mines with just a few placer streams) within the Juneau Mining District. Eleven of the lode mines appear to be located on lands currently administered by the Forest Service, but the three principal producers (the Treadwell complex, the A-J and the Alaska-Gastineau) all are situated primarily on private land. The Juneau Mining District has produced 6.8 million ounces of gold, 2.7 million ounces of silver, and 45.6 million pounds of lead in the aggregate. Just a fraction of a percent of these commodities were derived from mines within the Tongass National Forest as follows: 0.8 percent of the gold production, 0.3 percent of the silver production, and just 0.0002 percent of the lead production.

Total reported production from the Tracy Arm-Fords Terror Wilderness / Windham Bay Area is about 28,000 ounces of gold. The Sumdum Chief Mine accounts for most of this production with small contributions from three other lode mines and two placer streams. All of these past producers are on lands administered by the Forest Service, as are the two productive mines within the Stikine Area. Production records are not available for the Stikine Area mines. The nine productive mines in the Chichagof and Baranof Islands Area also all are within the Tongass National Forest. Total production from this area aggregates to 810,370 ounces of gold, 230,400 ounces of silver, and 500,000 tons of gypsum.

Of the 38 past producers within the Ketchikan Mining District, 32 appear to be situated on Forest Service-administered land. Aggregated production figures from the entire Ketchikan Mining District are as follows: 63,750 ounces of gold, 403,677 ounces of silver, 20,540 ounces of palladium, 49 million pounds of copper, 27 million pounds of lead, 110,448 pounds of zinc, and 85,760 pounds of tungsten. Mines within the Tongass National Forest account for 100 percent of all the lead, zinc, palladium, and tungsten produced, and for 92 percent of the gold and 90 percent of the silver and copper produced within the regions under consideration.

Chugach National Forest

Prince William Sound and the Copper River Delta contain 43 past producers, all lode mines. Twenty of these appear to be situated on lands administered by the Forest Service today. Aggregated gold production totals 144,426 ounces; 22 percent of this material came from mines currently on the Chugach National Forest. Prince William Sound mines produced 1.7 million ounces of silver, but just 0.4 percent of this production was from mines currently within the Forest. Total copper production from Prince William Sound aggregates to over 208 million pounds, with the Beatson and Ellamar mines, which are privately owned today, accounting for the bulk of the recovered material. Just 0.03 percent of the copper came from mines currently administered by the Forest Service.

Portions of the Kenai Peninsula and Turnagain Arm that are within or proximal to the Chugach National Forest contain 15 productive lode gold and silver mines and 19+ streams from which placer gold production is reported. All of the lode mines are situated on Forest Service-administered lands. Just California Creek and a stretch of the Kenai River extend beyond the Forest boundaries. Total placer production aggregates to 133,000 ounces of gold. Even if we assume all of the gold from California Creek (300 ounces) and the Kenai River (100 ounces) was obtained beyond Forest boundaries, streams within the Forest still account for 99.6 percent of the total placer production. Lode production aggregates to 27,941 ounces of gold and 9,045 ounces of silver.

SUMMARY

The history related above is used as the basis for defining important themes, people, and engineering accomplishments or technological innovations as they relate to the history of mining in the Tongass and Chugach National Forests. Eleven specific themes are identified. Guidance is provided for identifying significant individuals and engineering or technological accomplishments beyond those covered above.

Themes and Periods of Significance

Mining related themes and periods of significance for Alaska's two National Forests include:

- Pre-contact Native mineral exploration and extraction (dates undetermined)
- Mineral exploration and extraction in the Juneau Mining District, 1870s-1944
- Mineral exploration and extraction in the Tracy Arm-Fords Terror Wilderness / Windham Bay Area, 1869-1940s
- Mineral exploration and extraction in Chichagof and Baranof Islands Area, 1870s-1942
- Mineral exploration and extraction in the Stikine area, 1900-1930s
- Mineral exploration and extraction in the Ketchikan Mining District, 1867-1950s
- Gold mining in Prince William Sound, 1880s-1920s
- Copper mining in Prince William Sound, 1890s-1920s
- Russian and early American gold prospecting on the Kenai Peninsula, 1850s-1890s
- Kenai Peninsula and Turnagain Arm Gold Rush, 1895-1898
- Post-gold rush mining activities on the Kenai Peninsula and Turnagain Arm, 1900-1940s

Properties associated with the first theme may or may not be identified within one or both Forests in the future. None have been definitively recorded to date, thus the lack of a specified period of significance. The rest of the themes are organized by region as they were presented in this chapter to reflect current geographically delineated reporting units used by economic geologists and minerals specialists.

Periods of significance follow directly from the dates when prospecting and mining activities are known to have occurred within each region. Because a variety of minerals were exploited throughout the Tongass National Forest and a number of mines produced a variety of those minerals, it seemed reasonable not to attempt a breakdown by targeted commodity. In contrast, there is a clearer spatial break between gold and copper mines in Prince William Sound and the Copper River Delta (although the "copper mines" also typically produced gold and sometimes silver). Productive gold mines are confined to the northern Sound excepting the McKinley Lake Mine on the Copper River Delta. Mines at which copper was the principal targeted commodity are situated south of the gold mines.

Whether or not evidence for Russian mining activities or sites that reflect the earliest American efforts on the Kenai Peninsula exist and can be recognized for what they are remains to be seen. Should such properties be discovered, however, they would be important touchstones to some of the earliest documented mining efforts in Alaska. Thus, a separate theme was defined for such properties. Properties associated with the Turnagain Arm Gold Rush will reflect placer mining exclusively whereas those associated with post-gold rush operations will be associated with both placer and lode gold mining.

Significant Individuals

Various individuals were identified in the preceding discussions as having been associated with the mining industry throughout the regions under consideration. Some of these people are regarded as having played a significant role in the development of that industry. Others are significant for their association with other aspects of American history such as finance or commerce, which are related but distinct from mining *per se*. It is not possible to compile a complete list of significant individuals who might have direct associations with mining properties throughout Alaska's National Forests because that information is not available in the published literature. People that were of national or international renown are relatively apparent. The international financiers and captains of industry (robber barons to some) Bernard Baruch, J.P. Morgan, the Rothchilds, and the Guggenheims spring instantly to mind. But much more historical research than is currently available would need to be done in order to identify many of the people whose accomplishments were at the state or local level.

It *is* possible, however, to list some candidates and to direct the reader to sources where additional research may be initiated. Chapter 6 provides guidance on how to recognize truly significant individuals, document their accomplishments, and decide whether or not they had an important and direct association with a given mining property. Evaluators assessing a specific mining property are advised to first identify people known to have been associated with the property and then to research those people to determine whether they meet the quite stringent requirements for true significance laid out in National Register Bulletin 32, *Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* (Boland n.d.).

In 1997 the Alaska Mining Hall of Fame Foundation was established and six men who had already been inducted into the National Mining Hall of Fame were selected as "charter inductees" to the Alaska Mining Hall of Fame (Hawley 1998). Three of these men worked in the regions that comprise Alaska's National Forests. They include John Treadwell and Frederick Worthen Bradley, both associated with the Juneau Gold Belt, and Stephen Birch who is associated with the Copper River Delta because of his efforts at railroad construction there related to the Kennecott Mines.

In 1998, the Foundation concentrated on individuals associated with mining in the Alaskan Interior including Howard Franklin who also worked in Southeast. The following year they inducted four men involved in the discovery of the Juneau gold mines—Kawa.ée, George Pilz, Richard Harris and Joe Juneau—along with innovative engineers Bartlett Thane, and Livingston Werneke. A subsequent inductee to the Alaska Mining Hall of Fame with ties to the Chugach National Forest is Wesley Earl Dunkle, an innovative mining geologist and developer who worked in Prince William Sound at the Beatson Mine as well as at the Kennecott Mines for the Guggenheims (among his numerous other mining ventures). In 2001 Benjamin Duane Stewart, a long-time Territorial Commissioner of Mines with ties to Juneau, also was inducted.

Over 100 men and women have been nominated to the Alaska Mining Hall of Fame. Thus far just the earliest and most well known individuals have actually been inducted, but many of the nominees likely would be considered significant individuals. Charles (Chuck) Hawley, who chairs the Alaska Mining Hall of Fame Foundation's honors committee, and Rolfe Buzzell with the OHA suggested some possible candidates from the regions under consideration; additional possibilities were identified in sources used to prepare the history related above. Mr. Hawley suggested that as a general rule the original locator of an important mine should be considered significant if he or she also was instrumental in later promotion or development efforts at that mine. Later promoters and developers of important producers also might qualify if their efforts were substantial and important aspects of the mines' productive success.

For the Juneau Gold Belt, individuals to consider include Pierre "French Pete" Erussard, the discoverer of the Paris lode (part of the Treadwell mines complex), Bill Mecham (an important early prospector), and the partnership of Campbell, Coons and Harkrader, the most successful small placer operators in the region, among many others. For the Windham Bay Area, Mix Silva and Alexandre "Buck" Choquette, both of whom who were very early prospectors, and Herman Trip, who was associated with the Sumdum Chief Mine are possible candidates. The developer of the Chichagof Mine is another possibility as are the discoverers and developers of major producers in the Ketchikan Mining District. DeArmond (1980) provides a listing with brief bibliographies of 300 people associated in one way or another with the establishment of Juneau as a mining center. Another source for biographical information on Alaska gold rush pioneers of the Juneau-Douglas area is Darlin and Ruottsala (1998). Some of these people may qualify as significant individuals. Broader coverage is provided by Redmond (1989) and Roppel (1991), both of whom discuss individuals associated with the mining industry throughout Southeast.

In addition to the Guggenheims, other potentially significant individuals associated with Prince William Sound are prospectors Peder Johnson and John Bremner, A.K. Beatson (who developed the region's most important mine, which is named for him), M.O. Gladhaugh (who discovered the Ellamar Mine), W.A. Dickey (associated with the Rua Cove and Threeman Mines), H.E. "Red" Ellis (discoverer of the Cliff and Midas Mines), D.G. and Mary G. Debney (both associated with the Midas Mine), and Helen van DeCamp (who was associated with the Latouche Island Mines). The McKinley Lake Mine in the Copper River Delta area has been determined eligible for National Register listing under criterion B for its association with a prominent Cordova physician, businessman and politician, Dr. Will Chase. For Prince William Sound and the Copper River Delta, the best general reference for potentially important people is Lethcoe and Lethcoe (1994).

Persons important to the mining history of the Kenai Peninsula and Turnagain Arm include the Mathison and Carlson families, Charlie Herron who promoted dredging on Sixmile Creek, Robert Hatcher, John Gilpatrick, John Hirshey, Charles G. Hubbard, Frank P. Skeen and his partner John Lechner, Simon (Sam) Wible who pioneered hydraulic mining on Crow Creek and on the Kenai Peninsula, and Nels. O. Anderson the general manager of the Canyon Creek Development Corporation and the architect of the highly ambitious though ultimately unsuccessful effort to dam Canyon Creek in the 1910s and 1920s. Barry (1997) is the most comprehensive source for the Kenai Peninsula. Two individuals who lived on the Kenai Peninsula also wrote autobiographies that contain information about their numerous acquaintances. One was a miner, Albert Weldon Morgan; his autobiography was edited by Buzzell (1994b). The other was Dennie D. McCart who started out as a miner working out of Hope and subsequently established the first truck line to run between Hope and Seward (McCart 1983).

Engineering and Technology

Information on significant engineering or technological applications and innovations throughout the regions considered came principally from the author's discussions with Ken Maas (Tongass National Forest), David Stone (Alaska Electric Light & Power Company of Juneau), and Logan Hovis (National Park Service). Conceivably, additional examples are mentioned in the descriptions of individual mines published by the BOM and BLM as part of the minerals assessment for the Tongass National Forest. To a lesser extent (because the available descriptions are very much abbreviated compared to those available for the Tongass), additional innovations may be identified in the minerals studies for the Chugach National Forest as well.

The most obvious, significant engineering accomplishments in Southeast were the sophisticated production systems developed at the three major Juneau area mines (Treadwell complex, Alaska Gastineau, and A-J) for the extraction of gold from extremely low grade ore. Southeast also was the scene of a number of "firsts" including the first recorded mining claim in Alaska for the Copper Queen prospect on Prince of

Wales Island, Alaska's first lode gold mine and the site of Alaska's first stamp mill at the Stewart Mine in Silver Bay near Sitka, and the adoption of flotation for concentrating copper at the Salt Chuck Mine. The Kensington Mine in the Juneau Gold Belt had the first locomotive to be used at an Alaskan mine. The first use of a diesel engine also occurred in the Juneau Gold Belt, at the Jualin Mine.

Southeast also contained the only smelters ever established in Alaska, in Hadley and Coppermount on Prince of Wales Island. The Riverside Mine near Hyder is Alaska's only tungsten mine; and the Ross-Adams Mine on Prince of Wales Island is the state's only uranium mine. The only known Chilean mill in Southeast was at the Jensen Mine in the Windham Bay area. (Chilean mills are more common in the regions that comprise the Chugach National Forest.) Finally, it may be noted that use of the cyanide leaching technique is rare throughout both Forests; thus its use at the Hirshey-Lucky Strike Mine is remarkable.

Page intentionally left blank.

Chapter 5

Property Types

CHAPTER 5. PROPERTY TYPES

"The identification of historic contexts should emphasize those contexts associated with extant historic properties likely to be encountered during field surveys." (Noble and Spude 1992).

A highly important step in identifying properties worthy of preservation efforts is development of a classification scheme for defining those properties in the field. In this chapter, *basic property types* are distinguished from *specific property types* and their constituent *features* (components, attributes or elements) and *artifacts*. The chapter begins with a consideration of terminology employed by the cultural resource community contrasted with that used by miners and mining specialists for basic property types. Mining technologies used in Alaska are described next. Then current mining inventories are reviewed, with an emphasis on recorded attributes (that is, the types of features actually observed in the field). Finally, a typology of specific mining properties is proposed.

BASIC PROPERTY TYPES

In Chapter 1, the five basic property types that may be eligible for National Register listing are identified: *sites, buildings, structures, districts* and *objects*. This is a litany so familiar to archaeologists and other cultural resource specialists that they sometimes fail to realize that "laymen" and members of other professions (like miners and mining specialists) may use some of these terms very differently. These five basic property types are defined as follows in guidance issued by the National Park Service (National Register Bulletin 15: IV, 1995). National Register Bulletin 16A (*How to Complete the National Register Nomination Form*) and Seifert (2000) (*National Register Bulletin: Defining Boundaries for National Register Properties*) provide explicit guidance on defining boundaries for all five property types.

Site. A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of the value of the existing structure. The Halleck Island Prospect, considered in the pilot field study reported in companion Volume II to this historic context, is an example of an archaeological site as is the Mahoney Mine described by Mobley (2001).

Building. A building, such as a house, barn, church, hotel, or similar construction, is created principally to shelter any form of human activity. "Building" may also be used to refer to a historically and functionally related unit, such as a courthouse and jail or a house and barn. ... If a building has lost any of its basic structural elements, it is usually considered a "ruin" and is categorized as a site. The standing cabins at Mull Claims described in Volume II are buildings. If it retained roof and walls, a construction that housed milling equipment would be classed as a building in National Register parlance; if it had collapsed, it would be regarded as a site (or as one component of a site or district).

Structure. The term "structure" is used to distinguish from buildings those functional constructions made usually for purposes other than creating human shelter. ... If a structure has lost its historic configuration or pattern of organization through deterioration or demolition, it is usually considered a "ruin" and is categorized as a site. ... Examples of structures include ... aircraft ... automobile ... boats and ships ... bridge ... cairn ...canal ... dam ... earthwork ... highway ... irrigation system ... railroad grade ... trolley car ... tunnel ... ." Mining structures would include headframes, hoists, engines, stamp mills and other large equipment unless they were in ruins, in which case they would be components of an archaeological site or district.

District. A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development. Mobley (2001) identifies the related Sealevel, Goo Goo and Gold Banner mines as a historic district. As discussed in Volume II, the aggregated components of the Salt Chuck Mine, hydroelectric facilities, mill operation and residential and other support facilities are regarded as a district. This district could logically be expanded to include the spatially contiguous Rush and Brown Mine because the two were operated together during a portion of the historic period. The Granite Mine and associated power, processing and residential facilities also are described as a district in Volume II. Because the hydroelectric plant (and associated aqueduct and headgates) for the Granite Mine are physically separated from the mine/mill/residential complex, this would be an example of a discontinuous district. The ruins of the boomtown of Sunrise, its associated cemetery, and nearby evidence for placer mining along Sixmile Creek on the Kenai Peninsula are listed on the National Register as a historic district. The Kennecott Mines and associated townsite and mill buildings in Wrangell-St. Elias National Park are described as a historic district and listed as a National Historic Landmark.

In recent years, cultural resource specialists have addressed both designed and rural historic landscapes, which are classed either as sites (if they are relatively small and spatially discrete) or districts (if they are large and spread out). Designed landscapes are the creations of professional planners, designers, architects and the like; they do not ordinarily pertain to mining properties. Rural historic landscapes, however, may well pertain to some accumulations of mining properties. For purposes of the National Register, a rural historic landscape is defined as, "a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features. ... Large acreage and proportionately small number of buildings and structures differentiate rural historic landscapes from other kinds of historic properties" (McClelland and others 1995). The National Register Bulletin developed to provide guidance for evaluating rural historic landscapes by McClelland and others (1995) focuses primarily on agricultural properties. The guidance makes it clear, however, that landscapes resulting from historic mining enterprises also may fall into this special kind of site or, more commonly, district.

Object. The term "object" is used to distinguish from buildings and structures those constructions that are primarily artistic in nature or are relatively small in scale and simply constructed. Although it may be, by nature or design, movable, an object is associated with a specific setting or environment. … Examples of objects include … boundary marker … milepost … monument … sculpture …" A mining claim marker likely should be classed as an object. Conceivably, smaller pieces of mining equipment also might be classed as objects.

The two most problematic terms are "site" and "district," both of which are used very differently in mining parlance. To put this consideration of mining terminology in perspective, additional consideration of mining law is required.

> The major Federal law governing locatable minerals is the Mining Law of 1872 (May 10, 1872), as amended (30 U.S.C. 22-54). This law provides citizens of the United States the opportunity to explore for, discover, and purchase certain valuable mineral deposits on those Federal lands that remain open for that purpose. These minerals include metallic minerals and certain nonmetallic minerals. The law also sets general standards and guidelines for claiming the possessory rights to valuable minerals discovered during exploration. Other provisions provide for the enactment of State laws that are consistent with Federal law. Therefore, most States have enacted laws that prescribe the manner of locating and recording mining claims, tunnel sites, and mill sites on Federal lands within their boundaries. …..
>
> The Mining Law of 1872, as amended, has five elements: (1) **discovery** of a valuable mineral deposit, (2) **location** of mining claims and sites, (3) **recordation** of mining claims and sites, (4) **maintenance (annual work/surface management)** of mining claims and sites, and (5) **mineral patents**. (U.S. Department of the Interior Bureau of Land Management 1996).

Individuals (including corporations, which the Government considers to have the same standing as individuals) wishing to file mining claims must demonstrate a "reasonable prospect of selling minerals from a claim or group of claims (*ibid*). A *mining claim* is a "a particular parcel of Federal land … for which an individual has asserted a right of possession. The right is restricted to the extraction and development of a mineral deposit" (*ibid*). That is, title to the land is retained by the Federal Government unless the claim is patented. As noted in preceding chapters, there are two types of mining claims, lode and placer, and there are two other types of mineral entries, *mill sites* and *tunnel sites*. Mill sites must be located on non-mineral land; their purpose is to support mining operations. Tunnel sites refer to situations where a tunnel is excavated either to develop a known ore deposit or as a discovery mechanism. The important distinction here is that a claim may only be filed if the claimant can demonstrate a reasonable expectation that the parcel contains valuable minerals. Tunnels may be run to explore for buried mineral deposits that may or may not turn out actually to be present. The preceding discussion demonstrates that the term "site" has a very specific meaning under mining law, and one very different from that used by cultural resource specialists.

A conscious effort has been made in this volume to use the term "mining property" rather than "mining site" to cover the full range of physical entities to be assessed for historic significance. It is recognized, of course, that many, if not most, of these properties have deteriorated to the point where they are properly identified as "sites" as that term is used by the cultural resources community, or as sites combined to form "districts." This chapter is devoted to a consideration of specific types of mining properties; these will include both mill sites and tunnels among a host of additional, functionally distinct property types.

Let us briefly discuss the term "district" before turning to a consideration of mining technology. (Also refer to discussion in Chapter 1.) Miners frequently formed their own "mining districts." These kinds of mining districts, organized by often isolated, mining communities, were quasi-political entities created as a form of self-government. These geopolitical entities, a number of which were mentioned in Chapter 4, drew up their own laws and mining regulations (similar to incorporation of a new town).

Economic geologists and mining engineers also identify "mining districts," but they use the term in a geographic sense that may or may not be coincident with miners' geopolitical districts. In Alaska several geographic mining district categorizations have been developed (for example Ransome and Kerns 1954, Cobb 1973, DGGS 1993) (refer to Figure 4). While similar, district names and boundaries do not always correspond entirely when geographic schemes are compared. It is important for researchers to understand that the highly useful mining "district" studies published jointly by the BLM and BOM for Southeast use simplified regional breakdowns variously labeled districts or areas (refer to Figure 3).

The term *district*, as used by cultural resource specialists, will ordinarily identify much smaller entities than those defined either by miners or economic geologists. A simple way to think about these differing usages is to consider Prince William Sound where for example, gold miners established first the Prince William Sound Mining District and later, the Valdez Mining District (among others), both of which encompassed portions of just the northern Sound. But some economic geologists lump the entire Sound plus the Copper River Delta into a single mining district encompassing an estimated 4 million acres or over 6,000 square miles (DGGS 1993). The BLM (n.d.) combines the Sound and northeastern Kenai Peninsula into a single, even larger district roughly coincident with the entire 8,750-square-mile Chugach National Forest.

In marked contrast, the historic mining districts identified by cultural resource specialists and others concerned with heritage preservation will typically include no more than a series of adjacent claims, workings and associated residential areas, or the boomtowns that sprang up during rushes. For example, the Sunrise City Historic District, which was listed on the National Register in 1997, includes the old townsite, the nearby cemetery, and more widely distributed historic sites and encompasses an estimated 45 acres. The

Kennecott Mines National Historic Landmark, arguably the most important historic mining property in Alaska, is considerably larger, encompassing an estimated 16,800 acres (26.25 square miles), and includes the Kennicott townsite, the mill and other support facilities, and several individual mines. Gilbert and others (2001:3) describe the historic district as being 7,700 acres in extent or just 12 square miles, but this figure does not correspond with their map. Either way, even this extensive national historic landmark is nowhere near the size of a geopolitical or geographically defined mining district. Rationale for defining *historic* mining districts of a meaningful and manageable size are discussed below and in Chapter 7.

MINING TECHNOLOGY

The following discussion relies heavily on Saleeby (2000:21-64), who has compiled a comprehensive description of mining technologies employed in Alaska, and on Noble and Spude (1992). Another useful reference is *Anatomy of a Mine* published by the Forest Service in a revised edition in 1995 (USDA Forest Service 1995). Saleeby (2000) follows Purington (1905) and Wimmler (1927) in describing placer mining techniques. The former is a USGS publication; the latter was prepared by the BOM. Logan Hovis, with the National Park Service - Alaska Region also provided a number of personal communications cited by Saleeby (2000) regarding historic placer mining technology and practices. USGS personnel (Brooks and later Smith) authored numerous useful Professional Papers and Bulletins beginning in 1901 and 1902, respectively. Additional USGS and later BOM personnel also produced similar reports over the course of the next several decades.

Saleeby (2000) also found the *Annual Reports of the Territorial Mining Inspector*, which began to appear in 1912, valuable sources along with Peele's (1918, revised 1927 and 1941) *Mining Engineer's Handbook*. The *Handbook of Mineral Dressing* (1927, revised 1945) and the *Elements of Ore Dressing* (1951) by Arthur F. Taggart also were called to the author's attention as valuable resources (Logan Hovis, personal communication 2001). Appendix E provides illustrations of some of the various mining techniques and mining equipment discussed below. These are referenced below as Images E-1 through E-31.

Alaskan mining technology was largely derived from methods initially developed elsewhere, but those methods sometimes had to be modified in consideration of Alaskan climate and other conditions including the high cost of labor and transportation due to a lack of infrastructure and small to non-existent permanent population base. Different minerals required different extraction methods. This discussion emphasizes the extraction of gold and copper. For gold, the primary distinction among extraction methods has to do with the source in which the ore was found. Lode gold occurs in a rock matrix and it is extracted using a variety of hard rock mining techniques. Placer or free gold has weathered or eroded from the parent rock and is concentrated in alluvial sediments such as sands and gravels in streambeds, in adjacent terraces and benches, or in beach sands. Free gold particles can range in size from large nuggets to extremely tiny flecks sometimes called "colors" or gold dust. Placer mining techniques differ sharply from those used to extract lode gold.

Irrespective of the nature of the mineral deposit, mining activities occur during four phases: *prospecting, exploration, development*, and *exploitation*. Prospecting equates with searching for minerals and may or may not result in their being found. Exploration occurs after a deposit has been located and involves efforts to better understand its extent. Mineral deposits proven to have worth during exploration may subsequently be developed. Facilities may be installed, and openings to better access the deposits may be excavated for example. Exploitation follows development and refers to actual extraction, processing, and eventual sale of the targeted commodities.

Prospecting and Exploring for Placer and Lode Gold Deposits

The very earliest gold seekers in Alaska were independent prospectors who searched for placer deposits using just hand tools including picks, shovels and gold pans (Images E-1 through 2). Their efforts often encompassed all four mining phases when they made a strike. That is, they searched for free gold by panning or using primitive implements including rockers and other types of sluice boxes (Images E-3 through 5), then further explored, developed and exploited the find with shovels and picks with which they excavated test pits, trenches, shafts and drifts into shallow (less than 10-foot) gravel deposits. In moist or deep sediments, drill holes were also employed. Later, however, extensive exploration, development and exploitation of profitable placer deposits often was done by actual mining companies, which would purchase likely claims from the original independent prospectors.

For independent prospectors and small mining companies alike, excavations like shafts and trenches were preferred over drilling as more practical and less expensive. Even moist gravels could be excavated with shafts if wooden cribbing could be obtained. Or excavations could be undertaken when the ground was frozen, in which case no cribbing was necessary. Excavating frozen gravels required the use of a portable boiler (4 to 6 horsepower) usually mounted on a sled or skids, steam pipes and hoses, and a hand windlass to haul the gravel to the surface as the shaft was excavated. A typical exploratory shaft measured 4 by 6 feet on a side and was perhaps 8 feet in depth.

When it was necessary to drill as a means of exploration, typically hand-operated churn drills were employed, powered by several men and a horse. The necessary equipment included casings, drills, poles and a platform. Drills also could be powered with steam or gasoline engines. Equipment included a derrick with cables to suspend the drilling and pumping equipment. Whether obtained using hand or engine powered drilling equipment, the sample was tested by panning or rocking. After about 1927, drilling for placer exploration was almost all done with steam or gasoline powered equipment.

Prospectors interested in lode gold deposits often searched first for placer deposits (looking for "colors" by panning at creek mouths, for example), then traced them back to the hard rock source. Or they searched for quartz veins or other likely lithologic sources along ridge tops. Where bedrock was not exposed on the surface, they commonly dug shallow, hand trenches to determine the location and orientation of the rock; less commonly drilling was employed. If testing of the rock was required, pneumatic drills were employed or dynamite was used to blast off chunks of rock. Various excavations into the rock itself also might be required in more advanced exploration and development of the ore body. These methods are the same as those used for development and exploitation and are described below.

Development and Exploitation of Placer Deposits

Development and exploitation of a placer deposit involves four steps: (1) excavating the sediments (sands and gravels), (2) transporting the sediments for processing and gold recovery, (3) processing the paydirt (recovering the gold), and (4) removal of the tailings to make room for additional processing. Placer mining can be by means of open cuts (surface mining) or drifts (under-ground mining) depending on the nature of the deposits. Prior to about the beginning of the twentieth century, placer mining (including development and exploration) was accomplished entirely with the hand methods described above. From 1900 to the time of World War I, additional technologies were added including: ground sluicing, booming, drift mining, hydraulicking, and dredging.

By the 1930s, bulldozers and draglines powered by diesel engines were being used to haul sand and gravel in some areas, and portable centrifugal pumps also were employed in some areas. Mobile (skid or track-mounted) washing and recovery plants and sluiceplates also came into use prior to World War II, but were not used in all areas. In fact, the older, less mechanized methods continued to be used in many areas, and by miners with fewer resources, throughout the first half of the twentieth century. Placer mining technology developed after the Second World War was extremely sophisticated and little resembled the earlier methods and equipment. These new technologies, which employed heavy equipment almost exclusively (Image E-6), began to be used in Alaska in the 1960s, and thus are not yet historic.

Placer mining entails the removal and washing of large amounts of sediments and often resulted historically in extensive alterations to the landscape along worked drainages (Image E-7). Thus, the remains of placer mining will often be understood as rural historic landscapes large enough to be classed as districts rather than sites.

Open-cut Placer Mining

Shoveling-in is the term used to describe the most basic method of open-cut placer mining. One or more men excavate a pit directly into a stream bank and shovel the sediments directly into a sluice box (refer to Image E-5). The sediments in the sluice box are washed, often using water that has been diverted upstream and transported in a ditch or flume or via pipes or hoses. Shoveling-in works best with shallow deposits (no more than 5-6 feet) and a steep gradient so that the sluice box can be placed on bedrock at the lower end of the paystreak.

There are many variants of sluice boxes, which are used both with hand processing and more sophisticated methods like hydraulicking. Basically, a sluice box is an inclined trough for washing and separating ore from the alluvium in which it occurs. The separation is brought about by gravity. The lighter sands and gravels are lifted and removed from the sluice by running water as the heavier gold particles settle to the bottom of the sluice where they may be trapped behind riffles or slats. Prior to the 1930s, standard sluice design in Alaska consisted of a series of telescoping sections, each 12-foot in length. To recover very fine gold, a device that is essentially a shallow sluice was used in combination with the main sluice; this implement is called an "undercurrent." Another device consisting of heavy steel rails or flats and called a grizzly might be used to connect an undercurrent with the main sluice; the grizzly caught large cobbles, thus preventing them from entering the undercurrent.

In cases where several feet of overburden overlie a paystreak, a trench may be excavated to bedrock or at least below the paystreak if it is relatively shallow (6-8 feet) and water diverted into the trench as a means to remove the gold-bearing sediments, which are then washed in a sluice box at the lower end of the trench or sometimes along irregularities in the bedrock. This method, which was sometimes used in conjunction with shoveling-in, is called *ground sluicing*. It was necessary in some cases to use a dam to regulate stream flow while ground sluicing. The process of impounding water to be released periodically is called *booming*. Dams could be constructed of a combination of timbers, rock and mud and might be associated with ditches and flumes (Image E-8).

When gold-bearing sediments had to be moved some distance prior to being washed, various implements and devices were employed including buckets, wheelbarrows, "stoneboats" (runnerless sleds or skids), or even small mine cars on tracks. Hoists also might be used or inclined runways constructed to position sluices at the proper grade; sometimes sluice boxes were placed on trestles (refer to Image E-5). To increase production, plows and horse drawn scrapers could be employed to increase the volume of sediments to be processed.

Once gold particles have been trapped in sluices and undercurrents, they are captured in a process called "cleanup" in which liquid mercury, which amalgamates easily with gold (and silver), was often employed. The water is turned out of the sluices and the amalgam and any remaining alluvium (together termed the sluice concentrate) are removed carefully using whiskbrooms and small metal tools resembling dental picks to ensure recovery of all the gold. Cleanup might be accomplished daily in a small shoveling-in operation, and just once a season during a hydraulicking operation, especially if the working season was short.

The final process in placer mining where mercury has been employed, is to extract the gold from the amalgam. This can be done by simply heating the amalgam on a clean iron surface (a frying pan or scrap of sheet iron will suffice) until all the mercury, which becomes gaseous, is driven off. Heat can be supplied by an open fire, a forge, or a furnace depending on the sophistication of the operation. The mercury fumes are toxic. A safe method for heating the amalgam is to use a retort, which traps the fumes and cools them until the mercury returns to its liquid form. The mercury can then be reused.

The use of power equipment for open-cut placer mining began to supersede hand methods just after the beginning of the twentieth century (although hand methods continued to be used into the 1930s and 1940s by very small operators). Equipment included mechanical excavators like power scrapers and power shovels along with power hoists and derricks. Actual washing plants were established and aerial cableways and draglines (or dryland dredges) were used for excavation and transport of the gold. Some of these machines were equipped with internal combustion engines. Scrapers, hoists and cableways were powered by means of boilers or stationary steam engines.

"Drift" Placer Mining

"Drift" is a term commonly associated with lode mining and refers to a horizontal underground passage that follows a vein of ore. Deeply buried, gold-bearing placer deposits also were extracted in a similar fashion in some cases, for example in bench gravels. Commonly this involved excavation into frozen deposits. The excavated gravels were stockpiled during the winter, then sluiced in summer when flowing water was available. Drift mining could be done on a small scale using just a pick and shovel or with power equipment. Possible evidence for drift mining along Canyon Creek on the Kenai Peninsula is reported by Buzzell and McMahan (1986:59).

Hydraulic Placer Mining

As the name implies, hydraulic mining was accomplished using water under pressure to excavate and wash placer deposits. Water was diverted from streams or captured and stored in reservoirs, then transported via ditches, flumes or pipes to a spot above the targeted placer deposit. From there the water was directed at the deposit through large nozzles (Image E-9). These nozzles are typically referred to by their trade names: giant or monitor. They come in varying sizes (from 1 to 10 inches in diameter), from small, hand held implements to large nozzles that had to be securely bolted onto bedrock. A continuous supply of water with sufficient head is a prerequisite for successful hydraulic mining or "hydraulicking." The water stream is used to loosen and transport the placer sediments to the sluices, and then to force the sediments through the sluices. Water under pressure also was used to remove and stack tailings as they accumulated below the sluices. In cases where sediments included boulders (too large to be moved by water pressure), derricks and winches were employed; sometimes the boulders were transported on "stoneboats." Depending on the situation, hydraulic elevators might be required to lift loosened sediments into the sluice boxes.

Hydraulic mining was invented in California in 1852 and reportedly was introduced to Alaska around the turn of the century. Most operations were relatively small and operated by just a few miners, although more elaborate operations did occur. It was not until after World War II that bulldozers began to be employed commonly for the initial excavations, followed by hydraulic sluicing. Even the small operations, however, could result in massive earthmoving. Within Alaska's National Forests, hydraulic mining was important in the Silver Bow Basin near Juneau and on the Kenai Peninsula after the Turnagain Arm Gold Rush had ended.

Placer Mining with Dredges

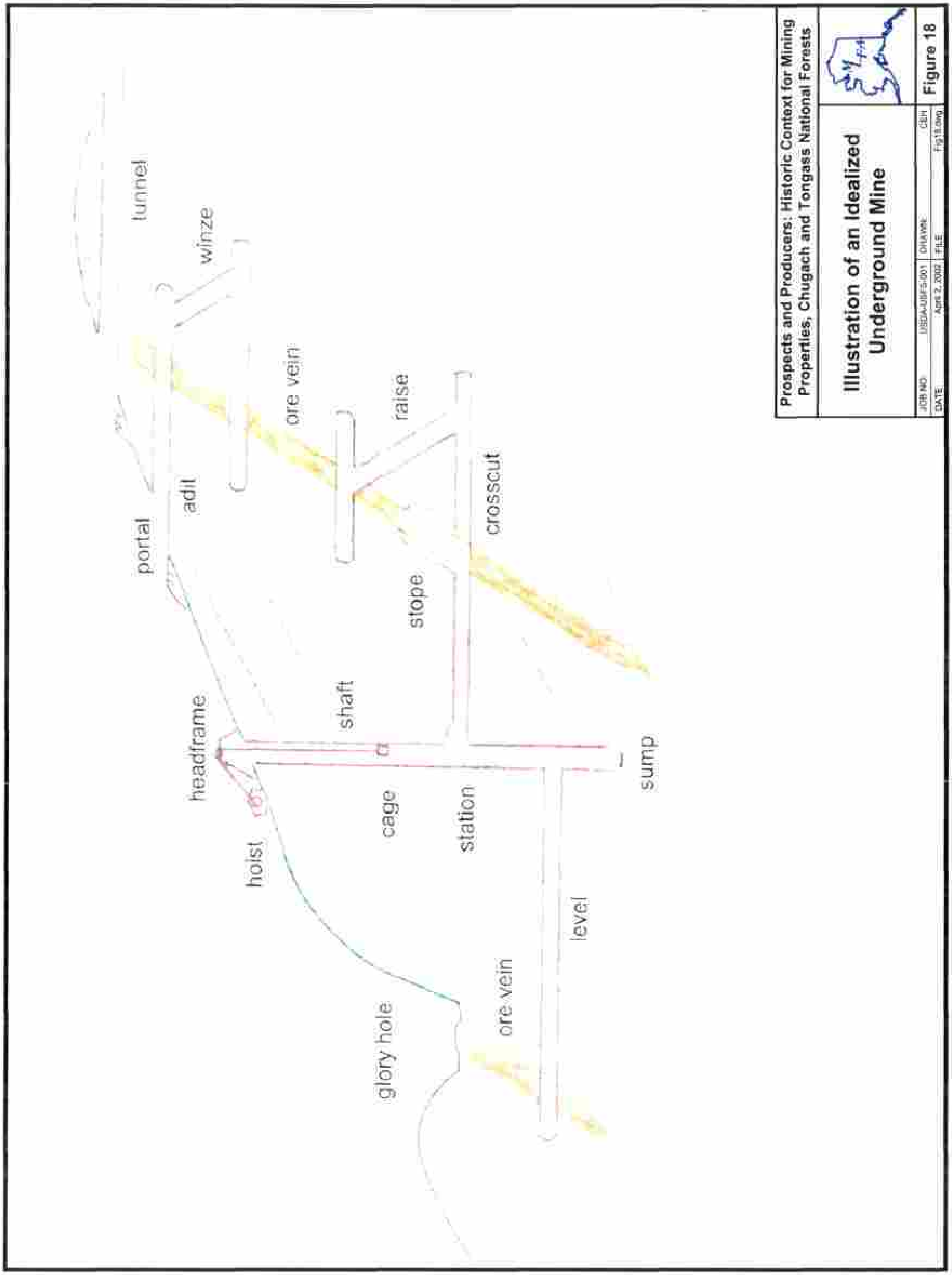
Alaskan miners began experimenting with dredging around the turn of the century (Image E-10). Bucketline dredges were most commonly used in Alaska for mining large, flat deposits of low-grade sediments that contained few boulders. Because dredges must float, they can be used only during the summer. Wooden hulled dredges were used initially and replaced by steel-hulled pontoons in the 1930s. An artificial pond is created above the targeted placer deposit. The dredge floats on the pond and through its mining operations causes the pond to move forward. A continuous line of buckets is employed to excavate placer deposits at the bow and dump them into a hopper. The sediments are moved via a chute to a trommel screen (Image E-11) and sprayed with water under high pressure to separate out the smaller particles.

Typically the smaller particles are then sluiced and the amalgamation process is used to recover the gold. In some dredging operations, devices called jigs were used in conjunction with trommel screens and sluices. Jigs separate gold from sand and gravel by pulsating water through a screen. Additional equipment that might be found on a dredge includes amalgamator plates or tables, ball mills (described below), retorts and furnaces. After the gold has been recovered, the fine tailings are transported behind and away from the dredge through tail sluices. The coarse tailings are dumped off the back of the dredge using a conveyor belt; in this way the dredge and the pond on which it floats move forward toward sediments waiting to be excavated. Steel cables and heavy timbers were used as anchors and winches to maneuver the dredge.

Development and Exploitation of Lode Deposits

Gold and copper lode deposits were exploited in Alaska either by open pit or by underground mining. In some operations the two methods were used in combination; refer, for example, to the description of the Treadwell Mine in Chapter 4. An illustration of an idealized underground mine with typical features is provided in Figure 18.

As the name implies, the open-pit method typically is used when targeted mineral deposits occur relatively near the surface. The following discussion is taken from Saleeby (2000:52 citing Frenette 1982:124, 127). The method is also particularly applicable to the exploitation of large, low-grade deposits because of lower costs and higher productivity


tunnel
winze
ore vein
raise
portal
adit
crosscut
stope
headframe
shaft
cage
station
sump
hoist
level
glory hole
ore vein
Prospects and Producers: Historic Context for Mining Properties, Chugach and Tongass National Forests
Illustration of an Idealized Underground Mine
JOB NO. USDA-USFS-001
DATE April 2, 2002
DRAWN CEH
FILE Fig18.dwg
Figure 18

compared to an underground mine. Following various exploration activities to establish the depth and extent of the ore body, the first step in open pit mining is to remove overlying sediments and rock. The ore is then extracted by excavating narrow benches; the benches may run as a spiral or be dug in levels with interconnecting ramps. Primitive open pit mining was accomplished by hand or using animal-drawn or powered scrapers; explosives may or may not have been employed. Typically, however, excavation of the ore was accomplished with explosives. Holes were drilled and filled with dynamite and blasted. The broken up chunks of ore were removed from the growing pit using power shovels or front-end loaders to load the materials into trucks, rail cars or conveyors depending on the depth and configuration of the pit. One type of open-pit mine is a glory-hole. Glory-holes typically are connected to underground workings of some sort. The ore may be transported down below the glory-hole through a raise and then hoisted or carried on a tram via rail cars to the surface via a shaft or adit (see discussion of terminology below).

Underground mining is complicated and potentially much more dangerous than any of the mining methods and techniques discussed above–dangerous to the original miners and also to individuals interested in the historic values of mining properties. Only rarely will it be possible for an investigator to view or evaluate the historic importance of underground workings. In order to understand the aboveground expressions of underground mining, however, it is necessary to understand the entire enterprise.

Development of an underground mine requires consideration of the geology of the ore body, how to gain access to it and how to break up the ore, how to ventilate the mine to ensure breathable air belowground, sometimes how to keep water out of the workings, and how to transport broken ore to the surface. In wet circumstances, open pit mines also require periodic dewatering. Miners use a variety of terms for the kinds of holes that they dig. In order to open a mine and thereby eventually gain access to the buried ore body, miners dig vertical or slanted shafts or horizontal adits and tunnels. The surface entrances to shafts are called collars; the surface entrances to adits and tunnels are termed portals (Image E-12). Drifts are horizontal excavations that run parallel to the ore body or vein; crosscuts also are horizontal and are driven perpendicular to a drift to intersect the ore body. Raises contrast with shafts (which are dug from the surface to belowground) in that typically, they are excavated upward vertically to connect a lower level with one above it or with the surface.

Underground mines are typically excavated in levels (horizontal galleries). The cavity created by ore removal is called a stope. To "stope out" is to excavate a pocket of ore in a series of steps above and below a level. Depending on the matrix surrounding the ore body and the consistency of the ore itself, stopes may or may not require structural support; in some cases, they may be produced by undercutting the ore and then making it cave into the opening by blasting and, thereafter, allowing it to fall of its own weight.

The basic sequence employed in underground mine exploitation is the same as that used in open-pit mining: drill and blast to loosen or break up the ore, then haul it out of the mine. Early lode mining was done by hand. Miners used hammers and rock drills (jacks) to make the holes for insertion of dynamite. After blasting, they used picks and shovels to collect the chunks of ore and then transported the ore to the surface in a variety of conveyances (muckers, ore cars, tracks and so forth) depending on depth and configuration of the mine. Mechanical drills (powered by compressed air) were available by 1869, but not all miners possessed them. Those that did, installed air compressors (Image E-13) outside the mine and connected them to the drills with air lines. Broken up ore was loaded into chutes, cars (on tracks) or conveyors with hand shovels, power shovels or power scrapers. Power scrapers were developed coincident with World War I. Ore cars were hauled by hand, by horses or mules, or using locomotives, which were introduced by the 1930s (Saleeby 2000:54).

"Rope haulage" also was employed when ore, equipment or miners had to be transported up a vertical shaft. In the late 1800s and early 1900s, hoisting was accomplished using a headframe erected over the mineshaft in conjunction with a cable, which passed over a drum or sheave located at the top of the headframe, and windlass (hand operated winch) or whim (horse powered winch) and an iron bucket. Headframes resembled gallows, and were constructed of wood initially (Image E-14). Thereafter, they were made of steel or concrete. Man and horsepower were eventually replaced with steam, compressed air or diesel or gasoline-powered motors, or in some cases electric lines with various power sources. In addition to iron buckets, hoists were used to raise and lower cages for men and equipment, ore cars and after the 1930s, self dumping skips.

Transportation Systems

As discussed in Chapter 4, ore was often milled on-site, then transported some distance for final processing. In Southeast and Prince William Sound, long-distance transport typically was by sea. To move ore from the surface of the mine to the near-by mill, Alaskan miners typically used roads or trails, rail lines (surface tramways), and aerial tramways (Images E-15 through 17). Aerial tramways are of various types, but basically consist of towers to support the track cables, cables, carriers attached to the cables, and a motor to power the system. Longer roads and trails, which could be dirt surfaced, or constructed using logs or milled wooden planks in wet areas (corduroy roads), also served to haul supplies and men.

Transportation systems also figured importantly for entry into a mining region. Trails, for example, the Chilkoot Trail (not within a National Forest), the route over the Valdez and Klutina glaciers in Prince William Sound, or the Iditarod Trail from Seward to Nome, were highly important aspects of mining history. Roads and trails, of course, also led to shipping ports, as did the Copper River & Northwestern Railroad, which connected the Kennecott Mines with Cordova on the Copper River Delta. Ore transport was accomplished using boats and barges where possible (thus, it was desirable for milling facilities to be located close to tidewater). Docks, wharfs, piers and associated facilities like warehouses may be included when enumerating mining related transportation systems.

Mineral Processing

After ore has been removed from the mine, it must be processed (dressed) to physically separate the valuable minerals from the waste rock (sometimes termed gangue). The waste generated by processing is identified as tailings. The distinction between waste rock and tailings, however, is not always clear-cut. When ore was processed initially by hand sorting (sometimes the case with copper mines), for example, the discarded rock is typically termed waste rock rather than tailings even though it *is* the product of a mechanical extraction process. The "concentration" of valuable minerals may then require further refining in a smelter or refinery, for example, to extract silver and gold from certain types of copper ore. During the initial processing, the ore is "upgraded" and reduced in bulk but some waste rock remains. Subsequent smelting or refining is used to extract the valuable minerals from this remaining waste rock.

"Beneficiation," "milling," and "concentrating" tend to be used interchangeably. Each term has both general and specific definitions. Noble and Spude (1992) explain that, "Beneficiation, in its strictest form, includes every phase of upgrading mineral value, from the mine face to the refinery product. However, in its common use, the meaning of beneficiation is restricted to the processing of ore in a mill or concentrator, or otherwise preparing the ore for refining." In the discussion that follows, the initial processing stage is termed "concentrating" or "milling" and the facilities are called "mills" or "concentrators." The buildings that housed milling or concentrating equipment also are termed mill (buildings) or concentrator (buildings). Mills frequently were augmented by assay offices where the percentage of valuable mineral in the final mill concentrate could be determined (Image E-18).

Milling is most profitably accomplished as close to the mine as possible because of costs involved in transporting heavy, bulk ore for any distance. In Southeast and Prince William Sound, mills also were located as close to tidewater as possible to facilitate shipment of concentrates to distant smelters. Mills were often constructed on hill slopes in order to make use of gravity feed of ore and water as part of the process. In Alaska, mills typically were powered with water, steam, or internal combustion engines in self-contained, on-site facilities. Early Alaskan mills often were powered with Pelton water wheels; the rotary motion created using these wheels would be transferred to the mill via a line shaft (Images E-19 through 22). Pelton wheels were replaced, or used in combination with steam or diesel engines when water supplies and pressure were insufficient to support the operations (Image E-23).

Equipment used in the milling process varied depending on the mineral to be extracted and its chemical composition, but might include grinding and crushing machines and concentration tables. Individual milling processes are typically depicted as flowsheets. Each stage in the milling process addresses ore particles that fall within specific size ranges or specific gravity ranges. Therefore, screens (including grizzlies for large chunks) were used to sort materials larger than 1.5 millimeters, and machines called "classifiers" were used to sort smaller particles (Saleeby 2000:57 citing Peele 1918:1658). There are many types of classifiers, but they usually contain water tanks.

Stage 1. Crushing: Ore is crushed in the first stage of the milling process. The industry standard for this purpose during the late 1800s were "jaw crushers" and "stamp mills" (Images E-24 through 27). The use of arrastras is reported as well. There were a variety of jaw crushers along with gyratory crushers, cone crushers, and crushing rolls. Cone crushers became the industry standard at copper mines in the 1930s.

Stamps are heavy implements attached to a camshaft; typically they are used in groups of five. They are allowed to fall sequentially within a mortar box to crush chunks of ore (usually of a size less than 2 inches in diameter) that have been placed in the box. Some ores were heated in a kiln prior to being stamped (Saleeby 2001:57 citing Hardesty 1988:40-41). Others were stamped in water. In either case, the object was to separate large, free, metal particles from the matrix in which they occurred. Stamp mills were used primarily to process high-grade (gold) ore; even for that purpose, they were relatively inefficient, but continued to be used at some mines into the 1930s.

Free gold and silver could be recovered during the milling process using amalgamation. In effect, this was the final concentration process for these minerals. Large copper tables or plates where crushed ore mixed with water (termed "pulp') was combined with mercury were employed for this purpose along with retort furnaces. Barrel or pan amalgamation (Image E-28) was used as well, but was replaced by the 1890s when cyanide-leaching techniques were introduced in some parts of Alaska.

Stage 2. Grinding: After ore has been crushed, the second stage in milling involves grinding, which reduces the ore to "slime." Typically crushed ore is transported to the grinding portion of a mill on a conveyor or elevator. Early operations used Chilean or Huntington mills for grinding. Chilean mills had round cast iron bases. The ore was ground by heavy, wheel-like rollers that moved in a circular motion within the trough formed by the base. Chilean mills were fairly common in the Chugach National Forest, but very rare in Southeast (Ken Maas, personal communication, 2001). Huntington mills used rollers on vertical axles to grind the ore. Tube and ball mills had replaced both these early grinding devices by 1910 or 1920. Tube and ball mills have large rotating cylinders; the former contain flint pebbles, the latter have iron or steel balls (Image E-29). In tube and ball mills, the ore is ground through contact with the rock or metal particles as the cylinders rotate. Whatever type of grinding device was employed, the ore would be classified after it was ground, and too-large particles sent back for regrinding, while the slime went on to the next stage in the milling process.

Stage 3. Final Concentration: The third milling stage results in the targeted mineral being separated from the gangue as thoroughly as possible by mechanical means. Final concentration was achieved by gravity (most common), flotation, or leaching (least common). Gravity concentration is the simplest and oldest method employed for this purpose; this method is based on the fact that targeted minerals and gangue have different specific gravities. There are a number of gravity concentration devices, which differ depending on the sizes of the particles to be separated. They include jigs (which treat particles from 50-1 millimeters), shaking tables (Wilfley [Image E-30] and Deister tables) (2.5 millimeters to fine sand, 0.12 millimeters), vanners (0.75 millimeters to fine sand), and round slime tables (0.12 millimeters to smaller, colloidal particles).

All gravity concentration processes use large quantities of water, which must eventually be removed (called "dewatering) from the concentrated mineral to complete the milling process. Drying, filtration or draining, and thickening all were employed, with thickening the most common technique. Large, shallow tanks equipped with rotating arms with blades ("thickeners") were used to gradually skim clear water off the top of the tank and force the suspended solids to settle to the bottom where they were swept toward a central outlet. The result was a thickened pulp, which was then sent to a filtration device like a rotary drum filter, and finally to a drying machine. The latter stages of this process also pertain to flotation systems.

Flotation came into use as an important concentration method between 1913 and 1916. It was used for processing gold, silver, copper and lead. Flotation was used initially in combination with gravity concentration at copper mills, but soon became the major process used by the industry. Concentration by flotation is accomplished in the following manner. Pulp or slime is combined with water, appropriate reagents, and a small amount of oil. Sulfide minerals are then separated from the host rock as a frothing machine introduces air bubbles and froth forms on the surface of the flotation tank. The mineral particles are attracted to the bubbles and cling to the oil in the froth while the gangue remains in the water below. The froth with its mineral component is then skimmed off and sent to a dewatering vat. Flotation devices differed in detail; one of the most popular from 1910 until about 1930 was the Janney agitation-froth machine, which included an agitation compartment with two froth-separation compartments. Typically a series of these machines were used in tandem along with one or two emulsifiers to remove the oils (Image E-31).

Where gravity concentration or flotation was inapplicable, concentration might be accomplished by leaching. This was uncommon throughout Alaska's Forests, but cyanide leaching was used at the Treadwell mines complex on Douglas Island near Juneau and at the Hirshey-Lucky Strike Mine on the Kenai Peninsula. Both gold and silver can be concentrated by leaching. Treatments are similar although the leaching solutions differ. Cyanide of potassium or sodium is used with gold and silver. A number of leaching agents are used with copper depending on the mineral composition of the ore. Sulfuric acid is used for copper carbonates, sulfates, or oxides; ferric sulfate is used for copper sulfides; and ammonia is used for native copper. Leaching involves a four-step process: (1) crushing the ore, or in some cases oxidation and reduction to a soluble state; (2) solution with the leaching agent; (3) separation of the mineral-bearing solution from the leaching agent; and (4) precipitation of the metal.

The cyanide process was developed in the 1890s. The gold and/or silver ore was initially prepared using jaw or gyratory crushers; then ball, rod or tube mills. A stamp mill was employed at the Treadwell mining complex. Following classification and dewatering, the pulp was placed in a large tank (Pachuca Tank) with a dilute solution of cyanide of potassium or sodium. The pulp may be stirred (agitated) mechanically or through the injection of compressed air to promote dissolving of the metal. Then the pulp is filtered (sometimes using a revolving drum) and the solution is drawn off with a vacuum pump allowing the concentrate to dry and fall off. Finally, the gold or silver is precipitated on zinc shavings or zinc dust.

Typically, Alaskan mining operations relied on smelters in the Lower 48 or British Columbia, but two short-lived smelting operations were established on Prince of Wales Island several years after the turn of the century. These were located at Hadley on the Kasaan Peninsula and Coppermount on Hetta Inlet; they remained in operation for just a short time, 1905-1908 (Roppel 1991). Noble and Spude (1992) provide the following description of smelters:

> Smelters represent another type of beneficiation plant. A smelter may accept high-grade ore directly from a mine or receive the concentrate from a mill for further reduction by heat. The heat and fluxes of the smelting process removed further impurities and upgraded the ore into a form known as matte. … The early plants used simple log-, charcoal-, or coal-fueled fires to melt ores into a matte that was still not pure [45 percent copper matte according to Ken Maas, personal communication, 2001], but rich enough in content to ship to refineries and manufacturers.

The final step in mineral processing is refining, that is, converting metal into a state of purity suitable for industrial use, manufacturing, or commercial exchange (Noble and Spude 1992). After 1866, all gold and silver refining was accomplished at the United States Mint or its branches and assay offices by order of Congress. Base metals like copper typically were refined at the larger smelters (in British Columbia or Washington state) where access to international markets was readily available. Refineries operated in concert with smelters (Noble and Spude 1992).

MINING PROPERTY INVENTORIES

It should be readily apparent, even from the abbreviated and simplified description of mining technologies supplied above, that a productive mining operation (or even a property where extensive exploration and development took place), might be reflected on the surface today by the remains of a bewildering set of attributes and features. (Subsurface observations are precluded in the vast majority of cases by safety constraints.) Mining equipment was varied and some was highly sophisticated or at least complex. It is one thing to track down mining records, examine a flowsheet, and learn that a 10-stamp mill was used initially, then superceded when flotation milling was introduced at mining property X, and quite another to visit that property to determine whether remnants of those processes still exist. This situation is compounded by the fact that much mining equipment was intended to be portable and that some mining areas were subjected to multiple use episodes during which differing technologies may have been employed and earlier remains disturbed or obliterated by later exploitation.

On the plus side, it *is possible* to obtain written records for many mining properties. Not all prospectors might have bothered to file claims, but as holders of potentially valuable commercial properties, miners and mining companies who proceeded to exploration, development and exploitation phases did, indeed, produce (in some cases, voluminous) records that document their enterprises. Likewise Territorial, USGS, and later BOM inspectors also produced numerous reports that document historic mining endeavors.

To develop a meaningful typology of mining properties, it was important to determine what kinds of properties had already been recorded within Alaska's National Forests, and how they had been described and classified–by mining specialists, and by cultural resources specialists. To that end records generated by the USBM and BLM during their examination of potentially hazardous mining locations were examines, as was the AHRS database.

Appendix C summarizes findings of the mining specialists to illustrate the range in variability at the more substantial mining properties contained within the Forests. These investigators selected mining properties for investigation based on recorded documentation that indicated there was some reason to suspect hazards might be present. That is, they inspected properties reported to contain potentially dangerous openings to underground workings, buildings and structures that might now be in a deteriorated and dangerous condition, mills where complex sulfide ores were processed, and properties where access/visitation was occurring or likely to occur. Thus, they typically carefully inspected the mining records prior to their field inspections (although they also occasionally discovered theretofore unrecorded evidence of prospecting and exploration).

Terminology used in the BOM and BLM records typically follows the conventions and usage detailed above, as do the archaeological site records for the most part. The latter, however, tend to be less detailed and more likely to simply list "mining machinery" rather than identifying specific pieces of equipment. In the Chugach National Forest, 137 mining properties were inspected for physical and chemical hazards by the BOM and BLM. One hundred and twenty-one of these records were reviewed and are tabulated in Appendix C. In the Tongass National Forest, 109 properties were inspected by the USBM or BLM; 91 of these records were available for review and are listed in Appendix C. Out of this universe of 212 mines and substantial prospects, 40 have been recorded by archaeologists and assigned AHRS numbers.

A total of 144 probable mining properties with AHRS numbers were reviewed. These are listed and briefly described in Appendix D. Forty of these properties are in the Chugach National Forest. Sixty are in the Tongass National Forest; and 46 are near but beyond the boundaries of the Tongass National Forest. The properties on the Chugach are a sample obtained by querying the AHRS database for records that contained the word mine or mining in one of several fields and jurisdiction listed as USFS. A similar sample was obtained originally for the Tongass National Forest. This was subsequently expanded to include *all* recorded mining properties on that Forest plus the nearby properties when the additional information was assembled and supplied by Ketchikan Zone Archaeologist John Autrey. Some Tongass-area mining properties have been assigned AHRS numbers, but the records are blank with the exception of locational information. These properties are not included in Appendix D.

The majority of properties listed in Appendix D are mines and prospects with boundaries and descriptions not unlike those provided for the mines and prospects listed in Appendix C. However, archaeologists also have recorded mine-related residential and commercial buildings, structures and sites. Within Forest boundaries, most of these are isolated cabins or small mining camps. Roads and trails used to access mines are included as well in the Chugach listing as are ditches and other components of larger placer mining operations. Several boomtowns have been recorded within the Tongass National Forest. The majority of properties beyond the boundaries of the Tongass National Forest are either residences (miners cabins or cottages) in Juneau or components of the large Juneau area industrial mining complexes.

SPECIFIC MINING PROPERTIES, FEATURES AND ARTIFACTS

At the most general level, mining related properties can be divided into four, functionally distinct categories: (1) transportation routes used to access mining areas or for long-distance transport of ore, personnel and supplies, and associated origination and termination areas; (2) prospects and mining operations; (3) mineral processing facilities, which may or may not be in physical proximity to the mining operations; and (4) support facilities including individual miners' residences (cabins, bunkhouses, tent frames) or small mining camps, more elaborate boomtowns with residential and commercial establishments, and company towns with facilities similar to boomtowns but possibly including more substantial and elaborate office and storage space and public facilities.

Transportation Routes and Associated Properties

Physical manifestations of transportation routes will include roads and trails, possibly improved in places (graded, buttressed, marked with cairns, planked and so forth), and railroad grades (with associated remains such as tracks, ties, spikes, ballast and so forth). It is known that such structures and features are present within Alaska's National Forests. Origination and termination points will be port towns for the most part; such properties are less likely to be found on Forest Service land. Ports like Valdez, Cordova, Juneau and so forth are currently occupied municipalities today, and as such not within the Chugach or Tongass National Forests although they may be surrounded by federally administered lands. Portions of some of the smaller shipping ports like Hadley, Sumdum, and Chichagof, may or may not extend within Forest boundaries; some are patented townsites and therefore not under federal jurisdiction.

Prospects and Mines

As discussed above, there is general agreement among mining specialists and historians that, when successful, the entire mining enterprise consists of four phases: *prospecting, exploration, development*, and *exploitation* (Saleeby 2000). In the strictest sense, prospecting (defined as searching for minerals) will not result in physical, cultural manifestations other than campsites, perhaps, which will not necessarily be identifiable as mining-related. In practice, however, the noun "prospect" is widely used to refer to the features that result from exploration (digging holes or chipping off chunks of rock or drilling and the use of explosives in order to follow up on visual observations that suggest the presence of precious or base metals) as well as development (excavation of tunnels, shafts, and adits and installation of at least minor support facilities). When used in that sense (as it is throughout this document), a simple prospect contrasts with a developed prospect, which in turn, contrasts with a productive (exploited) mine. (A mineral occurrence–as economic geologists and minerals specialists use that term–is an outcrop, for example, where no cultural modification has occurred.)

As discussed in Chapter 4, some prospects were developed in anticipation of exploitation, but for one reason or another never became productive. The demand for minerals fluctuates in response to economic, political, industrial, and social conditions. For minerals like copper, the world market was and continues to be of greater importance than positive or negative local conditions (like improved transportation or labor shortages). This is true today for gold as well, but was not as much of a factor at the beginning of the twentieth century. Especially for copper, exploration might demonstrate that a prospect contained valuable ore for example, but the price of the targeted commodity might fall as development was taking place, thus precluding profitable exploitation at that time. Such a developed prospect likely would be abandoned, at least temporarily, and perhaps for good depending on a host of variables.

Prospects that never witnessed development will typically exhibit relatively shallow or simple holes of some sort (pits, trenches, shafts, adits); possibly claim markers will be present along with discarded tools. Developed prospects and productive mines will contain an increasingly elaborate array of features, equipment, and artifacts. The term "feature" is used here in its archaeological sense as a generic label for a wide variety of cultural manifestations that do not qualify as buildings or structures; objects like small pieces of machinery are among these manifestations as are a variety of types of landscape disturbance like test pits. Simple prospects, developed prospects and productive mines can refer either to placer or lode deposits although they are more easily applied to the latter.

Table 10 is adopted from Saleeby (2000:62) who summarizes the physical attributes or elements an investigator can anticipate finding as reflections of the several methods of placer mining discussed above. Saleeby (2000:62) distinguishes among equipment and structures, water diversion and supply features, and landscape disturbance features.

A number of the attributes associated with placer mining also will be found at lode mines along with many others. Table 10 summarizes the features, equipment and machinery, and smaller artifacts that may characterize the surface manifestations of hard rock prospects and mines. As discussed above, various combinations of attributes and elements will tend to reflect different targeted commodities, extraction methods, and time periods. But there is considerable overlap, making development of a neat set of distinct attributes for each nearly impossible to construct. All of the attributes or elements listed in Tables 10 and 11 could be present throughout the Tongass and Chugach National Forests. Placer mining, however, was much more common and widespread on the Kenai Peninsula than in other parts of the Forests.

Table 10
Placer Mining Methods and Potentially Associated Cultural Remains

Methods	Equipment and Structures	Water Diversion / Supply	Landscape Disturbance
Prospecting / Exploration	Tool scatter, hand or churn drill, rocker	——	Test pits, shafts, drill holes
Open-cut Hand Methods	Tool scatter, shovels, picks, wheelbarrows, buckets, plow, horse scraper, cars on tracks, sluice boxes	Ditches, flumes, dams, ground sluices	Tailings piles, boulder piles, mining pits
Open-cut Power Equipment	All of the above, plus boilers, power scrapers, steam shovels, bulldozers, derricks, draglines, dry-land dredges	Ditches, flumes, dams, ground sluices	Tailings piles (possibly segmented), boulder piles, mining pits
Drift Mining	Tool scatter, shovels, picks, wheelbarrows, buckets, boilers, headframes, whim, windlass, steam points, self-dumping carrier	Ditches, flumes, dams, ground sluices	All of the above, plus shafts, adits, drifts, winter dumps
Hydraulic Mining	Tool scatter, shovels, picks, wheelbarrows, buckets, stoneboats, hoists, derricks, explosives	All of the above, plus pressure box, penstock, pipeline, regulator, hydraulic nozzle	Tailings piles, boulder piles, washing pits
Bulldozer / Hydraulic	All of the above, plus bulldozer	All of the above	All of the above
Dredging	Dredge and associated parts	Ditches, dams, ponds	Symmetrical rows of tailings

Source: Saleeby 2000:62

Table 11
Cultural Remains Associated with Lode Mines

Mining Phase	Hand Tools/Equipment	Power Tools/Machinery	Landscape Disturbance
Exploration	picks	pneumatic drills	claim markers
	shovels	air compressors	pits
	rock drills (jacks)		trenches
	hammers		shallow shafts
	explosives		short adits
Development / Exploitation	all of the above, plus	all of the above, plus	all of the above, plus
	hand or horse-drawn scrapers	power scrapers	open pits (spiral or level-bench)
	pipes	front end-loaders	waste rock dumps
	cables	trucks	glory holes
	windlasses	rail cars	adits/portals
	iron buckets	conveyors	shafts/collars
	ore cars	power shovels	tunnels/portals
	skips	locomotives	stopes (if open to the surface)
	wheelbarrows	headframes	rail lines
		whims	tramways
		generators	piping
		electric lines	
		hoists	
		pumps	
		muckers	

Mineral Processing Facilities

Table 12 enumerates attributes that may be expected at mineral processing locales, that is, mills, concentrators and smelters. As noted above, processing properties may, or may not be located in proximity to mine workings. All of these elements can be expected within the Forests.

Table 12
Mineral Processing Equipment and Machinery

Processing Stage or Methods	Building / Structure	Equipment / Machinery	Landscape Feature
All	Assay office	Pelton water wheel	Waste rock dumps
	Mill / Concentrator	Steam or diesel engine	Tailings piles
	Smelter		
	Power House		

Processing Stage or Methods	Building / Structure	Equipment / Machinery	Landscape Feature
Crushing		Jaw crusher	
		Stamp mill	
		Gyratory crusher	
		Cone crusher	
		Crushing roll	
		Kiln	
		Amalgamating tables / plates	
		Retort furnace	
		Barrel amalgamator	
Grinding		Conveyor	
		Elevator	
		Chilean mill	
		Huntington mill	
		Tube mill	
		Ball mill	
		Classifier	
Gravity Concentration		Jig	
		Shaking table	
		Vanner	
		Round slime table	
		Large shallow tank	
		Rotary drum filter	
		Drying machine	
Leaching		Large tanks	
		Drum filter	
		Vacuum pump	
Flotation		Flotation tank	
		Frothing machine	
		Emulsifier	
		Dewatering vat	
Smelting		Furnace	Slag

Support Facilities

The simplest support facilities will be small residential buildings, cabins or tent frames, which often are found near mine workings. Mining camps also will include residential buildings or the ruins of such buildings including facilities for just a few people and buildings (storage sheds, privies) can be expected as well. In some cases, office facilities including an assay office may be present. All of these building types or their remains are reported within the Forests.

Townsites, whether boomtowns or company towns may be expected to include a reasonably full complement of residential, commercial, and industrial facilities. At least a few such abandoned property types may occur within the Forests today. The remains of Golden on the eastern side of Port Wells would be such a property. Ellamar and Latouche also were Prince William Sound boomtowns that once were within the Chugach National Forest; today, however, they are in private ownership. Sunrise, Hope, and Seward on the Kenai Peninsula also are near, but beyond the Chugach National Forest boundary. Mining settlements and smaller mining camps within or proximal to the Tongass National Forest include Amalga, Cobol, Comet Landing (Stewart City), Coppermount, Craig, Douglas, Hadley, Hollis, Hyder (Portland City), Juneau, Ketchikan, Kimshan, Niblack, Sulzer, Sumdum, Thane, Windham, and Wrangell. There are many others, some directly proximal to the mines they served (refer to Heiner 1977 for a complete listing).

COMBINING PROPERTY TYPES

The simplest mining properties include isolated objects, structures, and features such as mining claim markers, pieces of abandoned equipment, and exploratory pits and trenches, with or without associated tool scatters (artifacts). The OHA database contains records of a number of such manifestations. Isolated buildings and larger structures also are possible, but except under exceptionally fortuitous circumstances, these are likely to be in ruins, and thus more properly identified as archaeological sites. The most common examples are the remains of cabins and out buildings thought to be related to nearby mine workings or prospects. The National Register bulletin on property definition cautions against including elements that have lost integrity within property boundaries where that can be avoided (Seifert 2000). The concept of integrity is taken up further in the following chapter.

Simple prospects, developed prospects, and productive mine workings are typically recorded as archaeological sites. These can include evidence of mineral processing and nearby support facilities along with the mine workings. When the physical attributes of such developments are widely spaced or cover a fair amount of area, they are sometimes identified as contiguous potentially National Register-eligible districts (for example, Mobley's 2001 consideration of the Gold Standard Mine in the Ketchikan Mining District). Boomtowns and company towns are usually extensive enough to warrant designation as contiguous districts; Sunrise and Hope on the Kenai Peninsula are relevant examples. Transportation routes (roads, trails, and railroads) are identified as structures, sites or possibly non-contiguous districts in cases where just spatially separate segments have been preserved.

Logical combinations of mining properties and their constituent elements into larger districts, contiguous or non-contiguous, certainly is a possibility. The Last Chance Basin in the Juneau area has been designated a historic district; it contains evidence for both lode and placer mining along with a variety of support facilities (Gillette 1990). The Bremner Historic District in Wrangell-St. Elias National Park and Preserve (White 2000) is another example of a district that contains the remains of a number of both lode gold and placer mines scattered throughout a 20,000-acre landscape in a pass in the Chugach Mountains. The Bremner Historic district, " ... superbly preserves a broad spectrum of mining technologies and infrastructure, existing as standing structures, surface remains, isolated artifacts, and archaeological sites ... [and] ... retains much of the fabric of a small-scale mining landscape" (White: 2000:1). This kind of district may be a reasonable model for combining lode and placer mines along specific creeks on the Kenai Peninsula, for example, or contemporaneous mines located near one another that targeted similar commodities elsewhere throughout the Forests.

Noble and Spude (1992) provide several examples where identification of non-contiguous districts may be appropriate. They mention mining properties that include linear systems like long tramways, ditches and flumes. They note that in some systems, ditches and flumes periodically empty into the streams they are tapping and pick up again farther downstream. In such cases, the unaltered portions of the streams would not necessarily be part of the district. Noble and Spude (1992) also suggest that a copper mine, the tramway that transported ore, and the several-mile-distant smelter to which the tramway transported the ore might form a non-contiguous district if portions of the tramway have been destroyed. Conceivably this example might pertain to mines near Hadley or Coppermount. Other examples of non-contiguous districts would be spatially discrete mines owned and operated by a single mining company, or several mines and the single mill or smelter that served all of them.

One idea that has been discussed and is, in fact, recommended by Chambers Group and Tetra Tech, Inc. (2001) for the Port Wells area in Prince William Sound is to define historic districts (for possible National Register listing) based on the districts originally organized by miners. As discussed in Chapter 1, to even evaluate this idea would require a much better understanding of miner-organized districts throughout the Forests than is currently available. Based on what *is* known, however, it would seem that these poorly defined areas probably are much too large for use as National Register properties, even assuming they were defined as non-contiguous districts. In the end, decisions about combining properties into multicomponent archaeological sites, contiguous districts or non-contiguous districts must take management considerations including jurisdiction into account.

Before concluding this chapter, it may be instructive to mention one additional concept—the multiple property listing. Multiple Property Documentation Forms are used as cover documents that serve as the basis for evaluating the National Register eligibility of related properties. A form may be used to nominate and register thematically-related properties simultaneously, or to establish the registration requirements for properties that may be nominated in the future. Individual nomination forms are prepared for each property, but they need include only abbreviated consideration of the applicable historic context and associated property types because this information is provided in the Multiple Property Documentation Form. In effect, this historic context is an enlarged multiple property documentation form and could be abstracted to create such a form if the Forest Service wished to do so.

SUMMARY

The intent of this chapter was to develop a classification scheme for use in defining mining properties in the field. Basic property types include sites, buildings, structures, districts (including landscapes), and objects as those terms are used in the NHPA. Specific property types and their constituent features and artifacts are defined using concepts and terminology that relates directly to mining technology. Mining activities occur in four phases: (1) prospecting (looking for minerals), (2) exploration (better defining the extent of a mineral deposit once it has been located), (3) development (further exploration of the deposit and installation of infrastructure to facilitate exploitation of the targeted commodity), and (4) exploitation (extraction, processing, transport, and sale of the targeted commodity). The physical reflections of phases 1 through 3 are called *prospects*. Properties that reflect phase 4 as well are called *mines*. Lode mineral deposits occur in a rock matrix and are extracted using a variety of hard rock mining techniques. Placer deposits occur in alluvial sediments. Placer and lode prospecting and mining techniques differ markedly. Placer mining in Alaska's Forests targeted gold deposits. Lode deposits exploited in the Forests included gold, copper, silver, lead, zinc, palladium, tungsten, and gypsum.

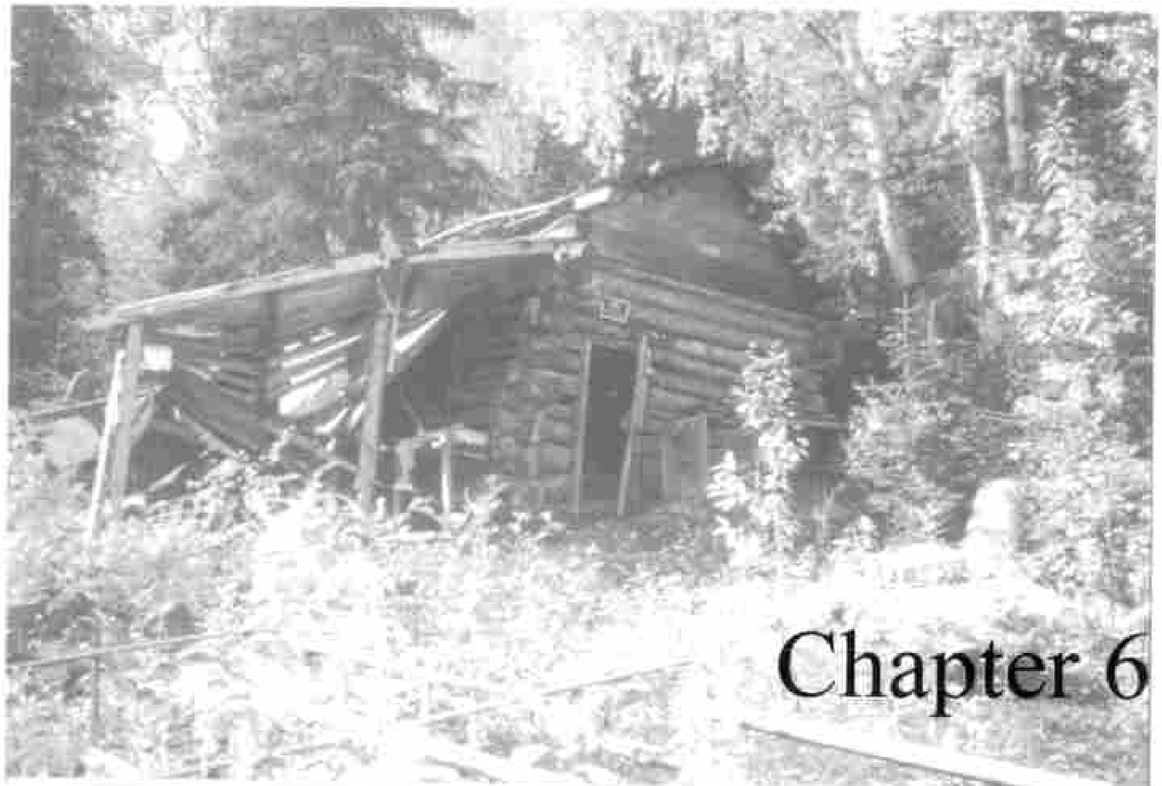
Mining specialists and archaeologists have recorded a variety of mining properties throughout the Chugach and Tongass National Forests. These can be classed broadly as transportation systems (used to move people, supplies, and ore to and from mining areas), the workings that reflect actual prospects and mines, mineral processing facilities (where targeted minerals are separated from the matrix in which they occur naturally), and support facilities (residential and industrial).

Tables 10 and 11 list physical remains (tools and equipment, machinery and structural elements, and landscape disturbances and features) that an observer can expect to find in areas where placer and lode prospecting and mining took place historically. Gold that occurs in placer deposits is separated from the alluvium using a variety of washing methods that range from simple hand panning and sluicing to sophisticated hydraulic and dredging techniques. Irrespective of the method employed, placer mining typically results in the removal and washing of large amounts of sediments and extensive alterations to the landscapes along the streams or beaches where the mining took place. The final stage in separating gold from alluvium often was accomplished through amalgamation, which entails the use of various heating equipment. Minerals derived from lode deposits are separated from their matrices in stages that include crushing, grinding, and final concentration. Table 12 lists the buildings and structures, equipment and machinery, and landscape features that an observer should look for in areas where mineral processing took place proximal to hard rock mining operations. Facilities developed to support prospecting and mining operations can include isolated cabins, small mining camps, boomtowns, and a variety of office, storage, and commercial and industrial facilities dependent on the size and scope of the mining operation under investigation. Transportation systems include roads and trails, tramways, railroads, and wharfs and docking and storage facilities.

Cultural resource specialists can anticipate finding physical remains that reflect prospecting and mining operations and support systems in various states of preservation and in a variety of combinations of constituent elements. These can be recorded and identified using the basic property types defined in the NHPA and related regulations and guidance. Isolated claim markers, abandoned equipment, or simple excavations (pits and trenches) may be found and ordinarily will be recorded as objects, structures or simple sites. Isolated standing buildings and structures will be found only rarely. The most common combination of elements that reflect prospecting and mining activities throughout Alaska's Forests will be archaeological sites. Culturally modified rural landscapes and extensive archaeological sites (or grouping of buildings and structures) also may be anticipated and classed as historic districts.

Chapter 6

Evaluating National Register Eligibility



CHAPTER 6. EVALUATING NATIONAL REGISTER ELIGIBILITY

"The United States has ranked among the world's leading nations in the production of gold, silver, copper ... and other metals. These treasures from the earth have also made major impacts on ... settlement and development ... from Appalachia to Alaska. ... Large segments of the population have been influenced by the work of prying ore ... from the bowels of the earth." (Noble and Spude 1992).

Noble and Spude's (1992) *Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties*, was published by the National Park Service for the express purpose of assisting cultural resource professionals, land managers, and members of the general public in deciding whether specific mining properties are eligible for listing on the National Register and thus, worthy of preservation measures. Therefore, Noble and Spude's (1992) "Chapter IV. Evaluation: Applying National Register Criteria to Mining Resources" is followed here, with a focus on property types known to be present within the Tongass and Chugach National Forests. More recent guidance was consulted as well (Little and Hardesty 2000; Little and Seibert 2000) along with National Register Bulletins 15 (*How to Apply the National Register Criteria for Evaluation*), 16A (*How to Complete the National Register Form*), 30 (*Guidelines for Evaluating and Documenting Rural Historic Landscapes*), and 32 (*Guidelines for Evaluating and Documenting Properties Associated with Significant Persons*).

Following a general discussion, the four criteria under which properties may qualify for National Register listing are outlined. Criteria considerations (exceptions) are described next. Thereafter, aspects of integrity (the capacity of a property to convey its significance) and their specific applicability to mining properties are considered. Finally, recommendations for assessing the eligibility of individual and grouped mining properties are presented. Decision-making nodes are outlined and examples of recommended eligible and ineligible properties are discussed.

GENERAL DISCUSSION

With few exceptions, mining properties within the Forests have deteriorated to the point where the buildings and structures contained within them have become "ruins." Buildings and structures that retain *all* of their structural elements appear to be rare indeed. Thus in terms of the basic property types appropriate for listing on the National Register, most mining properties will be classified as archaeological *sites* (or sites grouped into districts).

It has always been acknowledged that archaeological sites might be eligible for National Register listing under any of the four criteria (A, B, C, or D; refer to Chapter 1). In practice, however, sites were most likely to be determined eligible only under criterion D, as having yielded, or being likely to yield information important in prehistory or history up until quite recently. Today this bias is shifting. It is becoming increasingly common for archaeological sites to be evaluated under criteria A, B and C. This is certainly appropriate, and such an orientation is adopted here. But a caution must be emphasized.

Under current regulations, properties identified as eligible under criteria A, B, and C are essentially held to a higher standard than those regarded as eligible under criterion D. Little and Seibert (2000) place considerable stress on this point. "It is important to note that under criteria A, B, and C the archaeological property must have demonstrated its ability to convey its significance, as opposed to sites eligible under criterion D, where only the potential to yield information is required" (Little and Seibert 2000:8 of 41). Put differently, A, B, and C properties *must* (1) have demonstrated significance, and (2) contain visually apparent evidence of their importance; they must be preserved well enough, and contain enough of their original constituent elements to allow a knowledgeable observer to comprehend what they looked like during their period of significance and thus, what aspect of mining history they represent. In short, the integrity of A, B, and C properties (which is discussed in greater detail below) must not have been seriously compromised. This is a distinct possibility at mines and prospects that have witnessed renewed or continued exploration, development, or extractive activity within the last 50 years.

The terms "significance" and "significant" can be confusing to the uninitiated. And, in fact, the terms are used in several ways, with slightly differing meanings even by well-informed cultural resource practitioners because of varying usage in published regulations and guidelines. In the larger sense, to be eligible for National Register listing, a property must be significant, and it must retain sufficient integrity to convey that significance. Properties are significant if they are related or connected *in an important sense* to important historical events or patterns (in which case they qualify under criterion A), or to historically important people (criterion B), or if they comprise important architectural, artistic or engineering accomplishments (criterion C), or if they are likely to contain important information (criterion D).

But, important patterns and events are defined as historically important themes or "areas of significance," using the term in its narrower sense. When used in this narrower sense, significance has a more restrictive meaning that relates only to criterion A. Some people use the term significant to equate with "eligible for National Register listing." This is an error. A property may be significant (in the larger sense), but lack sufficient integrity to qualify for National Register listing because it does not have the ability (capacity) to convey its significance. A property also may relate to an area of significance (in the narrower sense), but again, it is not eligible for listing under criterion A if it cannot convey that significance.

In addition to deciding which National Register criterion or criteria a property may meet, properties also should be assigned to one of three *levels of significance*: local, state, or national. Some people erroneously, but quite understandably substitute "regional" for state, especially when considering Native properties. Local can be used variously depending on the size of the area under consideration as long as the applicable local area is generally identified. Properties of state significance are just that, of importance in state history. It is well to remember that an assignment of national significance means a great deal. Under current guidance, a property determined eligible for National Register listing at the national level of significance should be declared a National Historic Landmark, which is the highest level of importance (and protection) that can be accorded a historic property in the United States.

Noble and Spude (1992) confine their discussion to prospects, mines, and immediately proximal mining camps. They do not provide guidance for evaluating mining related transportation facilities or residential and commercial support facilities (boomtowns and company towns), arguing that these are more apt to be appreciated and identified for preservation than are actual industrial mining properties. The discussion that follows also emphasizes mines and prospects and associated camps. The reader is directed to generally applicable National Register bulletins for guidance on evaluating roads, trails, and railroads. Several state and federal agencies also have sponsored the development of property-specific guidance including Bourne (1995), Francis (1994), Garrison (1985), Keane and Bruder (1999), Marriott (1998), Massey (1990), and Owen (1991). Specific guidance for evaluating cemeteries (often associated with boomtowns) is provided in National Register Bulletin 41, *Guidelines for Evaluating and Registering Cemeteries and Burial Places* (Potter and Boland 1999 online version).

As discussed in Chapter 5, there are boomtowns understood to be present within the Tongass and Chugach National Forests. These should be evaluated using criteria and reasoning similar to those described in the National Register nomination for the Sunrise City Historic District (Buzzell 1997). The Sunrise City Historic District, which covers 45 acres on either side of Sixmile Creek on the Kenai Peninsula, contains 263 contributing elements (sites, structures and objects) and 3 noncontributing buildings and an object; the latter post date the district's period of significance: 1895-1916. The ruins of the abandoned gold rush era town and proximal residences, placer mining features, remnants of a tramline, and a cemetery include just a single partially standing structure, but "achieve significance collectively." Despite the absence of the original streets, the spatial layout of the business district and residential portions of the townsite still are readily discernable as delineated by building foundations, root cellars, trash deposits and so forth. Components of the cemetery have been restored (new grave markers) with in-kind materials handcrafted to exactly match the originals. The hand-stacked placer tailings are some of the best preserved expressions of the simple pick and shovel methods characteristic during the Turnagain Arm Gold Rush that have been recorded.

Buzzell (1997) argues that the "contributing resources retain a high degree of integrity of location, setting, materials, feeling and association as a historic archaeological district." He also makes the case that these features comprise an important data assemblage with the potential to shed important light on the development of an Alaska gold rush era settlement. On this basis, the Sunrise City Historic District was determined eligible and listed on the National Register under criteria A and D at the local level of significance.

Noble and Spude (1992) make it quite clear from the examples they use that typically, *it is mines that were commercially viable and that still contain a variety of elements, which should be regarded as eligible for National Register listing*. They state, "Most potentially eligible mining properties do not consist only of a single resource, but rather will include a discrete historical area containing a grouping of functionally related resources that all played a part in the extraction, refinement, and production of minerals." To some readers, this will seem like an obvious conclusion; of course it is the successes that were important, not the failures. (Productive success not infrequently did not equate with long-term financial success.) But other readers may be offended and ask why properties that reflect prospecting and exploration–the hopes and aspirations of dreamers, however unsuccessful from the standpoint of production–should not receive equal consideration. It is hoped that the following discussion will serve to allay some of these concerns. In the remainder of this chapter, criteria for listing on the National Register are explained as they relate specifically to mining properties, and especially to mining properties that are archaeological sites. Then the means by which integrity is assessed are described.

CRITERION A

To meet criterion A, a mining property must be "associated with events that have made a significant contribution to the broad patterns of our [the nation's] history" (36 CFR Part 60.4). To decide if a mining property is related to such an event, one first evaluates whether or not it is connected with a historic theme or area of significance. Thirty themes are identified in *National Register Bulletin [16A]: How to Complete the National Register Form* (Table 13). Noble and Spude (1992) selected 17 of these as most applicable to mining as shown in Table 13, but their discussion is not particularly enlightening and they are clearly stretching some of the themes far beyond a reasonable application. Curiously, Nobel and Spude (1992) do *not* include the theme of industry (technology and process of managing materials, labor, and equipment to produce goods and services), which would seem most applicable to mining properties, in their list. A more recent effort at theme construction by the National Park Service is preferred by Hardesty and Little (2000) and also shown in Table 13.

Table 13
Generic Areas of Significance

National Register Bulletin 15 (1995)	Noble and Spude (1992)	Hardesty and Little (2000)
Agriculture	Agriculture	Peopling Places
Architecture	Business	Creating Social Institutions and Movements
Archaeology	Commerce	Expressing Cultural Values
Art	Community Planning and Development	Shaping the Political Landscape
Commerce	Conservation	Developing the American Economy
Communications	Economics	Expanding Science and Technology
Community Planning and Development	Education	Transforming the Environment
Conservation	Engineering	Changing Role of the United States in the World

National Register Bulletin 15 (1995)	Noble and Spude (1992)	Hardesty and Little (2000)
		Community
Economics	Ethnic Heritage	
Education	Exploration/Settlement	
Engineering	Invention	
Entertainment/Recreation	Labor	
Ethnic Heritage	Law	
Exploration/Settlement	Literature	
Health/Medicine	Military	
Industry	Politics/Government	
Invention	Science	
Landscape Architecture	Social History	
Law		
Literature		
Maritime History		
Military		
Performing Arts		
Philosophy		
Politics/Government		
Religion		
Science		
Social History		
Transportation		
Other		

While all these categories may indeed be important historic themes, they are extremely generic and the lists are far from exhaustive. These categories are too broad to use in building a tight argument for the historic importance of a specific mining property under criterion A. Instead, they should be used as heuristic devices to guide specific theme development. Here, the historical context related in Chapter 4 is used as the basis for defining 11 specific mining-related themes and periods of significance:

- Pre-contact Native mineral exploration and extraction (dates undetermined)
- Mineral exploration and extraction in the Juneau Mining District, 1870s-1944
- Mineral exploration and extraction in the Tracy Arm-Fords Terror Wilderness / Windham Bay Area, 1869-1940s
- Mineral exploration and extraction in Chichagof and Baranof Islands Area, 1870s-1942
- Mineral exploration and extraction in the Stikine area, 1900-1930s
- Mineral exploration and extraction in the Ketchikan Mining District, 1867-1950s
- Gold mining in Prince William Sound, 1880s-1920s
- Copper mining in Prince William Sound, 1890s-1920s
- Russian and early American gold prospecting on the Kenai Peninsula, 1850s-1890s
- Kenai Peninsula and Turnagain Arm Gold Rush, 1895-1898
- Post-gold rush mining activities on the Kenai Peninsula and Turnagain Arm, 1900-1940s

Refer to the conclusion of Chapter 4 for an explanation of the rationale behind the selection of these themes and their direct applicability to the Chugach and/or Tongass National Forests.

CRITERION B

To meet criterion B, a property must be "associated with the lives of persons significant in our [the Nation's] past" (36 CFR Part 60.4). Noble and Spude (1992) provide the following examples of significant individuals with important ties to mining: "Herbert Hoover's mine engineering career before he entered politics, financier Bernard Baruch's rise to power through mine speculation dealings, General Sherman's early years as a California gold dealer, or bonanza king Horace Tabor's association with the Matchless mine in Leadville, Colorado." These clearly are examples of individuals of national or even international importance. People whose importance was more limited geographically, however, also may qualify as significant individuals.

Some mining properties within or near the Tongass and Chugach National Forests are, indeed, related to people of national and international importance as discussed in Chapter 4. Chapter 4 also provides listings of people who may qualify as significant individuals for their contributions to the history of the state of Alaska or to their local communities. Buzzell (2001b) provides an example of a locally important individual from the Copper River Delta in his argument that the McKinley Lake Mine is eligible for listing under criterion B because of its association with Dr. Will Chase, the mine's primary promoter. Chase was a "prominent Cordova physician, politician, and businessman for over 55 years. Dr. Chase was appointed Alaska's first Health Commissioner and served as Deputy Health Commissioner for the southcentral part of the territory for many years. He was a well known big game hunter and served on the territory Game Board, including five years as its chairman" (Buzzell 2001b:60).

The application of criterion B to a given property is less straightforward and more problematic than application of criteria A, C, and D. Specific guidance has been developed in consideration of this difficulty (Boland n.d.). National Register Bulletin 32, *Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* (Boland n.d.) defines persons significant in our past as "those whose activities have been important to the communities in which they are located, to the history of their state, or to the nation as a whole."

Boland (n.d.) outlines a three-step process to decide if a property qualifies under criterion B. First, it is necessary to gather sufficient information to demonstrate that the person in question truly made a significant contribution to their community, state, or the nation. Contributions can be positive or negative, although most properties listed under criterion B are associated with people who have made positive contributions. Second, it is necessary to determine the length and nature of the individual's relationship to the property under study *and to other properties* also associated with that person; and then to decide why the property under study is an important representation of that person's accomplishments. If other properties better exemplify the person's accomplishments, then the property under study may not qualify under criterion B. The third step requires an assessment of the integrity of the property under study; that is, a determination of whether the property retains enough "authentic historic character to convey its significant associations or qualities." Three sets of additional guidelines are provided in three groupings that roughly equate with the three steps described above.

Significance Guidelines for Criterion B: The individual must have made a contribution or played a role that was significant within a defined area of American history (politics, settlement, industry and so forth). If multiple important individuals are named, it is necessary to detail each of their individual accomplishments. A property cannot be listed for its association just with an important family, for example. The accomplishments of individual family members must be enumerated. Contributions of individuals must be weighed against those of others in the same field at either the local, state, or national level of significance. Only persons who have had a major impact or influence within their field (at the appropriate level) will be singled out as truly significant. If the property in question is less than 50 years old or the associated individual's accomplishments occurred within the last 50 years, the property must be of exceptional significance. Ordinarily, properties associated with living persons are *not* determined eligible under criterion B. Finally, a property that is significant because it exemplifies the skill of an important architect or engineer should be nominated under criterion C rather than criterion B.

Association Guidelines for Criterion B: The significant individual must be *directly* associated with the property in question. Properties that possess direct associations include homes, workplaces or businesses, and the locations of important events in which the individual played a key role. Ordinarily the property should have a direct association with the person during the time their important accomplishments were made. Thus, birthplaces or retirement homes typically do not qualify unless they are the only surviving property associated with a significant person. It is necessary to define very explicitly how the property represents the person's accomplishments. An important politician, who also owned a mine, would be better represented by the government building where he or she served than by the mine. Only properties that are good (or the only surviving) examples of a person's contributions will qualify under criterion B. But it *is* possible for multiple properties to qualify for National Register inclusion because of their association with a single individual.

Methods and Integrity Guidelines for Criterion B: Generally accepted methods of research and analysis must be used to substantiate the significance of individuals and their association with the property in question. Hard evidence is required; assumptions and speculation are not acceptable. Finally, the property must retain integrity from the period of its historic associations. The basic test of the integrity of a property that may qualify under criterion B is "*whether the significant person ... would recognize it as it exists today.*" Assessments of integrity are discussed in greater detail later in this chapter.

CRITERION C

In order to qualify for National Register listing under criterion C, a property must embody "the distinctive characteristics of a type, period, or method of construction, or [represent] the work of a master, [possess] high artistic values, or [represent] a significant and distinguishable entity whose components may lack individual distinction" (36 CFR Part 60.4). Noble and Spude (1992) explain that mining properties that qualify under criterion C usually do so as examples of architecture or engineering. The former might pertain to standing complexes of mills, hoists houses and smelters, noteworthy vernacular architecture associated with a particular ethnic group, or to innovations in the use of metal and concrete (*ibid.*). Noble and Spude (1992) note that the field of mining and metallurgical engineering has witnessed tremendous progress in the last 150 years. Thus, mines also may exemplify changes and important innovations in such technology over time.

Certainly criterion C would apply to the highly innovative production systems developed at the Treadwell complex and Alaska Gastineau and A-J mines for the extraction of gold from extremely low-grade ore (but those mines are largely beyond the Tongass National Forest boundary). At least a few mines within the Forests witnessed the use of first-in-Alaska technological applications or were the sites of technological innovations unique to Alaskan conditions as described in Chapter 4. Additional examples may well be identified as the histories of individual mines are reexamined more thoroughly.

Criterion C also could be applied to mining complexes that represent at least locally important production even if none of the complex' constituent elements are individually distinctive. Keane and Rogge (1992:83 citing Feierabend 1990) provide the following example: "[B]uildings at a mining complex may have collapsed, machines may have been salvaged from their mounts, and rail tracks may have been removed, but in combination with remains of paths, roads, shaft openings, trash heaps, ruins of head frames, and large tailings piles, such sites may yet collectively create a landscape that conveys an image of historically significant mining operations." This aspect of criterion C, at least as applied to mining properties, is actually akin to integrity of design under criterion A; it is probably best to reserve this use of criterion C to mining landscapes.

CRITERION D

To meet criterion D, a property must "have yielded or may be likely to yield, information important in prehistory or history" (36 CFR Part 60.4). Criterion D is probably the most problematic of the four criteria when considering mining properties. The crux of the difficulty is that huge volumes of written documentation concerning mining history already exist. This documentation ranges from primary source material (mining claim records, company files, technical manuals) to a wide variety of synthetic treatments concerning the industrial revolution in the United States.

To be sure, additional synthetic efforts to make sense of the primary data and relate those findings to larger historical themes and questions undoubtedly are warranted for the three areas covered by this historic context: Southeast, Prince William Sound and the Copper River Delta, and the Kenai Peninsula and Turnagain Arm. But that is an issue for historians. What about the archaeologists called upon to recommend whether a mining property is important for its information potential? What potential to provide information *that is not better researched in written documentation* might a mining property possess?

All guidance documents argue that to assess information potential, one needs a *research design*. Archaeologists understand this requirement perfectly, and if they are honest, will admit that developing meaningful research designs is the toughest part of their job. It is child's play to identify research questions that are interesting or intriguing, but are they important? Are the data to be extracted important? Or are the questions merely interesting, but ultimately trivial?

Archaeology is a subdiscipline of anthropology. As such it is literally the study of mankind, and seeks to understand not just what has happened in the past, but why it happened as it did. It attempts to identify patterns and seeks broad explanations of when, why and how things occurred. Archaeologists who study the remains of pre-literate societies (especially ancient peoples for whom we lack even oral histories) typically must begin by assembling the most basic information. Where and what events occurred? When did they happen? What role did environmental factors play in shaping those events? What groups were involved in those events? How did those groups distribute themselves across the landscape? How did they make a living? Where were their campsites and settlements?

Such an approach, however, is inappropriate for addressing historic mining properties. We already understand the broad sequence of events. Thanks to the detailed minerals evaluations prepared for both Forests, we already have a reasonably complete inventory of mining properties, their locations, dates of operation, targeted commodities, and constituent elements. Thus, we do not need to ask "where and when" questions. Instead, we are in a position to look more closely into specifics that will round out the broad historical record and provide detail and color. Various publications provide general guidance in developing appropriate questions—for example, Hardesty (1990:41), Noble and Spude (1992:17), Periman (1995), Saleeby (2000); and Stevenson (1982). What we do not necessarily understand are (1) the lives of the miners and their families; (2) specific applications of mining technologies at individual mines and prospects; and (3) internal arrangements and site-specific dynamics at individual mines and prospects. It is important to bear in mind that all of these questions can be approached through the use of both archival records and archaeological data. But only properties with sufficient archaeological data potential to address them should be identified as eligible under criterion D.

Question 1: To address the first question, it is necessary to identify properties that include residential areas with a reasonable potential to provide data. Trash accumulations and privies (often used for trash disposal) are a good sign of such data potential and likely of greater importance than subsurface potential. To be sure, buried remains could easily be present under some environmental circumstances at mining properties, but at historic (age) sites, artifacts need not, and often, are not buried simply because the sites are so relatively young in comparison to prehistoric aboriginal sites. A host of related questions may be posed. How many people lived there? Were women and children present? What ethnic groups are represented? What foodstuffs and other goods and services were available? How connected with the outside world (or insular) were the lives of the miners and their families?

Question 2: The second question stems from the fact that while myriad technological systems had been developed and were available for purchase "off-the shelf" by the time Alaskan mining got underway, few could be applied without individual, site-specific modifications. Thus, investigations and comparisons between mining properties where broadly similar systems were used may be quite instructive. We might ask, for example, how the flotation processes employed at a variety of mines differed from each other and from the applications described in technical manuals of the day. And why; that is, what variables led to the adoption of different or similar applications? Obviously, properties at which these questions could be addressed would need to still contain adequate evidence of their processing systems (or aboveground expressions of extractive systems). Or, we may identify properties whose constituents do not appear to "make sense." Further investigation (comparison of archival documentation with the archaeological record) may reveal that the miners were experimenting with techniques or equipment unfamiliar to them; and their solutions may or may not have been effective.

Question 3: The third question will be applicable at properties where specific "mysteries" have been identified. For example, the historical record indicates that between 1924 and 1926, over 50 men were employed at the Salt Chuck Mine, which occasioned the construction of new cottages and bunkhouses near the beach. It is hypothesized (in Volume II, the Results of the Pilot Field Study, which is a companion volume to this report), that prior to that time bunkhouses further upslope had housed the miners. Archaeological investigations aimed specifically at dating these upslope features would be necessary to confirm or deny this supposition. Because trash accumulations have been observed near the collapsed buildings in question, there is a good likelihood that collection and analysis of these artifacts would provide a definitive answer to the question.

Methodological Questions: Several researchers (for example, Mobley 2001:16, and Saleeby 2000) mention that mining properties may be investigated archaeologically to address methodological questions having to do with site formation and post abandonment processes. It is suggested that such questions are best addressed at sites with reasonable potential to address the more substantive questions outlined above. That is, mining properties should not be identified as eligible under criterion D if only methodological questions can be posed for them. Conversely, when addressing substantive questions, it is of course necessary to be cognizant of formation and abandonment processes; advances in our understanding of these processes within the two Forests are best addressed at mining sites with additional information potential.

CRITERIA CONSIDERATIONS

There are seven criteria considerations (A-G) that identify classes of properties that qualify for National Register listing even though they fall into one of seven property classes that are typically disqualified from listing. Briefly properties that typically do *not* qualify for listing include: religious properties like churches; properties that have been moved from their original location; birthplaces and graves; cemeteries; reconstructed buildings and structures; commemorative properties; and properties less than 50 years old. The seven criteria considerations identify instances where these property classes might be eligible.

Noble and Spude (1992) mention several caveats to remember (criteria consideration applications) before concluding that a mining property is disqualified from National Register listing because it falls into one of the seven property classes. Mining equipment and facilities often were designed to be portable. Thus criteria consideration B (on moved properties) should be applied rather than concluding *a priori* that the building or structure within a mining property is ineligible (or a non-contributing element) just because it is not in its original location. If the current location of the building or structure pertains to a historic usage, it may still qualify. Criteria consideration G (properties less than 50 years old) should be applied to mining properties less than 50 years old if they appear to be of exceptional national, state, or even local significance. An example would be a property related to the Cold War, an event widely understood to be of exceptional historical importance despite not having ended until 1989. Noble and Spude (1992) list uranium mines as possible Cold War-related examples. Thus, Alaska's *only* uranium mine, the Ross-Adams on Prince of Wales Island, which was located and initially developed in the 1950s in direct response to Cold War needs, might qualify under criteria consideration G at the state level of significance.

INTEGRITY

To be eligible for listing on the National Register, a property must possess significance. That is, it must have an important relationship to a historic theme or area of significance (criterion A), an important person (criterion B), important art or engineering (criterion C), or it must possess the potential to provide important information (criterion D), *and* it must have the capacity to visually convey that significance to an informed observer. A property that can convey its significance has integrity. Properties convey significance if they contain physical features that exemplify the historic theme with which they are connected. These exemplary physical features also must be readily observable.

There are seven aspects or qualities used to decide whether or not a property retains integrity. Some are more applicable to mining properties than others. *Extremely rare property types require less integrity than more common properties to qualify for listing.* The seven aspects of integrity include: location, design, setting, materials, workmanship, feeling, and association. Each is discussed below with regard to mining properties.

Location

A property retains integrity of location if it is still in its original location. This aspect of integrity usually applies to buildings, structures and objects that might have been moved from where they were constructed initially. Prospects and mines are not inherently moveable, but mining and milling equipment and even some buildings and structures were designed to be portable. As long as these types of properties were moved into place at a mining location more than 50 years ago, they would retain integrity of location even if that area was not the first place they had been used.

Design

A property's design reflects function and technology and may or may not also refer to esthetic considerations. "Design is the combination of elements that create the form, plan, space, structure, and style of a property" (National Register Bulletin 15). Noble and Spude's (1992) discussion assumes that the mining property in question is a full-fledged mining operation. They explain that the aspect of design should be applied to a mining property by determining whether it is intact enough to reflect "the flow of ore from the mine to the mill to the refinery." The evaluator will be in the best position to judge whether the property retains most of its important components if he or she actually has the engineering flow chart for the mine under consideration. Components will include the aboveground remains of buildings and structures, equipment (objects or structures), landscape features, and artifacts. It is ironic that the underground workings from which the ore was actually extracted in many mines will typically not figure into integrity evaluations. Except in rare instances, however, these underground workings are too potentially hazardous to be accessed safely.

Noble and Spude (1992) emphasize that the components of the mine need not be in pristine condition. The buildings and structures need not be standing, but it should be possible to determine where they stood originally and tumbled remains or at least foundations should be discernable. If some machinery has been removed, it still should be possible to find the equipment mounts. Landscape features like waste rock dumps and tailings piles should not have been disturbed or obliterated by more recent mining activity. Pathways and roads or other internal linear connections between components should be in evidence. If there was an aerial tramway, it should be possible to locate at least some of the supports although they need not be standing. If there was a railroad, its bed should be visible even if the ties and track have been removed, and so forth.

Noble and Spude (1992) also note that the evaluator should not expect a mine that was in operation over a length of time to reflect its original construction plan. Instead, it will retain integrity of design if the property's evolution through time is discernable. That is, changes reflecting the adoption of new technologies were part and parcel of a successful mining venture and do not detract from its integrity *unless they took place less than 50 years ago and have largely obliterated the mine's historic components.*

Setting

Setting refers to the environs of a mining property. A property retains integrity of setting if its physical surroundings still resemble those that were present when the property played its historical role. If a mining area was deforested in order to make way for the industrial complex required to process the ore and house the workers, then that setting would be compromised if the area were now overgrown. Likewise, if the mining operation was originally in an isolated location, its setting could be compromised by the encroachment of modern development. Noble and Spude (1992) note that some aspects of setting (for example, landscape features like the denuded areas beside streams caused by hydraulicking) are regarded as decidedly ugly by some viewers. Settings need not be visually pleasing. Instead, they should resemble the mine's surroundings when it was in operation.

Integrity of setting can be evaluated from two perspectives: (1) with regard to the immediate vicinity of the mining property, and (2) with regard to its wider surroundings. For example, a mine in the rain forests of Southeast Alaska may have lost integrity of setting internally because the forest, which had been cleared during its period of operation, has now returned. But its wider rain forest surroundings may look much as they did when the mine was in operation.

Materials

This aspect of integrity applies to mining properties that have undergone recent (or at least, post-operation) repairs or stabilization that involved replacement of constituent materials. Unless the replacement was done with in-kind materials (for example, untreated wood), integrity of materials might have been degraded.

Workmanship

Like materials, this aspect of integrity applies to properties that have been subject to post-operation repairs. If repairs have been made, they should reflect construction techniques, conventions, and esthetic principles in use when the mine was in operation; if they do not, the property may be judged to have lost a degree of integrity of workmanship.

Feeling

Noble and Spude (1992) contend that it is appropriate for a historic mine to evoke a feeling of abandonment (in contrast, one supposes, to the lively activity of an active mining complex). They reason that unlike some other facilities, it is to be expected that a mine will be abandoned much sooner and more abruptly than other kinds of industrial facilities, either because the targeted ore has been exhausted or in response to one of the vicissitudes that exemplify the boom and bust cycles endemic to the mining industry.

Association

"Association is the direct link between an important historic event or person and a historic property" (National Register Bulletin 15). Thus, it pertains, especially to properties that meet criteria A or B. To retain integrity of association, a property must be sufficiently intact to be able to visually convey its direct relationship to the important event or person. In many ways, "association" in the larger sense is less an aspect of integrity than it is simply an affirmation of the connectedness between a property and its area of significance or historic theme.

RECOMMENDATIONS

A review of Appendix D, which includes information on eligibility recommendations made by consultants and determinations made by federal agencies in consultation with the SHPO, reveals a record similar to that in many states throughout the Nation. Some recommendations and determinations seem reasonable today and others do not. This is not a criticism, but simply a function of the evolving and dynamic state of attitudes towards cultural resources preservation. While the eligibility information from past studies is interesting, it need not be slavishly copied or accepted in future investigations. A conscious attempt was made, in developing this historic context, to identify a reasonable middle ground—one in which neither "everything old is eligible" nor "almost nothing is eligible."

It is desirable for a property to possess multiple aspects of integrity in order to qualify for listing on the National Register. Clearly, however, depending on the property in question, some aspects may have more or less applicability. National Register Bulletin 15 acknowledges that the seven aspects of integrity apply primarily to properties that meet criteria A, B or C. The integrity of properties that meet criterion D is judged by whether or not they appear to possess information potential *that relates to an important research question*. To qualify under criterion D, an archaeological site or district should contain *in-situ* surface artifacts and features, or have been demonstrated to contain reasonably undisturbed subsurface materials.

In order to decide whether a given mining property retains sufficient integrity to qualify for National Register listing, the evaluator must have a firm understanding first, of the "why, where and when" of the historic theme to which the property pertains, and second, of the physical features or attributes that exemplify that theme.

Noble and Spude (1992) conclude their discussion regarding the assessment of integrity with the following statement. "The important principle … is that the integrity of mining properties will frequently hinge not so much on the condition of the extant buildings, but rather on the degree to which the overall mining system remains intact and visible. This method of evaluating integrity requires a holistic outlook that comprehensively considers all the component parts of the **mining system**. If clear physical evidence of a complete system remains intact, deterioration of individual aspects of the system may not eliminate the overall integrity of the resource."

Assessing Eligibility Under Criteria A, B, and C

Table 14 contains a matrix designed to assist evaluators in deciding whether or not a mine or prospect qualifies for listing on the National Register under criterion A. This matrix also should be employed when assessing mining properties under criteria B and C, but with some adjustments as discussed below. The guiding principle that informed this matrix follows directly from the intent of the NHPA, which is to preserve properties that exemplify important historical themes for the edification of the American people. *Rare or unique properties require less integrity to qualify than do more common property types.*

Criterion A: To date, no Native or Russian mining sites (excepting Russian coal exploitation) have been identified, but there are hints in the literature that some may yet be found. "Firsts" would include the first lode gold mine in Alaska (the Stewart Mine in the Silver Bay area near Sitka), and the first lode claim to be staked in Alaska (the Copper Queen claim and prospect of that same name on Prince of Wales Island). Unique types would include Alaska's only tungsten mine (the Riverside near Hyder) or Alaska's only uranium mine (the Ross-Adams on Bokan Mountain on Prince of Wales Island, which also is important for its association with the Cold War), assuming they were reasonably important producers rather than unimportant anomalies.

Productive mines and developed prospects should be evaluated in terms of their overall importance to the mining industry of the region in which they are located *if they retain sufficient integrity to visually convey their importance*. Thus, by definition, major producers are of greater importance than minor producers or prospects that were developed but never shipped ore for one reason or another. Nevertheless, an exceedingly well-preserved, minor producer or developed prospect may well convey the essence of mining. And, in fact, it is these less important properties that may tend to be better preserved simply because they likely were less subject to repeated operations through time. Major producers will require less integrity than will developed prospects to qualify for listing. Very common or ubiquitous property types (undeveloped prospects, which typically consist of just a few pits or trenches) will not ordinarily qualify unless they are associated with more exemplary properties (for example, as part of a historic district). It is of vital importance to distinguish among major producers, moderate producers, and minor producers and developed prospects *on a regional basis*. A suggested breakdown in this regard is provided in Table 15.

Table 14

Decision-making Matrix for National Register Eligibility Determinations under Criteria A, B and C (Region-specific)(1)

Property Type	Distinct Entity	Integrity(2): Association	Design: Later *Historic* Periods of Operation(3)	Design: Earlier Periods of Operation	Setting	Feeling	Materials	Workmanship
These are exceedingly rare or unique components of regional or wider mining history, and will be considered eligible even if they have sustained considerable loss of integrity.								
Rare Types								
Native or Russian	Required(4)	Identify	Almost any concrete evidence of Native or Russian mining efforts would qualify.		Good but not necessarily required	Good but not necessarily required	Assumed to be intact	Assumed to be intact
First of a Kind or Unique Type	Required	Identify	If present, does not entirely obscure earlier manifestation	At least a few major elements discernable	Good but not necessarily required	At least some retention	A minus if replacements have not been "in kind."	A minus if replacements have not been "in kind."
These are important components of regional mining history, and will be considered eligible if they retain sufficient integrity to convey that association.								
Major Producer	Required	Identify	Major elements should be observable	A plus if some elements present	Good but not necessarily required	At least a moderate level required	A minus if replacements have not been "in kind."	A minus if replacements have not been "in kind."
Moderate Producer	Required	Identify	Should be Largely Intact	A plus if some elements present	At least some aspects retained	A moderate to high level required	A minus if replacements have not been "in kind."	A minus if replacements have not been "in kind."

Property Type	Distinct Entity	Integrity(2) Association	Design: Later *Historic* Periods of Operation(3)	Design: Earlier Periods of Operation	Setting	Feeling	Materials	Workmanship
Minor Producer or Developed Prospect	Required	Identify	Should be almost entirely intact	A plus if some elements present	Should be largely unaltered	High level required	A minus if replacements have not been "in kind."	A minus if replacements have not been "in kind."
These are property types that are either quite common or that have little capacity to convey the essence of mining to a viewer on their own. They will not ordinarily be considered eligible except possibly as contributing elements to a district.								
Explored Prospect	Required	Identify	Elements should be largely intact and easily observable		Comparable to district	Comparable to district	Ordinarily not applicable	Ordinarily not applicable
Simple Prospect	Required	Identify	Elements should be largely intact and easily observable		Comparable to district	Comparable to district	Ordinarily not applicable	Ordinarily not applicable

(1) For use with mines and prospects. To qualify under criteria A, B, or C a property must have an important association and sufficient integrity to convey that association. Typically individual, collapsed, buildings, structures and objects will not be considered eligible. Exceptions might include: standing buildings and structures with a clear and important association with mining, and rare or large and very impressive pieces of mining equipment (*in situ* and that, on their own, evoke the essence of mining).

(2) Integrity of location ordinarily is a given for mines and prospects.

(3) If a mine or prospect witnessed recent (less than 50 years ago) activities, it is important to assess any negative effects these may have had on the historic-era remains.

(4) While an isolated artifact might not qualify, even minor workings in association with a few artifacts definitively associated with the Russian era might constitute an identifiable entity if it is possible to distinguish those workings from later mining efforts.

Table 15
Regional Production

Major Producer	Moderate Producer	Minor Producer
Juneau Mining District - Gold		
20,000 – 40,000 oz	1,000 – 4,000 oz	Less than 800 oz
Tracy Arm-Fords Terror Wilderness / Windham Bay Area		
24,000 oz	2,000 - 3,000 oz	Less than 100 oz
Chichagof and Baranof Islands Area - Gold		
100,000 - 700,000 oz	1,000 – 17,000 oz	Less than 700 oz
Ketchikan Mining District - Gold		
6,000 – 12,000	1,000 – 4,000	Less than 700 oz
Ketchikan Mining District - Copper		
2,000,000 – 13,000,000 lb	32,000 – 250,000 lb	Less than 6,000 lb
Prince William Sound - Gold		
25,000 – 52,000 oz	200 – 5000 oz	Less than 100 oz
Prince William Sound - Copper		
1,00,000 – 5,000,000 lb	30,000 – 600,000 lb	Less than 1,000 lb
Kenai Peninsula – Lode Gold		
2,000 – 5,500 oz	100- 800 oz	Less than 70 oz

Chapter 4 contains total production figures that provide the basis for these divisions. There are no production figures for the two productive mines in the Stikine Area, but they likely were low to moderate producers in comparison with surrounding regions.

The reader will note that for the Juneau Mining District, production figures for the Alaska-Juneau, Alaska-Gastineau and Treadwell complex, which produced an aggregate of over 6.6 million ounces of gold, are not included. These were world-class mines that far out shadow any other mining properties in Southeast, but they lie beyond Forest boundaries for the most part and their preservation status is far from assured. Therefore, the Forest Service must consider the universe available to it as a steward for the American people. The same is true in Prince William Sound where the single most important copper producers, the Beatson and Ellamar mines (which produced 182,600,000 and 15,761,337 pounds of copper respectively) lie beyond Forest boundaries and have been largely destroyed.

Volume II, the Results of the Pilot Field Study, provides concrete examples of the approach outlined on Table 43. The Salt Chuck Mine on Prince of Wales Island was a major regional producer. Salt Chuck is an easily discernable distinct entity; its constituent elements are connected by tramlines, pipelines and various pathways. The property is associated with the theme, "Mineral Exploration and Extraction in the Ketchikan Mining District, 1867-1950s." Major elements from most time periods can still be found. The interior setting of the mine is overgrown with large trees and was undoubtedly less vegetated when in operation; however, the mill and beach level residential areas probably are similar to the historic situation. The property's external setting closely resembles the historic situation. This abandoned mining property certainly retains integrity of feeling with the quantity of preserved elements. A few replacements (for example, a wooden portal) are of untreated wood and thus, "in-kind" replacements. While there is scattered evidence for modern exploratory activities, it is largely unobtrusive, and could easily be removed. In sum, the Salt Chuck Mine is recommended as eligible for National Register listing under criterion A.

The mine's principal supporter and developer, John E. Chilberg might be regarded as at least a locally important person (although not a full-time Alaskan resident) because of his unswerving leadership in the development of the mine that was the country's most important palladium producer in its day. Thus, it is possible the mine also would qualify for listing under criterion B. Salt Chuck witnessed Alaska's first use of the flotation process for concentrating copper and thus might also qualify under criterion C. However, none of the flotation equipment is currently visible beneath the collapsed mill building; nor is it known whether the equipment is, in fact, still present. Therefore, given our current state of knowledge, the property does not qualify under criterion C.

The Halleck Island Prospect would be classified as a developed prospect and, thus, possibly eligible under criterion A—*but only if it was in pristine condition and still retained the majority of its original, principal components*. The property is certainly a distinct entity. All extant components can be viewed from a single vantage point. The property is associated with the theme, "Mineral Exploration and Extraction in the Chichagof and Baranof Islands Area, 1870s-1942. The property is overgrown, but its external setting is probably very like the historic situation. Elements of materials and workmanship have not been compromised and the portal, shaft and several pieces of equipment convey the feeling of an abandoned mining property. However, major components of the property as described during its historic period of operation in the 1930s have been destroyed. These include elements directly associated with the mines primary function (the compressor house, dock, and powder house) as well as associated support facilities (the blacksmiths shop, oil house, and bunkhouse). Thus, the property's vitally important integrity of design is seriously degraded. It is recommended the property does not qualify for listing under criterion A; nor was any archival evidence found to suggest it might qualify under criteria B or C.

It had been hoped that the Mull Cabins and associated placer workings would provide an example of a historic landscape, possibly eligible under criterion A and/or C. Landscapes are historic sites or more typically, districts dominated by features other than buildings and structures. Thus extensive placer workings are obvious candidates. We discovered however (using documentary evidence, oral histories, and aerial photography) that evidence of the 1930s hydraulic workings associated with the cabins has been all but obliterated by more recent (especially 1980s) placer mining activities. Just a few remnants of equipment remain and they are in a bulldozed pile along with more recent materials. While Mull Claims do not provide a good landscape example, other placer mining areas on the Kenai Peninsula including the area downstream from the Mull Claims, which is identified as a district, may qualify.

Intact Buildings and Structures: Thus far in this discussion, intact buildings and structures have not been considered. Standing buildings with extant roofs and walls are relatively rare throughout both Forests, and largely limited to isolated cabins or small groupings of cabins and associated out buildings. Because of their rarity and the fact that a standing building has considerable capacity to engage a viewer's imagination, even isolated standing buildings should be considered for listing under criterion A *if their association with one of the identified historic themes can be demonstrated and they possess a reasonable degree of integrity.* Thus a cabin located in a mining area, but lacking a definite association with mining activities would not qualify. The reader will recall that for a property to be determined eligible under criteria A, B, or C, it must have *demonstrated* its ability to convey its significance (in contrast to a property eligible under criterion D, where only the potential to yield information is required).

Materials and workmanship come into play in the evaluation of standing buildings to a greater extent than in the evaluation of more complex mining properties. This is true because standing buildings almost invariably are intact because they have been used and repaired repeatedly through the years (Becky Saleeby, personal communication 2001). Thus, a standing cabin almost certainly has been repaired recently, at a time well beyond its association with historic mining activities; to be sure, the users may have been modern miners. Irrespective of the professions of the recent cabin inhabitants, their repairs should reflect in-kind materials and workmanship in keeping with the original cabin design in order for the building to retain sufficient integrity to qualify for listing under criterion A. If incompatible materials or an inappropriate building style has been used and the repairs are minor or easily reversible, the property may still qualify for listing. At least two of the Mull Claims cabins may qualify for listing under criterion A following this reasoning and their demonstrated association with the historic theme, "Post Gold Rush Mining Activities on the Kenai Peninsula and Turnagain Arm, 1900s-1940s."

Intact and *in situ* pieces of large mining equipment such as air compressors, hoists, locomotives, and various types of milling machinery are probably more common than standing buildings, but still relatively rare. Some of these large structures (under older regulations, they were considered objects) *do* have considerable capacity to evoke the essence of mining to a knowledgeable observer. In the various interviews conducted during this study, the author discovered that there is a high degree of public sentiment for the preservation of such structures. Therefore, an in-place, very well preserved piece of mining equipment may qualify for listing under criterion A if an argument can be made for its direct and important mining association and it also retains reasonable integrity of setting and feeling (materials and workmanship are a given for a well preserved machine).

Criterion B: Mining properties associated with important people may qualify for National Register listing under criterion B, as discussed above, if the association is an important one. In that case, the decision-making criteria outlined in Table 14 should be used to decide whether or not the mining property in question retains sufficient integrity to convey its significance. Or for a standing building or structure, the integrity considerations discussed above should be employed. It will be recalled that *the basic test of the integrity of a property that may qualify under criterion B is whether the significant individual would recognize the property as it exists today.* One caveat should be applied as an overlay to this process. If a minor producer or developed prospect is discovered to be the only extant property with which the significant person had an important association, it might qualify for listing even if its integrity was somewhat less than that required under the strictures identified for criterion A listing in Table 14. The Mull Claims cabins have a demonstrated direct association with Charles Mathison, a locally important mine developer on the Kenai Peninsula; he was a partner in the operation and lived on-site during the two-year operation of the Hiland Mining Company. Thus the Forest has argued previously (Yarborough 1992) that the cabins are eligible under criterion B; the author agrees as discussed in Volume II.

Criterion C: The decision-making steps outlined in Table 14 also should be used to evaluate properties identified as possibly eligible under criterion C. With mining properties, such an assignment will typically be made for properties where some kind of engineering or technical innovation was applied or invented. To qualify under criterion C, such a property would need to retain clear evidence of the engineering accomplishment or technique in question, however. Thus, the Jualin Mine might qualify under criterion C because it was the first mine at which a diesel engine was employed in Alaska, but only if that engine is still in place and readily observable.

Assessing Eligibility Under Criterion D

To qualify for National Register listing under criterion D, a mining property must have the potential to provide important data (or have already provided such data). As discussed above, current preservation guidelines acknowledge that the seven aspects of integrity are not particularly useful, nor applicable to criterion D assessments. Therefore, a different set of decision-making criteria for criterion D evaluations are required. These would seem to be relatively straightforward. First, the evaluator would research the property's history and, secondly examine its extant components. This research should be sufficient to decide whether the property in question is a candidate for addressing one or more of the three general questions outlined above.

If the property lacks residential features, it is not likely to have the capacity to address Question 1, which asks how miners lived. If residential features are present, they should have associated trash or at least a strong potential for such trash to be present (buried or discarded in privies for example). Properties with the capacity to address Question 2 will be those with well-preserved processing equipment (or above-ground evidence of extractive techniques) with most elements of the "flow" extant and observable. To decide whether a property is a candidate for addressing Question 2 will require some knowledge of processing and extractive techniques, or at least, consultation with individuals with such knowledge. Candidates for answering the third type of question, which can take many forms depending on the property in question, generally will be complex sites with multiple use episodes. These ordinarily will be sites considered eligible under one of the other criteria, where archival research and on-site inspections have identified specific questions amenable to archaeological inquiry and not answered in available literature or oral histories.

Prior to undertaking archaeological research at a property determined eligible for National Register listing under criterion D, it would be necessary to develop a *site-specific research design*. This is the accepted procedure for all modern archaeological inquiries, of course, but is doubly important for mining sites, especially those considered eligible for their ability to answer questions like 2 and 3. These questions will need to be specifically tailored to individual mining properties. The data necessary to address them will need to be identified with regard to those individual properties.

SUMMARY

The primary goal of this historic context is to provide succinct guidelines for evaluating whether or not a given mining property does or does not qualify for listing on the National Register. For properties that appear to be eligible, it is necessary to specify the criterion or criteria under which they qualify and their level of significance (local, state, or national). It also is necessary to demonstrate that the property in question retains sufficient integrity to convey its historic significance to a knowledgeable observer.

This chapter outlines the steps in the evaluation process. Many mining properties within the Chugach and Tongass National Forests have deteriorated into ruins and thus will be classed as archaeological sites or districts comprising a variety of constituent elements. Rare standing building and structures or groupings of buildings and structures also are known to be present.

Properties that qualify under criterion A (broad historical patterns) will be associated with one of 11 possible mining-related themes and periods of significance. Those that qualify under criterion B (historically important people) will have an important and direct association with individuals who have made an important contribution to their community, the state of Alaska, or to the nation as a whole. Properties that qualify under criterion C (artistry and engineering importance) will be those that witnessed significant architectural or engineering applications or where important technological innovations occurred. Finally, properties will qualify under criterion D (information potential) if it appears they contain important data that may further our understanding of mining history in the regions under consideration.

Typically properties like churches, properties that have been moved, birthplaces and graves, cemeteries, reconstructed buildings and structures, commemorative properties, and properties less than 50 years old do not qualify for National Register listing. In some cases, however, these property types may qualify if they meet certain criteria considerations. For mining properties, criteria considerations B (moved properties) and G (properties less than 50 years old) are most likely to be relevant.

In addition to possessing significance (that is, being able to be related to one of the four eligibility criteria), to qualify for National Register listing, a property also must possess sufficient integrity to convey its significance. Integrity is assessed in terms of seven aspects or qualities: location, design, setting, materials, workmanship, feeling, and association. For properties that may qualify under criteria A, B, or C, integrity of design is the single most important aspect of integrity following guidance published by the National Park Service (Noble and Spude 1992). "Design is the combination of elements that create the form, plan, space, structure, and style of a property" (*ibid.*). Extremely rare property types require less integrity than more common properties to qualify for listing. Properties that qualify under criterion D retain integrity, (1) if there are important questions about their histories that might be answered, at least in part, through an analysis of their physical remains, and (2) if the properties contain sufficient *in situ* surface artifact and features or have been demonstrated to contain reasonably undisturbed subsurface materials that might be used to address the important questions.

Page intentionally left blank.

Chapter 7

Needs Assessment and Preservation Issues

CHAPTER 7. NEEDS ASSESSMENT AND PRESERVATION ISSUES

"Abandoned, frail human structures do not last long in this damp climate and under such heavy winter snow-loads. (Lethcoe and Lethcoe 1994:1).

This concluding chapter summarizes the current state of knowledge concerning mining properties throughout the Chugach and Tongass National Forests. Foreseeable threats to those properties also are considered. Finally, several recommendations for management of the Forest's mining properties are offered.

CURRENT UNDERSTANDING AND APPRECIATION OF MINING PROPERTIES

The history of mining throughout the Chugach and Tongass National Forests as related in preceding chapters was abstracted from a number of available syntheses. There is no comprehensive history of mining for either Forest, but a variety of regional studies have been published by historians and economic geologists for Southeast, where the Tongass is located. Synthetic treatments for the Chugach are considerably less numerous. Historian Rolfe Buzzell has published information on the Turnagain Arm Gold Rush and the McKinley Lake Mine on the Copper River Delta. Several publications by Jim and Nancy Lethcoe include brief summaries of historic mining in Prince William Sound. Mary Barry has published the only detailed history of mining on the Kenai Peninsula. Additional historical research and syntheses certainly are warranted for both Forests.

There is an immense quantity of written documentation concerning individual mining properties throughout Alaska's two Forests. Some of this information is readily available; some is obscure and difficult to access. Minerals evaluation studies have tabulated virtually every mining property throughout both Forests, but the level of detail provided in the reports on these efforts varies. The investigations on the Tongass generally are more recent than those for the Chugach and provide much greater detail than is available in the Chugach studies. This disparity must be taken into account when planning to investigate mines on the two Forests. Considerably more detailed summary information is available for Tongass properties.

There are an estimated 500 mines and prospects within the Chugach National Forest as documented by Jansons and others (1984) and Nelson and others (1984). Their work was accomplished as a joint effort by the USGS and BOM. Brief summary data including targeted commodities, recorded or reported production figures, and information about observed workings are readily available to interested researchers. The data are organized by individual lode mines and prospects and by placer streams, portions of streams, or combined portions of streams. The locations of all mining properties (and unworked mineral occurrences) in the Chugach National Forest were mapped on 1:250,000 scale maps by both Jansons and others (1984) and Nelson and others (1984) and included as oversize maps in their reports. That locational information also was subsequently incorporated into the GIS database maintained by the Chugach National Forest.

The Tongass National Forest (and adjacent Glacier Bay National Park) also was studied for mineral potential by the BOM (and USGS for the Tracy Arm-Fords Terror Wilderness and vicinity) beginning in the mid 1980s. When the BOM was disbanded in 1996, their research was taken up by the BLM (which assumed the BOM's responsibilities in Alaska) and is continuing today. There are an estimated 1,350 mines, prospects and unworked mineral occurrences within the Tongass National Forest; perhaps 800 of these are mines or prospects. The Tongass studies are considerably more detailed than those for the Chugach. In addition to the kinds of brief summary data reported for Chugach properties, the Tongass minerals availability reports discuss mining and prospecting activities at each property (or placer stream) including years of operation, and provide maps of many of the individual properties showing workings and processing facilities, and sometimes individual claim locations. Numerous maps are included in the reports, but there is no Forest-wide map comparable to the one for the Chugach on which all properties are shown. Such a map could be produced, however, because all of the locational data has been input in the MAS/MILS database maintained by the BLM.

The Tongass minerals availability studies are organized by geographic regions labeled mining districts or areas. Thus far, reports are available for the Juneau Mining District, the Tracy Arm-Fords Terror Wilderness / Windham Bay Area, the Chichagof and Baranof Islands Area, the Stikine Area (final report in-progress), and the Ketchikan Mining District. The BLM has yet to address the mineral potential in the Yakutat Area or on Admiralty Island. Historic mining on Admiralty Island was confined to the northern end of the Island where just two productive mines are known to be present (Ken Maas, personal communication, 2001). Mineral potential in the Yakutat area is believed to be low, but placer mining for gold and PGEs in beach gravels is known to have taken place. While it is important to be aware of these gaps in summary data, they do not seriously detract from a larger appreciation of mining history in the Tongass National Forest.

In additional to the summary reports mentioned above, it is important to be aware that all mines, prospects and minerals occurrences on both Forests have MAS designations and associated MAS/MILS records, which can be accessed online. These records include listings of all names by which a property has been known as well as citations for virtually every published report in which the property is mentioned. When complete, the ARDF database (also available online) will provide similar, and sometimes complementary, in formation for each property. In addition, the BLM in Juneau and Anchorage maintain paper files with copies of pertinent pages from each of the cited reports for every property with a MAS designation. These paper records are currently being scanned and will eventually be available on CDs. The MAS/MILS files are of immense help when researching an individual property because not only do they alert the researcher to most pertinent citations, they actually contain copies of the cited reports. This obviates having to track down sometimes rare, out-of-print, and obscure documents.

To obtain even more detailed information concerning year-by-year activities at individual mining properties requires research at state recorders offices and, for recent (post 1976) activities, the BLM. This research is difficult at best because of the way mining claims are documented and the fact that the names of mines and prospects need bear no relationship to the names of either the claims where they are situated, or to the claim owners. Claim histories are most commonly compiled to facilitate third-party liability (potential responsible party) research at properties where hazards requiring remediation have been identified. If such a study has been accomplished, it will greatly facilitate historical evaluation of a given mining property.

Cultural resource specialists have recorded 60 mining properties in the Tongass National Forest and at least 40 such properties in the Chugach National Forest (a complete listing of recorded mining properties on the Chugach was not obtained). Summary data, primarily from the AHRS database are provided in Appendix D. The recorded properties include mines, prospects, associated cabins and camps, a few mining settlements, and facilities used for the transport of ore, supplies and personnel to and from the mines. Many of the recorded properties have not been evaluated for listing on the National Register. In the partial listing from the Chugach National Forest, four properties have been determined eligible under several criteria and one property, the Hirshey-Lucky Strike mine, is listed on the National Register. The Chugach list also includes six mining properties that have been determined not eligible for National Register listing. Nine mining properties within the Tongass National Forest have been determined eligible for National Register listing; 23 have been determined not eligible.

THREATS TO MINING PROPERTIES

The impetus to development of this historic context was anticipated remediation measures at historic mining properties where a variety of hazardous situations have been identified. These measures are currently being formulated. Dependent on the hazard in question, they may include: blocking adits and shafts, removal or covering of tailings, removal or in-place burning of collapsed wooden buildings and structures, trash removal and so forth. At a mining property determined eligible for National Register listing, such remediation measures have the potential to adversely effect the property if they substantially alter any of its contributing elements. It is well to remember in this regard that the components of an eligible mining property need not be in pristine condition to qualify as contributing elements. In fact, the guidance provided by the National Park Service (Noble and Spude 1992) and adopted here is explicit in requiring only that some physical evidence of a property's major components be observable in order for it to retain integrity of design (typically the single most important aspect of integrity by which to judge mining properties).

Despite the threats posed by remediation, it is abundantly clear that *the single most important threat to mining properties in Alaska's Forests is the weather*. Untreated wood and metal equipment deteriorates rapidly in the wet climates endemic to both Forests. These are regions where avoidance most certainly does *not* equal preservation.

Vandalism, intentional or otherwise, also is an issue. Easily transported artifacts and equipment are in danger of being stolen at readily accessible properties. Use and remodeling of mining related cabins has the potential to preserve these rare standing buildings. But, unless such alterations are accomplished sensitively and with an understanding of appropriate materials and workmanship, they also have the potential to degrade the integrity of the property. Proposed environmental restoration projects also have the potential to affect landscape features associated with placer mining. Finally, renewed mining activities at a historic mining property have the potential to damage or obliterate the older workings and support facilities, and to seriously alter the property's setting and feeling.

RECOMMENDED MANAGEMENT STRATEGIES

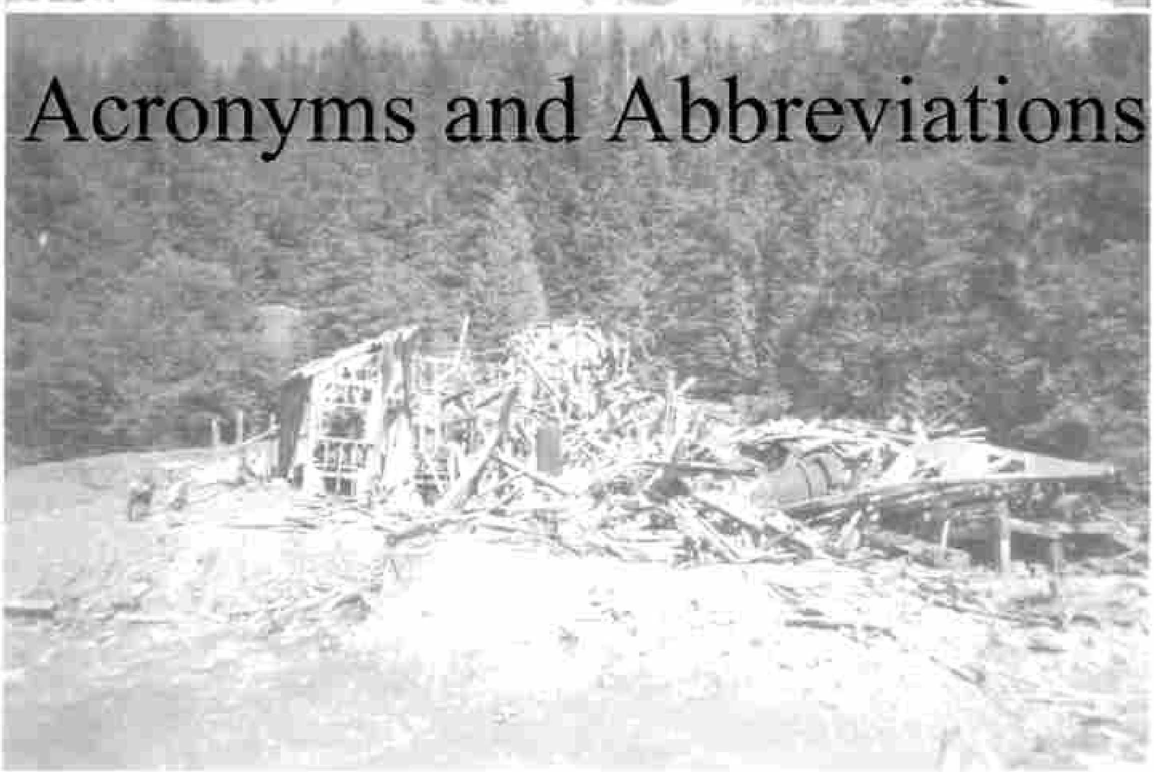
In cases where direct threats are posed by remediation or renewed mining activities, property-specific protection measures can be designed and implemented for eligible properties. Where adverse effects cannot be avoided, mitigation can be designed and formalized with memoranda of agreement between the Forest and SHPO. The Forest may wish to consider adopting a more proactive strategy, however, in keeping with the spirit and broader goals of the National Historic Preservation Act.

There are an estimated 112 past producers (lode mines and placer streams) and a larger number of developed prospects (perhaps twice or three times that many) scattered throughout the Chugach and Tongass National Forests that might qualify for National Register listing if they meet the integrity thresholds identified in Chapter 6. Even assuming that just a fraction of these properties retain sufficient integrity to be determined eligible for listing, it seems unlikely that the Forest will have the resources to stabilize and protect more than a handful of them given the toll inflicted year in and year out by natural weathering.

Perhaps, the Forest could identify a few of its most exemplary properties for active preservation and public interpretation. There are just a few mining properties that have been stabilized and made available for public enjoyment and education in Alaska. None are on Forest administered lands. Given the eminent threats posed by hazards remediation, and the long range, but ultimately much more serious threat posed by Alaska's climate, the Forest may wish to explore such a strategy in consultation with the SHPO and the ACHP. A programmatic agreement might be negotiated in which the Forest agreed to undertake a public interpretation program at a few specified properties in order to offset the immediate effects of hazards remediation at other properties along with unavoidable deterioration at many more properties in the future.

Appendix A

Acronyms and Abbreviations



APPENDIX A. ACRONYMS AND ABBREVIATIONS

AIM	Abandoned and Inactive Mine
A-J	Alaska-Juneau (Alaska Juneau Mining Company)
ACHP	Advisory Council on Historic Preservation
AELP	Alaska Electric Light & Power Company
AHRS	Alaska Heritage Resources Survey
ARLIS	Alaska Resources Library and Information Service
BLM	Bureau of Land Management (U.S. Department of the Interior)
BOM	U.S. Bureau of Mines (also USBM)
CFR	Code of Federal Regulations
CO	Contracting Officer
C.P.G.	Certified Professional Geologist
COR	Contracting Officer's Representatives
DGGS	Division of Geological & Geophysical Surveys
DNR	Department of Natural Resources
EE/CA	Engineering Evaluation/Cost Analysis
E.I.T.	Engineer in Training
FLPMA	Federal Land Policy and Management Act
FR	Federal Regulation
GIS	geographic information system
IMCG	Interagency Minerals Coordinating Group
JMIC	Juneau Mineral Information Center
lb	pounds
M	Million
MAS	Minerals Availability System
MILS	Minerals Industry Locator System
MIRL	Mineral Industry Research Laboratory
MLFA	Michael L. Foster & Associates
National Register	National Register of Historic Places
NHPA	National Historic Preservation Act
OHA	Office of History and Archaeology
oz	ounces
PA	Preliminary Assessment
PAD	Problem Area Description
P.E.	Professional Engineer
PGE	Platinum Group Element
Ph.D.	Doctor of Philosophy
PRP	Principal Responsible Party (Third Party Liability Report)
SHPO	State Historic Preservation Officer
US (U.S.)	United States
USC	United States Code
USBM	U.S. Bureau of Mines (also BOM)
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFS	U.S. Forest Service

USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator (Grid)
VMS	volcanogenic massive sulfide

Appendix B

Glossary

APPENDIX B. GLOSSARY

This glossary was compiled from glossaries published by Gould (2001), Keane and Rogge (1992), Noble and Spude (1992), Roppel (1991), Stone and Stone (1980), and White (2000). Webster's New World College Dictionary (Fourth Edition, 1999) was consulted as well.

adit horizontal entrance into a mine.

aggregate rock from which ore may be separated using only mechanical (rather than chemical) processes.

assay quantitative chemical analysis to determine components and value of metallic ores.

alluvium unconsolidated sediments deposited by moving water.

amalgam compound of mercury and gold or mercury and silver.

amalgamation
process using mercury to extract gold or silver from pulverized ore. The mercury combines with the gold and silver to form an amalgam. The amalgam then is heated to vaporize the mercury and leave the gold or silver as a residue. The mercury can be condensed from the vapor and re-used. Heating the amalgam produces toxic fumes.

back part of an underground lode situated nearest the ground surface.

ball mill a cylindrical steel container filled with steel balls into which crushed ore is fed. The ball mill is rotated on a horizontal axis causing the balls to drop, which in turn grinds the ore into small particles.

bed seam or horizontal vein of ore.

bonanza rich vein, mine, or discovery or ore.

bottoms deepest workings in a mine shaft.

bullion ingots containing both gold and silver; often sent to the U.S. mint for final refining.

claim tract of land with defined surface boundaries that includes mineral rights to all lodes and veins of ore extending downward from the surface. In the United States, the maximum size for a lode claim is 600 by 1,500 feet; maximum size for a placer claim is 600 by 1,320 feet.

claim jumping
staking a claim over a previously established claim.

claim marker
post, rock cairn or other marker placed to stake a claim.

classifiers screen-like dividers to sort ore by particle size after crushing. Different types of classifiers are grizzlies, Trommels and Dorrs.

chlorination chemical technology for milling complex ores (after the Frieberg chlorination process developed in 1858).

collar surface entrance to a shaft.

Concentrate ore that has been crushed and had waste rock partially removed; end product of the milling process.

concentrator simple machine to separate ore-bearing rock from waste rock using a shaking, vibrating motion. Different types of concentrators include jigs, buddles, vanners, Embrey tables, and Wilfley tables. The term also is used to identify buildings that house concentrating machines.

country rock
waste rock or gangue.

cradle a wooden sluice operated by rocking from side to side; used in placer mining; often synonymous with rocker.

crosscut level driven horizontally and at a considerable angle to the ore body. Sometimes used to prospect in the expectation it might disclose new deposits.

crusher machinery used to grind ore. Different types of crushers are ball mills, stamp mills, jaw crushers, rod mills, and tube mills.

cyanide process, or cyanidation
technique developed in the 1890s to extract gold from low grade ores. The cruder method of mercury amalgamation may recover 60 percent of the precious metals from ore, while the cyanide process may recover as much as 95 percent and can be applied to tailings as well as ore.

ditch excavated trench or canal to convey water.

dore product of cyanidation containing both gold and silver.

dredge large raft or barge on which are mounted either a chain of buckets or suction pumps to gather alluvial deposits of sands and gravels from below the water's surface, elevate them, and wash them to recover placer gold.

drift horizontal underground passage that follows a vein of ore. In contrast, a *crosscut* intersects the vein. A *level* may either follow or intersect a vein.

engine a machine that uses energy to develop mechanical power.

flotation an alternative method to smelting for separation of metals from barren rock. This method uses the principle that some minerals adhere to or are coated by certain oils and the oil-coated particles tend to adhere to air bubbles, stirred or blown into the pulp, and thus rise to the surface. The oil-coated minerals were collected as a froth and skimmed off, forming a concentrate. Such mills were at Salt Chuck and William Henry Bay.

free-milling gold gold that is easily separated from its country rock and can be recovered through amalgamation or gravity concentration; the converse is refractory gold.

flume an inclined channel, usually made of wood and often supported by a trestle, for transporting water.

gangue the commercially worthless mineral matter associated with economically valuable metallic mineral deposit.

giant water nozzle used in hydraulic mining. The name was derived from a manufacturing trade name.

glory hole funnel-shaped, surface pit in which ore is extracted through a raise from underground.

grizzly a grating used to catch larger pieces of ore.

grubstake supplies provided to a prospector in return for a share in his claims.

headframe steel or timber structure at the top of a mine shaft. The headframe carries the sheave or pulley for a hoisting rope. Alternate terms include gallus frame, gallows frame, headgear, hoist frame, and head stocks.

high grade ore of high value; containing a high percentage of valuable mineral to country rock; opposite is low grade.

hydraulic mining placer mining technique using water pressure to break down, wash, and transport gold-bearing placer deposits into a sluice where the gold can be trapped and collected. Delivering the high pressure stream of water requires a complex system including a diversion or storage dam, a ditch, a headbox connected to a pressurized pipeline or penstock, a hydraulic nozzle (called a monitor or giant), and a sluice.

jig any of several mechanical devices operated in a jerky manner, as a sieve for separating ores, a pounding machine, or a drill.

levels in underground mining, horizontal galleries excavated at regular intervals below the surface. Mines are customarily worked in numbered levels.

lode continuous mineral-bearing vein or deposit of ore.

long tom a long sluice or trough used to wash gold from placer deposits. A long tom is longer than a rocker or cradle.

matte crude mixture of sulfides formed in smelting ores of metals such as lead, copper and nickel. The Alaskan smelters sent matte to be further refined in the Lower 48 or Canada.

metal any of a class of chemical elements, as iron, gold or aluminum, generally characterized by ductility, malleability, luster, and conductivity of heat and electricity.

milling process of extracting minerals from ore; may be accomplished by crushing, grinding, and chemical leaching; sometimes contrasts with smelting.

mineral an inorganic substance occurring naturally in the earth and having a consistent and distinctive set of physical properties and a composition that can be expressed as a chemical formula; can be an element or a compound.

mine used as a noun, productive workings (placer or lode); contrasts with prospect. The verb 'to mine' means to extract valuable commodities.

monitor water nozzle used in hydraulic mining. The name was derived from a manufacturing trade name.

native gold (or silver or copper)
gold, silver or copper in their metallic form and found on the surface.

ore mineral of sufficient value and quantity to be mined at a profit.

panning simple placer mining technique that removes gold from placer deposits through the use of a shovel and hand pan. As water, sand and gravel are swirled in the hand pan, the lighter sand and gravel are washed over the rim and the heavier gold sinks to the bottom of the pan.

paydirt gold.

paystreak that part of a gravel deposit that carries gold in large enough quantities to make it profitable to mine.

Pelton Wheel trade name for a water wheel with buckets, used to generate electrical or mechanical power.

placer alluvial deposit eroded from parent bedrock.

placer mining recovery of gold from placer deposits by mechanical concentration. Simple hand techniques include panning, sluicing, rocking, and dry concentrating. These hand techniques are labor intensive and recover only the large pieces of gold. More complex, mechanized techniques such as dredging and hydraulic mining require more capital investment and allow lower grade deposits to be worked profitably.

portal surface entrance to a shaft or tunnel.

prospect used as a noun, an excavation of unproven value; may include pits, shafts, trenches, drifts, or drill holes used to explore mineral-bearing ground or rock. The verb 'to prospect' means to search for valuable minerals.

raise shaft excavated upward to connect levels within a mine or to reach the surface.

retort distilling or decomposed by heat of material, such as gold amalgam, to drive off mercury and recover the gold.

rocker a wooden sluice operated by rocking from side to side for washing sand or gravel in placer mining; often synonymous with cradle.

shaft vertical or sharply inclined excavation made to prospect for, or mine underground ore, or to hoist and lower miners and material into and out of below ground mine workings.

skip a self-dumping type of bucket used for hoisting ore in a shaft.

slag waste from the smelting process; contrasts with tailings and waste rock.

sluice box a wood flume with riffles on the bottom through which gravel is washed to recover gold during placer mining.

smelting using the high heat of a blast furnace (smelter) to melt ore and extract (separate) metals from country rock. The separation is both chemical and physical. The Alaskan facilities using this process were at Hadley and Coppermount on Prince of Wales Island.

stamp mill a crushing device in which heavy pieces of iron fall repeatedly, like hammers, upon pieces of ore.

stope in underground mining, a large pocket or ore, or the excavation left after removal of the ore. A stope may be excavated in steps above and below a level.

surface cuts open trenches and holes dug or blasted on the surface and frequently used to prospect for ore bodies.

tailings waste from an ore reduction process other than smelting; often refers to fine-grained debris generated by a stamp mill; contrasts with waste rock and slag.

tramway used for moving ore and supplies. An aerial tramway transports loads in carriers suspended from wire ropes forming the tracks, between supports such as towers or posts set in the ground. There are bi-cable and reversible aerial tramways. The term "tramway" is also used to describe surface transportation devices, usually railways on which ore cars moved by gravity, horsepower, manpower, or were pulled by locomotives.

trommel a sieve, usually a revolving cylindrical one, used in screening ore.

tunnel technically defined as a nearly horizontal underground passage, coming to the surface at both ends. Sometimes the term is used for a passage open to daylight at only one end, more properly termed an adit.

vanner a device used to concentrate fine particles. Vanners consist of endless belts inclined longitudinally and carried on a frame that oscillates in the plane of the belt. The shaking motion causes a stratification of particles of differing weights.

vein any zone or belt of mineralized rock lying within boundaries clearly separate from neighboring rock.

waste rock rock broken in the process of opening a mine and excavating tunnels; typically assumed not to contain commercially valuable ore; contrasts with tailings and slag. Individual chunks of waste rock tend to be cobble or boulder-size.

whim large vertical drum turned by horse power, steam power, or water power to raise ores from underground mines to the surface. The whim rope or chain attaches buckets to the whim.

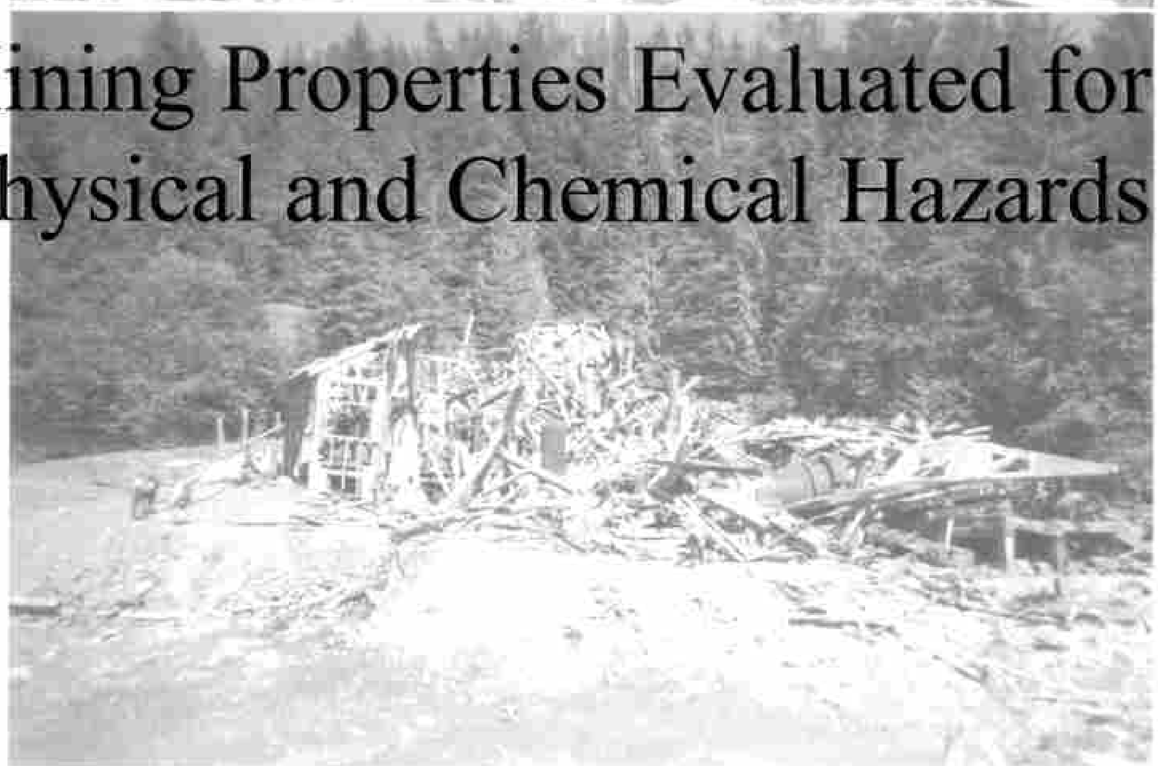
winze opening, like a small shaft, sunk from an interior point in a mine downward; used to connect one level with another, to prove the lode, for ventilation, or water removal.

workings excavations (placer or lode) developed to search for or extract valuable minerals; more generally, any mining development.

Page intentionally left blank.

Appendix C

Mining Properties Evaluated for Physical and Chemical Hazards



APPENDIX C. MINING PROPERTIES EVALUATED FOR PHYSICAL AND CHEMICAL HAZARDS

(Contributor: Donald K. Chancey)

BOM and BLM investigators inspected 137 mining properties in the Chugach National Forest and 109 properties in the Tongass National Forest for physical and chemical hazards during the mid 1990s. These properties were selected for evaluation based on recorded documentation that indicated there was some reason to suspect hazards might be present. Thus, the properties tend to include productive mines and the more elaborate prospects in contrast to smaller, less substantial properties. To understand the range of variability among the mines and prospects examined by the BOM and BLM, records that were readily available for 212 of the properties were reviewed (121 on the Chugach and 91 on the Tongass).

The results of our review are tabulated in this appendix. Each property's most common name and its MAS/MILS designation are provided. In cases where properties also were recorded by archaeologists and assigned AHRS numbers, that number is provided and may be cross referenced with the listings in Appendix D. The type (lode or placer) of each property is listed along with targeted minerals. Attributes of each property as described in historic records are summarized including dates of operation and features understood to have been present originally. This information is abstracted from data presented in the hazards assessments. Finally, summary information concerning the current (mid 1990s) attributes of each property is provided; that is, the features observed during the hazards evaluation are listed. The mining phase understood to be represented at each property also is listed. As discussed in Chapter 4, these phases include: prospecting (P), exploration (ER), development (D), and exploitation (ET). Productive mines will have experienced all four phases; while prospects will lack evidence of at least the exploitation phase. NI is used to denote cases where no information was available.

Page intentionally left blank.

Appendix C. MINING PROPERTIES EVALUATED FOR PHYSICAL AND CHEMICAL HAZARDS

Chugach National Forest

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
1	Alaska Homestake Mine	A-31	0020850191		lode	gold, silver	1918, two adits, mill, two structures, waste rock , mill tailings	P/ER/D/ET, two adits, mill
2	Alaska Wonder Ledge Prospect	A-23	0020850107		lode	gold, silver, copper, lead	1913	P/ER/D, adit, waste rock
3	Arrowhead Prospect	S-130	0020955019		lode	gold	NI	P/ER/D, adit
4	Bahrenberg Mine	A-41	0020850297		lode	gold, silver, lead, copper, zinc	NI	P/ER/D, adit
5	Banner Prospect	S-158	0020950352		lode	gold	1915-17, adit	P/ER
6	Bay of Isles Occurrence	S-75	0020950043		lode	copper, iron	early 1900s, adit	P/ER/D, waste rock
7	Bear Creek	P-91	0020950275		placer	gold, silver	1894-1931	P/ER/D/ET
8	Betty No. 1 Cabin	P-76	0020955001		placer	gold	1896-present	P/ER/D, cabin, two sheds, suspension bridge
9	Blackjack Prospect	S-115	0020950051		lode	zinc, lead, copper	1910-17, two adits	P/ER/D, cabin remains, waste rock
10	Brenner Mine	A-40	0020850296		lode	gold	1931-37, adit, shaft, mill	P/ER/D, adit, shaft, mill, waste rock, tailings
11	Brewer Alaska	S-205	0020950363		lode	gold, silver	NI	P/ER/D, three adits, two cabins, 2-stamp mill
12	Brown Bear Pr.	S-220	0020950105		lode	gold, lead, zinc	NI	P/ER/D, adit, powerline
13	Brown Bear Prospect	A-12	0020850114		lode	gold, silver, copper, lead, zinc	1930, adit	P/ER
14	California Creek	P-92	0020950256		placer	gold, tungsten	1898-1914	P/ER/D/ET
15	Cann and Minor Prospect	A-19	0020850112		lode	gold, silver, zinc	1913, adit	P/ET/D, adit, waste rock
16	Canyon Creek	P-76	0020950276		placer	gold	1895-1978	P/ET/D/ET
17	Case Mine	S-231	0020950112	SEW-659	lode	gold, silver	1912-49, three adits, mill, bunkhouse, cabin, sheds, waste rock	P/ER/D/ET, two adits, cabins, mill, waste rock
18	Chamberlain Bay Claim	S-112	0020950368		lode	copper, cobalt	NI	P/ER, seven trenches

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
19	Charles Cameron Prospects	A-21	0020850110		lode	gold	1912	P/ER/D, two adits, waste rock
20	Colorado Prospect	S-259	0020850167		lode	gold, silver	1911-31	P/ER/D, three adits
21	Coon & Plowman	S-302	0020950273		lode	gold, silver, lead	1914-30, adit, waste rock	P/ER/D, adit, waste rock, cabin
22	Cooper Creek	P-86	0020950130		placer	gold	1884-1998	P/ER
23	Cooper Creek Adit	-	0020955002		lode	gold	adit	NI
24	Crescent Discovery	-	0020950211		placer		1915	NI
25	Cripple Creek	-	0020955018		placer	gold	NI	NI
26	Crow Creek	P-93	0020950250		placer	gold	1897-1915, sawmill, flume, dam and turbine wheel	P/ER/D/ET, several buildings
27	Crown Point Mine	S-227	0020950114	SEW-192	lode	gold	1910-37, four adits, 5-stamp mill, living quarters	P/ER/D/ET, living quarters remains, mill, tailings
28	Culross Mine	S-102	0020950070	SEW-449	lode	gold, silver	1907, three adits, mill, compressor	P/ER/D/ET, adits, shaft, mill, wooden pipe, waste rock, tailings
29	Devils Club Ledge Pr.	S-219	0020950106		lode	gold	NI	did not find site
30	Downing Prospect	S-294	0020950289		lode	gold	1931, two adits	P/ER/D/ET, adit, waste rock
31	East Point Mine	S-226	0020950095		lode	gold	1924-56, living quarters, mill	P/ER/D/ET, adit
32	Eden Claims	P-81	0020955003		placer	gold	NI	P/ER, shed, outhouse, drums
33	Eldorado Ledge Prospect	S-123	0020950053		lode	gold, silver	1913-14	P/ER, waste rock
34	Fairman-Nova	P-81	0020955004		placer	gold	NI	P/ER, cabin, two sheds, outhouse, tailings
35	Falls Creek Mine	S-224	0020950113	SEW-162	lode	gold, silver	1905-49, adit, two shafts, mill	P/ER/D/ET, shaft, mill, buildings, waste rock, tailings
36	Finski Bay Prospect	S-105	0020950228		lode	copper	1917	P/ER, adit, waste rock
37	Four-in-one Prospect	A-8	0020850115		lode	copper, gold, silver	NI	NI
38	George and McFarland Pr.	S-157	0020950223		lode	gold, silver	1911, adit	P/ER/D, adit, shaft, waste rock, boiler

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
39	Gilpatrick Mine	S-253	0020950189	SEW-15	lode	gold, silver, copper, lead, zinc	1906-48, three adits, mill, assay office, cable tram	P/ER/D/ET, three adits, assay shop, mill, jaw crusher, tram terminal
40	Glendenning Prospect	S-116	0020950371		lode	copper, zinc	1906-20, adit, mill	P/ER/D, adit, mill
41	Globe Mine	A-3	0020850118		lode		1992, adit	NI
42	Gold King Mine	V-63	0020860021	VAL-266	lode	gold, silver	1911-22, three adits, mill, several cabins	P/ER/D/ET, two adits, mill and cabin remains, batteries, small tailings pile
43	Gold Stamp Prospect	S-301	0020950286		lode	gold, silver	1912-14, shaft, mill, two cabins, waste rock	P/ER/D, mill and cabin remains, waste rock
44	Golden Eagle Prospect	S-129	0020950061		lode	gold, silver	1911-16, two adits, 5-stamp mill, aerial tram	P/ER/D/ET, two adits, mill, tailings
45	Golden Victory Prospect	-	0020950107		placer??	gold	1900-16, shaft	P/ER/D/ET, shaft, building ruins, cables
46	Granite Mine	S-147	0020950226	sew-951	lode	gold, silver	1912-64, shafts, 10-stamp mill, hydroelectric plant, transformers, tailings	P/ER/D/ET, two adits, compressor, flotation cells, drill fabrication equipment, mill, electrical equipment, rail tracks, drums, waste rock, tailings
47	Grayson Lode	S-208	0020950364		lode	gold, silver	1911-12, trench	P/ER
48	Gulch Creek	P-73	0020950300		placer	gold	1897-1917	P/ER/D/ET, suspension bridge, tailings
49	H.J. Harvey Prospect	S-36	0020950023		lode	copper, nickel	1908-10, two adits	P/ER/D, two adits, waste rock
50	Hargood 1-3 Claims	P-82	0020950214		placer	?	1981-83	P/ER, three sheds
51	Harry Moore Prospect	S-47	0020950132		lode	copper	1909-17	P/ER/D/ET
52	Head of Bay Prospect	C-21	0020960040		lode	zinc, gold	1909, two adits	P/ER, adits, waste rock
53	Heavens Gate Claims	P-76	0020955005		placer	gold	1895-40, 1955-61, 1970-82	P/ER/D/ET, three cabins

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
54	Hirshey and Carlson Mine	S-292	0020950326	SEW-399	lode	gold, silver	1936-41, two adits, compressor and blacksmith shop, bunkhouse	P/ER/D/ET, two adits, piles and spring remains (probably used to support cabin destroyed by 1940 avalanche)
55	Homestake Ledge Pr.	S-204	0020950362		lode	gold, silver	1911	NI
56	Idle Claim (Kadin Lake) Prospect	A-2	0020850298		lode	zinc, copper, silver	NI	P/ER, adit
57	J.J. Bettles Claim	S-38	0020950024		lode	copper, zinc	1900, adit	P/ER, adit, waste rock
58	Jacobs Cabin	P-61	0020955006		placer	gold	1897-1907, 1915-80, two cabins	P/ER/D/ET, two cabins
59	Jensen Pr., Portsmouth	S-108	0020950049		lode	copper, silver	NI	NI
60	Jewell Mine	A-38	0020850101		lode	copper, gold, lead, silver, molybdenum	1912-38, adit, 10-stamp mill, water power system, tram	P/ER/D/ET
61	Johnson Prospect	S-258	0020950166	SEW-199	lode	gold, silver	NI	NI
62	Juneau Bowl Mining Co.	S-267	0020950374		lode	gold	1976-87, exploration drilling	P/ER, building debris
63	Kenai Star Pr.	S-296	0020950288		lode	gold	1922, two adits	
64	Knights Island Copper Prospect	S-52	0020950031		lode	copper, silver, gold	1902-15, two adits, shaft, air compressors, drills	P/ER/D/ET, building ruins
65	Knights Island Mining & Dev. Co.	S-81	0020950044		lode	copper, zinc, lead	1908-43, two adits, saw mill, electric plant, quarters	P/ER/D, two adits, building ruins
66	Krallco Sheds	P-76	0020955007		placer	gold	1989	P
67	Lansing Mine	S-163	0020950355		lode	gold, silver	1913-38, mill, cabin	P/ER/D/ET, mill, sawmill, cabin, tailings
68	Lauritsen Cabin	P-79	0020955008		placer	gold	1895-present	P/ER/D/ET, cabin, sluice box in good condition
69	Lillian L. Claims	P-81	0020955009		placer	gold	1895-present	P/ER/D, cabin, bridge in good condition, tailings
70	Lone Star Prospect	S-166	0020950136		lode	gold	May be part of Hamilton property	
71	Lucky Girl Prospect	S-21	0021050013		lode	copper	1908	P/ER, waste rock
72	Lucky Strike Mine	C-8	0020960052		lode	gold, silver	1912-25, adit	P/ER/D/ET, no recent visit

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
73	Lynx Creek	P-61	0020950155		placer	gold	1897-1915, see Whites Roadhouse or Jacob's Cabins	P/ER/D/ET
74	Mayfield Mine	V-67	0020860026	VAL-267	lode	gold, silver	1912-38, two adits, mill, blacksmith shop	P/ER/D, two adits, mill remains, tailings
75	McKinley Lake Mine	C-6	0020960053	COR-449	lode	gold, silver	1900-06, six adits, mill	P/ER/D/ET, several adits, bunkhouse, mess hall, mill and workshop ruins and equipment, bridge, rail tracks, tractor, waste rock
76	McMillan Prospect	S-248	0020950192		lode	gold	1910-17	P/ER/D/ET, adit, pit
77	Mighty Lode Prospect	S-300	0020950332		lode	gold, silver	1931, adit	P/ER/D, adit, waste rock
78	Mile Four Prospect	S-201	0020950087		lode	gold, silver	1910	could not locate
79	Mills Creek Placer Mine	P-79	0020950150	SEW-605	placer	gold	1897-37, diesel engine, Worthington pump, water cannon, sluice boxes, tractor, bulldozer, Jaeger pump	P/ER/D/ET, cabin, shower house and tool shed in good condition, late model truck, bulldozer, refrigerator, engines
80	Mineral King Mine	S-156	0020950239	SEW-259	lode	gold, silver	1912-39, adit, shaft, mill, compressor, Pelton wheel, aerial tram, several cabins	P/ER/D/ET, adit, mill, cabins, tram cables, tailings
81	Miners River Nickel Prospect	A-14	0020850113		lode	nickel, cobalt, copper	1904-11, two adits	P/ER/D, two adits
82	Mizpah Ledge Prospect	S-209	0020950097		lode	copper, gold, lead, zinc	1911, adit	P/ER/D, adit, waste rock
83	Monarch Mine	A-39	0020850295		lode	gold, silver	1909-42, six adits, mill, compressor, three trams, flume	P/ER/D/ET, one adit, burned building ruins, mill equipment
84	Mull Claims	-	0020950306	SEW-425	placer	gold	1979	P/ER, two cabins, storage shed, waste rock
85	Nearhouse	S-299	0020950287	SEW-392	lode	gold, silver	1931-42, adit, two shafts, camp	P/ER/D/ET, two adits
86	North Star Prospect	S-141	0020950342		lode	gold, silver	1911-31, adit, shaft	P/ER/D, adit, shaft, waste rock

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
87	Nugget	S-136	0020950066		lode	copper, gold, lead, silver	NI	P/ER/D/ET
88	Olson and Viette Prospect	A-35	0020850294		lode	copper, gold, zinc	NI	NI
89	Oracle (Heaston) Mine	S-255	0020950191		lode	gold, silver	1921-41, mill, cabin, tailings	P/ER/D/ET, mill, waterwheel, tractor, compressor, tailings
90	Penny Claims	P-76	0020955010		placer	gold	1890s	P/ER, drums
91	Portage Bay Mine	S-168	0020950244		lode	gold, silver	1928, mill, assay building, living quarters	P/ER/D/ET, mine workings, mill and assay building remains, tailings
92	Primrose Mine	S-214	0020950101	SEW-142	lode	gold, silver	1911-26, adit, mill, cabin, tailings	P/ER/D/ET, mill, cabin, tailings
93	Quartz Creek	P-81	0020950195		placer	gold	1890s-1906	P/ER/D/ET
94	Ready Bullion Prospect	S-272	0020950153		lode	copper	1904-07, adit	P/ER
95	Reed and Gauthier Prospect	S-149	0020950225		lode	gold, silver, zinc	1912, adit, shaft	P/ER/D, two cabins, waste rock
96	Resurrection Creek	P-90	0020950295		placer	gold	1888	P/ER/D/ET
97	Reynolds-Alaska Development Co.	C-79	0020960065		lode	copper, zinc, silver	1899-09, four adits, shaft, three buildings	P/ER/D/ET, three adits, shaft, powerhouse, two cabins remains, waste rock
98	Rilley Group Claims	C-7	0020960110		lode	gold, silver	1904-34, six adits, six cuts, cabin	P/ER/D, two adits, cabin remains, waste rock
99	Rough and Tough Mine	V-64	0020860020	VAL-322	lode	gold, silver	1935-39, adit, mill, structures, waste rock	P/ER/D/ET, adit, mill, drums, waste rock, tailings
100	Saw Mill Creek	S-312	0020950257		lode	gold, silver	1904-1939, adit, cabin	P/ER/D/ET, cabin, drum, outhouse ruins, debris
101	Seattle Creek Cabin	P-70	0020955011		placer	gold	NI	P/ER, cabin, scrap iron
102	Seward Bonanza Pr.	S-221	0020950109		lode	gold	1907-12, adit	P/ER/D/ET, adit seen from air, site not accessible
103	Shell Prospect	S-266	0020950172		lode	gold, silver	1931-50, pits, cabin	P/ER, adit, shaft, two cabins
104	Shoo Fly Prospect	S-24	0020950072		lode	copper, gold, silver	1924-26, adit	P/ER/D, two adits, waste rock
105	Silvertip Creek	P-75	0020950158		placer	gold	1897-11	P/ER/D/ET, tailings
106	Sixmile Creek	P-72	0020950268		placer	gold	NI	P/ER/D/ET, tailings

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
107	Skeen Lechner Mine	S-225	0020950116		lode	gold, silver	1907-50, three adits	P/ER/D/ET, two adits, cabin ruins, compressor, waste rock
108	Snowball Prospect	S-148	0020950344		lode	gold, silver	1913-31, adit, two shafts	P/ER/D, two adits, waste rock
109	State Claims	P-86	0020955012		placer	gold	1896-63	P/ER, cabin, shed
110	Stetson Claims	P-85	0020955013		placer	gold	1915	P/ER/D/ET, two cabins, shed, outhouse, barrels
111	Sweepstakes Mining Co.	S-140	0020950067		lode	gold, silver	1911-12, two adits, shaft, aerial tram, mill	P/ER/D, adit, waste rock
112	Sweepstakes Imperial Mine	S-152	0020950125		lode	gold, silver, antimony, copper	1912-37, adit, aerial tram, 2-stamp mill	P/ER/D, adit, mill, machinery, waste rock
113	Sweetums Claims	P-54	0020955014		placer	gold	NI	P
114	Swetman Mine (Hirshey-Lucky Strike)	S-289	0020950292	SEW-002	lode	gold, silver	1911-42, 5-stamp mill, jaw crusher, amalgamating plates, tram line, assay office, bunkhouse	P/ER/D/ET, three adits, roof, mill foundation, tram cables, two sheds, tailings
115	Teddy Bear Prospect	S-290	0020950291		lode	gold, silver	Pre-1920, adit	P/ER/D, not accessible
116	Tom Boy Ledge Mine	S-162	0020950235		lode	gold, silver	1912-24, two adits	P/ER/D/ET, adit, waste rock
117	Unnamed Prospect/Bebe Pt.	S-25	0020950186		lode	NI	NI	P/ER/D, adit, waste rock
118	Unnamed Prospect/Eleanor Is.	S-85	0020950297		lode	NI	NI	P/ER/D, adit
119	Walker Creek Cabins	P-72	0020955015	SEW-603	placer	gold	NI	P/ER, four cabins
120	Wells Bay Prospect	A-11	0020850117		lode	NI	NI	P/ER, adit
121	Whites Roadhouse	P-61	0020955016		placer	gold	1904, cabin	P/ER, four cabins, fuel storage shed, storage building, showerhouse, fuel containers, tailings

Tongass National Forest: Chatham Area

1	Chichagof Mine	CH-1	0021140023		lode	gold, silver	1906-42, adit, stamps, tube mill, flotation equipment, cyanide plant, power plant	P/ER/D/ET, adit, cabin remains, two oil tanks, tailings

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
2	Mertie Lode	CH-2	0021120072		lode	copper, nickel, cobalt	1919-56, two adits, flotation mill, aerial tram	P/ER/D/ET, two adits, ore cars, rails, tram station, buckets, frame supports, and wire, pipe, diesel engine, two-stroke engine, lead-acid battery, drum, spool of electric wire
3	Eagle River	CH-3	0021120084	JUN-24	lode	gold, silver	1902-15, adits, aerial tram, flumes, water power plant, boarding house, bunk house, general store, assay office, sawmill, blacksmith and machine shops, 2-mile horse tramway	P/ER/D/ET, seven caved portals, cookhouse, sawmill, and millsite remains at town site, cabin remains, tram terminal, and rusted cables at working site, metal hoists, cable, rails, ore containers waste rock
4	Hirst-Chichigof Mine	CH-4	0021140003	SIT-227	lode	gold, silver	1905-50, three adits, three shafts, stamps, jaw crusher, flotation mill	P/ER/D/ET, mine workings, burned mill building, tailings
5	Bessie Mine	CH-6	0021120077	JUN-215	lode	gold	1897-1904, two adits, shaft, waste rock	P/ER/D/ET, two adits, caved shaft, waste rock
6	Sumdum Chief	CH-7	0021150027		lode	gold	1895-1904, portals, surface tram, aerial tram, old buildings and pilings at town site, mill	P/ER/D/ET, mine openings, camp site near old town site
7	E Pluribus Unum	CH-8	0021120037		lode	gold, silver, copper, lead	1906-40, three adits, two cabins, mill, jaw crusher	P/ER/D/ET, three adits, two cabin ruins, Gibson mill, generator, Fairbanks Morse engine, jaw crusher, open ore chute, 55-gallon drums, wooden flume pieces waste rock

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
8	Enterprise Mine	CH-9	0021130012		lode	gold	1905-15, two adits, aerial tram, Johnson rod mill and five stamp mill, cabin at mine site and on beach	P/ER/D/ET, two adits, cabin platform west of lower adit, Johnson rod mill remains, stamp mill apparatus, waste rock, and tailings
9	Alaska Endicott	CH-10	0021120042		lode	gold, silver	1920s, adit, stamp mill, flotation mill	P/ER/D/ET, mill remains, two water-pump houses, two collapsed building, tailings
10	Crystal Mine	CH-11	NI		lode	gold, silver	1902-21, three adits, stamp mill, several cabins, cable tram, waste rock	P/ER/D/ET, three adits, five stamps and battery, rock crusher, vanner rolls, pipes, ore carwheels, grizzly, conveyor belt wheels, Pelton wheel, cabin remains with stove, cable tram station remains
11	Treasury Hill	CH-12	0021120098		lode, place	gold	1908-09, three adits, two stamp mill, six cabins	P/ER/D/ET, three adits, three cabin remains, three burned cabin remains, Gold Knob Tunnel, waste rock
12	Aurora Borealis	CH-13	0021120076		lode	gold	1896-97, four adits, mill, cabins	P/ER/D/ET, three adits, one contemporary cabin, two cabin remains, powerhouse remains, partially collapsed two story stamp mill
13	Cobol N	CH-14	0021140025		lode	gold	1921-36, adit, buildings remains, sawmill, waste rock, tailings	P/ER/D/ET, light-rail tram, mill

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
14	Cobol Prospect	CH-14	0021140026	SIT-116	lode	gold	1925-59, two adits, shaft, aerial tram, mill	P/ER/D/ET, two adits, surface and aerial trams remains, mill, seven buildings near beach, blacksmith shop, mill, shed and cabin at works, engine, crusher, compressor, generator, drums
15	Friday Mine	CH-16	0021150015		lode	gold	1890-1904, seven adits, 20-stamp mill, tailings	P/ER/D/ET, adits, mill remains, tailings
16	Lucky Chance	CH-17	0021160017		lode	gold, silver	1880-1904, two adits, shaft, 10-stamp mill, sawmill, water power plant	P/ER/D/ET, three cabins, mill, and sawmill remains, tram terminal sheave wheels, vanner rollers, Pelton wheel, sawmill blade, momentum wheels
17	Redwing	CH-18	0021150047		lode	NI	1898-1903, two adits, mill	P/ER/D/ET, mill remains
18	Stewart Mine	CH-19	0021160007		lode	gold	1872-1880, three adits, 10-stamp mill	P/ER/D/ET, three adits, cabin and mill remains, double boiler, steam engine, tailings
19	Jumbo Mine	CH-20	0021140049	CRG-50	lode	gold	1909-47, adit, shaft, mill	P/ER/D/ET, four buildings
20	Smith & Heid	CH-21	0021120093		lode	gold	1892-1930s, three adits, mill	P/ER/D/ET, three adits
21	California/Gold Standard	CH-22	0021120073		lode	gold	1897-1902, six adits, shaft	P/ER/D, five adits, two cabins remains, stamp
22	Jensen	CH-23	0021150048		lode	NI	1895-1938, adit, mill	P/ER/D/ET, adit, mill, assay lab, generator/compressor, cabin
23	Sisters Lake Power Site	CH-24	0021150233	SIT-110		NI	1909, power plant	cabin, power generation building, Pelton wheels, wire-wrapped wooden pipes
24	Alaska Chichagof	CH-25	0021140005		lode	gold	?-1936, adit, shaft	P/ER/D/ET, adit, shaft

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
25	Point Astley	CH-26	0021150019		lode	silver ?	1906-25, two adits , two shafts, large boilers, cabin remains	P/ER/D ,two adits, two shafts, machinery, fiberglass skiff
26	Point Howard	CH-27	0021120090		lode	NI	1917-21, shaft	P/ER, shaft
27	Black Chief	CH-28	0021120204		lode	NI	1906-07, two adits	P/ER, two adits, cabin remains
28	Dividend	CH-29	0021120082		lode	gold	1903-07, adit, shaft, piping	P/ER, adit, two cabins remains, forge, waste rock heliport
29	Chichagof Prosperity	CH-30	0021140024		lode	gold	1910-38, two adits, shaft	P/ER, two adits
30	Holkham Bay Prospect	CH-31	0021150013		lode	gold	1900-30s, two adits, three shafts, cabin, mill	P/ER/D, two adits, three shafts, two cabins remains
31	Joyce Jensen	CH-32	0021120081		lode	gold	1906-39, two adits, cabin	P/ER, two adits, cabin remains
32	Radio	CH-33	0021140074		lode	NI	1930s, two adits	P/ER, one adit, cabin
33	Halleck Island	CH-34	0021140152	SIT-522	lode	gold	1930s, adit, 2-compartment shaft, waste rock, power house, engine and compressor in building, bunkhouse, dock house, oilhouse, blacksmith shop, ore cart, small wheeled vehicle	P/ER/D, adit, 2-compartment shaft, waste rock, engine, compressor, ore cart, small wheeled vehicle
34	Windfall Creek	CH-35	0021120092		placer	gold	1898-1906, hydraulic elevators, flumes piping	P/ER/D/ET, piping, tailings
35	Sylvia Creek Placers	CH-36	0021150028		placer	gold	1870-?	P
36	Alaska Silver King	CH-37	0021120155		lode	silver	1938-?, aerial tram, cabin	P/ER, aerial tram remains, cabin remains, ore bucket, wire cable, stove
37	Goldwin	CH-38	0021140039		lode	gold	1920-47, adit	P/ER, adit, building remains, power plant, compressor, pump, generator, tram remains

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
38	Koby	CH-39	0021140051		lode	gold, silver	1933-36, adit	P/ER, adit, cabin remains, waste dump
39	New Chichagof Mining Syndicate	CH-40	0021140069		lode	gold	1932-36, four adits	P/ER/D, one cabin , two cabins remains, four adits, machinery
40	Sumdum Copper	CH-41	0021150014		lode	copper, zinc	1958-59, drilling	P/ER
41	Sweetheart Ridge	CH-42	0021150057		lode	NI	1899-1975, drilling	P/ER, heliport, lumber, plastic pipe
42	Port Houghton/Louise Group	CH-43	0021150011		lode	copper	1910s, three adits	P/ER/D, two adits, two cabins remains, waste rock
43	Mt. Baker	CH-44	0021140009		lode	copper	1907-79, drilling	P/ER/D, four adits, trenches, drill site, cabin remains
44	Rodman Bay	CH-45	0021140075	SIT-58	lode	NI	1898-1904, adit, 60-stamp mill, 7-mile track	P/ER/D, adit, mill
45	The Islander	CH-46	0021150005		lode	NI	1952	P/ER, two pilings
46	Powers Creek Placers	CH-47	0021150022		placer	gold	1869-1911	P/ER, cabin
47	Chuck River	CH-48	0021150024		placer	gold	1870-1900s	P/ER
48	Spruce Creek Placers	CH-49	0021150026		placer	NI	1869-1930s, tunnel	P/ER, cabin remains, tunnel
49	Boulder Creek	CH-52	0021120027		placer	NI	NI	P/ER, cabin site
50	Admiralty Alaska Gold Mining Co.	CH-55	0021120072		lode	gold	1887-1918, adit, 10-stamp mill, tram	P/ER/D/ET, adit, several buildings remains including powerhouse, aerial tram, waste rock

Tongass National Forest: Ketchikan Area

1	Khayyam Mine	KT-1	0021190036	CRG-89	lode	copper, gold, silver	1899-1905?, eight adits, aerial tram, surface tram	P/ER/D/ET, eight adits, aerial tram, surface tram, cabin remains
2	Stumble-On	KT-2	0021190303		lode	copper, zinc	1901, four adits, surface tram	P/ER/D, four adits, drilling platforms

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
3	Salt Chuck	KT-3	0021190135	CRG-19	lode	copper, palladium	1906-1949, glory hole, adits and shafts, milling equipment, residential and support facilities, tramlines, pipeline	P/ER/D/ET, as described historically plus 1980s drill platform
4	Ross-Adams Mine	KT-4	0021210003		lode	uranium	1957-71, open pit mine	P/ER/D/ET, adit, three portals, four buildings, barge loading ramp, waste rock
5	Dawson	KT-5	0021190064		lode	gold, silver, lead, copper	1903-1980s, five adits	P/ER/D/ET, five adits, two structures remains, mill machinery, tailings
6	Riverside	KT-6	0021180053	XBC-31	lode	(chalcopyrite, sphalerite, tetrahedrite)	1915-50, mill, waste rock, tailings	P/ER/D, waste rock, tailings
7	Puyallup	KT-7	0021190065		placer, lode	gold, silver	1900-46, mill	P/ER/D/ET, three adits, mill, structure remains, waste rock
8	Flagstaff	KT-8	0021190113	CRG-384	lode	gold, silver, copper, lead	1900-41, eight adits, aerial tram, mill, 11 buildings	P/ER/D/ET, eight collapsed adits, aerial tram remains, building remains, tailings
9	Gold Standard	KT-9	0021220026	KET-277 & KET-717	lode	gold, silver	1897-1942, four adits, two mills, waste rock, tailings	P/ER/D/ET, four adits, shaft, tram and rail line, two mills, bunk house, outhouse, wooden pipe, waste rock, tailings, two-story cabin in use near beach
10	Sealevel	KT-10	0021200026	KET-28	lode	gold	1897-1933, numerous adits, shafts, structures	P/ER/D, Forest Service cabin, adits, two shafts, two mills, power generator, several structure remains

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
11	Portland	KT-11	0021190114	KET-506	lode	gold, silver	1900-41, tram, mill, two cabins	P/ER/D/ET, two adits, mill machine shop, two structural remains, tram remains, tailings
12	Rush & Brown	KT-12	0021190006	CRG-388	lode	gold, silver, copper, lead	1904-29, shaft	P/ER/D/ET, adit, shaft, fuel drum
13	Solo	KT-13	0021180045		lode	(galena-electrum)	1937, tunnel	P/ER/D, cabin remains, batteries, fuel drums
14	Moonshine	KT-15	0021190090		lode	silver, gold (galena)	1905-48, adit, shaft, aerial tram, camp buildings	P/ER/D, two adits, shaft, aerial tram, compressor building, camp buildings remains, waste rock, fuel drums
15	Cymru	KT-16	0021190061		lode	copper, silver, gold	1900-1916, adits, shafts, rail line, wharf	P/ER/D/ET, three shafts, two adits, rail lines, cabin remains, hoist station foundation, waste rock
16	Lucky Nell	KT-17	0021190121		lode	gold, silver, lead	1900-40s, five adits	P/ER/D/ET, five adits, four building remains
17	Ronan	KT-18	0021180064		lode	(chalcopyrite, galena, sphalerite)	two adits	P/ER/D, two adits, waste rock, mine related iron and debris
18	Annie	KT-20	0021200176		lode	gold	1900-1963, shaft, two adits	P/ER/D/ET, two adits, two shafts, five cabin remains
19	Blasher	KT-23	0021180006	XBC-36	lode	(galena, sphalerite)	1920s, adit	P/ER, adit, waste rock
20	IXL	KT-24	0021200092		lode	(chalcopyrite, galena, sphalerite)	1898-1970s, adit	P/ER, adit, core shack remains
21	Six Mile	KT-27	0021200186	KET-645	lode	gold	1924-25, two adits	P/ER, two adits
22	Silver Falls	KT-28	0021200189		lode	silver, lead, zinc	1920s or 30s	P/ER, adit
23	Double Anchor	KT-29	0021180018		lode	(chalcopyrite, galena, sphalerite)	1923	P/ER, adit
24	Moth Bay	KT-30	0021200025		lode	zinc, copper	1911-1940s, two adits	P/ER, two adits

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
25	McCullough	KT-31	0021190043	CRG-154	lode	copper	1903-1930s, two shafts, adit, sawmill, dam, pipeline	P/ER/D, two shafts, powerhouse, pipeline, waste rock
26	Croesus	KT-33	0021190062		lode	gold	1899-1902, adits	P/ER, three adits, waste rock
27	Olympic No.8 and No. 9	KT-34	0021180135		lode	NI	1920s and 30s, two adits	P/ER/D, two adits, building remains
28	Shaft Creek Copper	KT-35	0021180096		lode	copper, gold	1930s, shaft	P/ER, shaft
29	Dall Bay Area	KT-40	0021200225	KET-595 & KET-649	lode	copper	1900s-1950s, Adits, shafts	P/ER, adit, shaft
30	Keystone	KT-42	0021190244		lode	NI	1900-13, adit, shaft	P/ER, adit, shaft, three structural remains
31	Burroughs Bay	KT-45	0021200163		lode	NI	1970s-1980, drilling camp	P/ER, four structures
32	Mahoney	KT-46	0021200024	KET-473	lode	lead, zinc, copper	1900-49, adit, mill	P/ER/D/ET, adit, cabin, mill, waste rock, tailings
33	Titan	KT-52	0021180129		lode	(chalcopyrite, galena, sphalerite)	1917-20s, adit	P/ERE, adit

Tongass National Forest: Stikine Area

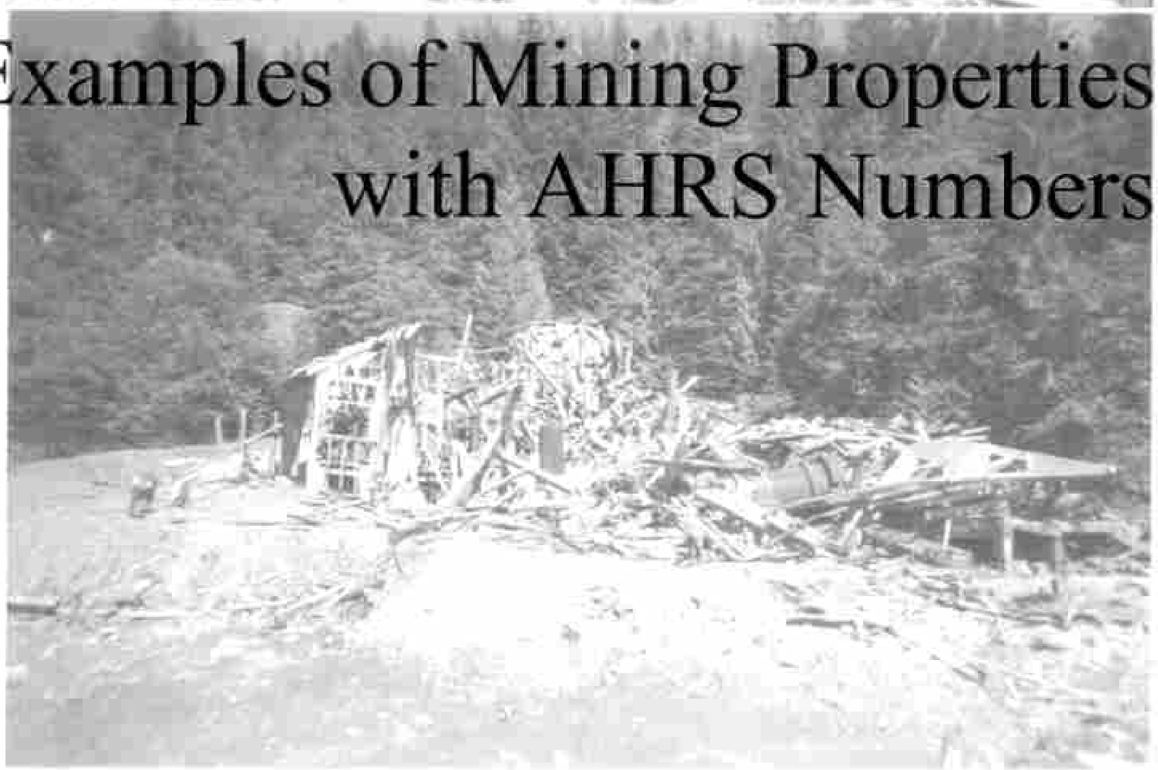
1	Berg Basin	ST-4	0021170021		lode	lead, zinc	1907-?, Reported to contain several surface pits, an 800-foot tunnel or adit, several 100 feet of diamond drilling	P/ER, none
2	Glacier Basin	ST-1	0021170020		lode	lead?	1899-?, Reported to contain numerous cuts and trenches, three short adits	P/ER, three short adits
3	Groundhog Basin	ST-5	0021170018		lode	zinc	1903-1980, Reported to contain a number of adits and crosscuts plus heliport and bunkhouses	P/ER/D, cabins, camping equipment fuel drums, drill core
4	Hattie Prospect	ST-6	0021170016	PET-166	lode	gold	1900-1907, Reported to contain shallow pits and cuts, adit, wintz, two levels and a raise. Ore was transported to off-site mill.	P/ER/D, adit portal and waste rock dump

	Name	FS ID	MAS/MILS	AHRS	Type	Target Mineral(s)	Attributes Described in Historic Records	Mining Phase / Features noted when project was visited in mid-1990s
5	Helen S Mine	ST-7	0021170014		lode	gold	1902-1908, Reported to contain pits, trenches, shafts, crosscuts, drifts, stamp mill	P/ER/D/ET, mine remains as recorded plus modern cabin and barge remains
6	Lake	ST-3	0021170019		lode	lead, zinc	1920s, Possibly reported to contain three adits and cabins	P/ER, adit portal remains and cabin remains
7	Maid of Mexico Group	ST-8	0021170015	PET-237	lode	gold?	1906, Reported to contain crosscut tunnel, small stope, stamp mill, jaw crusher, amalgamation plate, concentrating table, tractor, various power tools, small dam	P/ER/D/ET, remains of 3 portals and adits, waste rock dumps, stope and raise, mill remains, cabin remains, and hand mining tools
8	Taylor Creek	ST-2	0021170013		lode	undetermined	1903-1948, Reported to contain cut, pits, core drilling	P/ER, cut

D = development
ER = exploration
ET = exploitation
NI = no information
P = prospect

Appendix D

Examples of Mining Properties with AHRS Numbers



APPENDIX D.
EXAMPLES OF MINING PROPERTIES WITH AHRS NUMBERS

The AHRS database for the entire state of Alaska contains about 24,000 listings, with actual records available for about 18,000 properties (Joan Dale, OHA, personal communication, 2001). A number of mining properties (and properties like cabins and sawmills believed to have been associated with mining activities) within or near the Chugach and Tongass National Forests have been recorded and assigned AHRS numbers. A sample of these records was reviewed (144 records) to determine how cultural resource specialists tend to describe and classify these properties, and to better understand the range of property types that are present in the regions considered in this historic context.

Forty properties within the Chugach National Forest are included in the sample. These were identified by querying the AHRS database for records with the words mine or mining in one of several fields, and owner (jurisdiction) listed as USFS. As discussed in Chapter 5, a similar sample of records was obtained initially for the Tongass National Forest as well. This sample was subsequently augmented to include *all* recorded mining properties on that Forest along with records of nearby mining properties; this information was assembled and provided by Ketchikan Zone Archaeologist, John Autrey. Records for the Tongass vary slightly in format and content dependant on the type of form. These include OHA AHRS Site Forms, Tongass AHRS Site Reports, and Tongass Site Inventory Records.

Properties are identified by name (where one has been given), and AHRS number (actually an alpha-numeric designation in which letters stand for the appropriate 1:250,000 USGS quadrangle and numbers are assigned consecutively within each quadrangle). MAS/MILS designations are listed below the property names if those designations have been assigned. This permits cross-referencing with the properties listed in Appendix C. If known, the date each property was recorded (or a report published) is listed along with a tabulation of observed features and dates of mining operation if provided. Each property's condition (when recorded) is listed using terminology taken from the recording form. This differs slightly among forms.

National Historic Register status as regards eligibility is provided for each property. Many are of undetermined status, but one mine (the Hirshey-Lucky Strike on the Chugach National Forest) is listed on the National Register, and determinations of eligibility (DOEs) have been made for a number of others. DOEs were derived either from the AHRS database or from a separate database entitled "Alaska NHR/DOE Properties," which was provided by Jo Antonson (Deputy SHPO). Neither database lists the criteria under which properties qualified. In some cases, however, that information is provided here based on the recommendations in reports. No attempt was made to research consultation histories.

A "comments" column provides additional information. When the AHRS form contained a statement about the property's significance, this is typically provided in the comments column. Other information in the comments column addresses the issue of whether or not a given property actually received an on-the-ground inspection (some appear to have been "recorded" using historic documents alone), or other topics of interest. A final column is provided to succinctly identify the type of property represented by the AHRS listing. These are functional rather than morphological categories for the most part and include such listings as "lode mine with support facilities," access road or trail," "small mining camp," "isolated claim marker," and so forth.

Appendix D. Examples of Mining Properties with AHRS Numbers*

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
	Chugach National Forest							
1	Fidalgo Mine	COR -00084	South side of Port Fidalgo, PWS	1982 / Stone cairn above reported site of wharf and mining operation; thought to have been erected during a patent survey in 1912.	Normal weathering	Undetermined	It is unclear whether the recorders examined the actual mine site and wharf area, which appears to be on private property.	Isolated claim marker
2	McKinley Lake Mine	COR-00449	North of McKinley Lake, PWS	1999 / Caved adit, 2 shafts, trenches, waste rock dumps, ball mill remains, tractors, dump trucks, flotation unit, generators, compressors, shop remains, cabin remains, piping, road and rail bed remains, Pelton wheel, 2 bridges, mining debris, can dumps, CCC access trail; associated with Dr. W. Chase / 1906 - 1930s	Disturbed, investigated	Recommended eligible under A, B and D by Buzzell (2001); NRE 1999	Considered significant as one of the few gold mines in the Copper River Delta (although production was very low); in operation over a long span of time and important to the development of Cordova, and directly associated with Dr. Will Chase (of local and state importance)	Lode mine w/ support facilities including residences
3	Hirshey Mine and Camp (Lucky Strike Claim and Mine) [002 095 0292]	SEW-00002	Head of Palmer Creek south of Hope, KP	1988 / Roof, crusher foundation, frame supporting stamp guides / 1911 - 1942	Disturbed	NHR 1978	Apparent serious degradation since 1978 when property included adits, a 5-stamp mile, a jaw crusher mill, a tramline, 5 cyanide and settling tanks, water lines, residence and equipment buildings, and a road system.	Lode mine and mill site with support facilities and residences
4	Gilpatricks	SEW-00015	Confluence of Slate and Quartz creeks, KP	1988? / A number of buildings, none appearing to date prior to 1920 / 1906 - 1909	Unknown	NRI 1997	Described as the site of a ca. 1900-1910 mining camp with 3 cabins and 11 tents in 1909.	Small mining camp
5	Dahl (Quartz Creek)	SEW-00022	Lower Summit Lake south of Sunrise, KP	Mining camp with post office associated with Dahl placer mine 2 km north; 1910 - 1930s.	Unknown	Undetermined	Apparently no on-site inspection.	Small mining camp
6	Crown Point Mine Trail	SEW-00140	Northeast of Kenai Lake, KP	1988? / Well defined switchback trail connecting Crown Point Mine and Falls Creek Mine Trail / ca. 1910	Normal weathering	Undetermined		Access road or trail
7	Falls Creek Mine Trail	SEW-00141	East of Trail River, KP	1988? / Mining trail, now mostly 4WD connecting Falls Creek Mine with Falls Creek Station / ca. 1910	Normal weathering	Undetermined		Access road or trail
8	Primrose Mine [002 095 0101]	SEW-00142	Porcupine Creek, KP	1988 / Remains of about 6 buildings of variable dates (one standing); associated with Charles G. Hubbard / 1910s	Disturbed	NRE 1990	NRE determination apparently pertains only to the single standing cabin.	Lode mine with support facilities

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
9	Falls Creek Mine (California-Alaska Mine, Skeen-Lechner Mining Co.) [002 095 0113]	SEW-00162	Solars Mtn., KP	1991 / Collapsed shaft openings, tailings piles, and mining equipment; 3 adits, series of trails to adits, and fairly large milling complex remains / 1904 - 1915; 1945.	Normal weathering	NRJ 1997	Noted as associated with gold mining in the Cook Inlet region.	Lode mine and mill with support facilities
10	Victor Creek Prospect	SEW-00163	Victor Creek, KP	1994 / Cabin, platform, 2 large collapsed shafts, timbered (metal roofed) prospect / 1930s	Disturbed	Undetermined	Noted as associated with mining in Kenai Lake area.	Developed lode prospect with residences
11	Crown Point Mine [002 095 0114]	SEW-00192	Solars Mtn., KP	1990 / Complex of building ruins (one building still standing), tramways, mining equipment, tailings, and several mine shafts / 1906 - 1960s	Disturbed	Undetermined		Lode mine with support facilities
12	Johnson Creek Mine Complex [002 095 0166]	SEW-00199	Johnson Creek northwest of Hope, KP	1982 / Building ruins (including mill), 2 standing outhouses, 2 dumps, a bridge, wagon road remains, and much discarded mining equipment; dates not reported.	Normal weathering	Undetermined		Lode mine and mill with support facilities
13	Mineral King Mine and Mill [002 095 0239]	SEW-00259	Bettles Bay, PWS	1982 / A large 2-stamp mill, a bunkhouse, a cookhouse, a cabin, and aerial tram, piping, Pelton wheels, and miscellaneous equipment. At least 3 buildings reported collapsed in 1982 / 1912 - 1939.	Investigated	No recommendation on form but later recommended not eligible by Chambers Group, Inc. and Tetra Tech, Inc. (2001).		Lode mine with support facilities including residences
14	Wolf Creek Cabin	SEW-00263	Resurrection Creek south of Hope, KP	1997 / Log cabin (partially torn apart), shed remains, and log tent frame foundation, scattered trash, extensive hand-stacked tailings and mining equipment, ditch features along creek bank; dates not reported.	Investigated	Undetermined	Note description of placer mine workings; property characterized as associated with historic [placer] mining along Resurrection Creek.	Placer mine with small mining camp
15	Lansing Mine Sawmill	SEW-00266	Pigot Bay, PWS	1982 / Sawmill remains including platform, engine pieces and sawdust piles beside overgrown corduroy road leading upslope to the Lansing Mine / 1913?.	Disturbed, investigated	Undetermined		Sawmill and access road or trail
16	Jonesy Mine	SEW-00267	Knight Island, PWS	1982 / Portal, open and accessible underground workings, aerial tram remains, light fixtures and copper wire / early 1900s.	Investigated	Undetermined		Lode mine
17	Nearhouse [002 095 0287]	SEW-00326	Palmer Creek, KP	AHRS form not available.				
18	Hirshey & Carlson (Swetmann Mine; Swetman) [002 095 0326]	SEW-00399	Palmer Creek, KP	No description provided; associated with Robert Hatcher / 1936 - ?.	Investigated	Undetermined	Although this property appears to have been assigned an AHRS number as part of the Iditarod Trail survey, there is no suggestion of an on-site inspection.	Lode mine

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
19	Fairman-Madson Mining Camp and Quartz Creek Ditch	SEW-00410	Lower Quartz Creek, KP	1987 / One cabin in good condition and flume remains. Originally was a camp with several cabins built in 1910 and 1911 along with a blacksmith shop, and a tent; ditch dug in 1909 / 1909 - ?	Investigated	Undetermined	Noted as significant as the only major mining operation on lower Quartz Creek	Placer mine with support facilities and small mining camp
20	Jack White Cabins (Mull Claims; Pearson Mine) [002 095 0306]	SEW-00425	Resurrection Creek, KP	1989 / Three buildings: log bunk house, one-room cabin of milled lumber, and cook house of milled lumber / 1936	Normal weathering, investigated	Despite notation of 1989 determination of eligibility on AHRS form, in fact consultation is on-going. Recommended eligible under criteria A, B and D (Refer to Volume II).	Noted as significant for association with post-boom gold mining on the Kenai Peninsula on AHRS form (refer to Volume II).	Small mining camp
21	Otter Creek Mineshaft	SEW-00446	Knight Island, PWS	1981 / Mine shaft, privy, 4 culturally modified trees, and a drill hole; dates not reported.	Normal weathering, investigated	Undetermined		Lode prospect
22	Culross [002 095 0070]	SEW-00449	Culross Island, PWS	AHRS form not available.				
23	Snug Harbor Mine Adit	SEW--00480	Knight Island, PWS	1990 / Timbered adit, partially collapsed; dates not reported.	Normal weathering, investigated	Undetermined		Lode prospect
24	Moose Pass Trail (Jerome Creek Section)	SEW-00501	Near Quartz Creek, KP	1989? / Segment of trail or wagon road parallel and partially coincident with the Seward Highway; identified as the Moose Pass Military Road built by the Alaska Road Commission; road used to access mines, constructed 1908 - 1909.	Normal weathering, investigated	NRE 1989	Noted as significant as one of the last remaining segments of the Moose Pass Military Road.	Access road or trail
25	Walker Cabin [002 095 5015]	SEW-00603	Walker Creek south of Sunrise, KP	1992 / Standing log cabin with unfinished addition; built prior to 1910.	Normal weathering	NRJ 1992	Noted as significant for association with mining claim at confluence of Walker and Six-Mile creeks.	Cabin
26	Cascade Cabin	SEW-00604	Canyon Creek north of Pass Creek, KP	1992? / Log cabin with large, plywood addition; associated with Cascade claim (staked 1964) and likely constructed 1960s / 1970s.	Normal weathering	NRJ 1992	Designated a "trespass cabin" by the Forest in the 1980s.	Cabin
27	Mills Creek Cabin Site (Triangle Cabin) [002 095 0150]	SEW-00605	Mills Creek, KP	1992 / Frame and plywood cabin, bathhouse, tool shed, privy, trash, and mining equipment; possibly associated with Polly Mining Company and constructed 1961 or later.	Totally destroyed	NRJ 1992		Cabin with out buildings

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
28	BBJ Cabin (Wyn Taylor's Cabin, Keno's Cabin, Bodene's Penthouse)	SEW-00606	Bear Creek east of Hope, KP	1993? / Board and batten cabin in poor repair; possibly associated within mining; possibly constructed early 1900s, but more likely 1940s to replace earlier cabin	Normal weathering	NRJ 1993		Cabin
29	[unnamed]	SEW-00607	Sound end of Kenai Lake, KP	1992 / Trench (1 by 1.5 meters), pit (1 meter in diameter, 40 centimeters deep) and iron spike; possibly relates to prospecting no dates reported.	Disturbed	Undetermined	Noted as likely to "provide valuable information concerning mining activities ..."	Possible prospect
30	[unnamed]	SEW-00611	Confluence of Quartz Creek and Kenai Lake, KP	1996 / Substantial trenches and pits; possibly relates to mining, but could be Native caches; no dates reported.	Disturbed	Undetermined	Noted as "potentially" able to provide valuable information concerning mining activities.	Possible prospect
31	Case Mine (Grant Lake Placer Mine) [002 095 0112]	SEW-00659	Northwestern edge of Grant Lake, KP	1992 / Log cabin, frame bunkhouse, 4 storage sheds, tractor and machinery parts; assumed to be associated with historic mining; cabin believed built 1935.	Normal weathering	Undetermined	Noted as significant because of evidence of historic mining activities in the area.	Lode and placer mines with mill, mining camp and sawmill
32	Hope Mining Company Historic District	SEW-00661	South of Hope on Resurrection Creek, KP	1996 / Contributing elements include buildings, tailings, ditches, equipment, road and trails; 1890s -1990s; still active 1999.	Partially destroyed	NRE 1994	Noted for association with events and persons significant to the history of the state and the area.	Placer mines with support facilities including scattered residences
33	Unit 22A Mining Ditch	SEW-00777	Along Seward Hwy., KP.	1990s? / Ditch (1,320 feet long), milled lumber planks, and road segment; no dates reported.	Normal weathering	Undetermined	Noted as significant for association with "mining related activities."	Ditch and road
34	Unit 18E Mining Ditch	SEW-00778	West of Seward Hwy., KP.	1990s / Ditch (20 meters long); no dates reported.	Normal weathering, investigated	Undetermined	Noted as associated with historic mining.	Ditch
35	Unit 18F Road and Associated Ditch	SEW-00779	West of Seward Hwy., KP.	1990s? / Ditch, road segment and stacked logs; no dates reported.	Normal weathering	Undetermined	Noted as associated with historic mining.	Ditch and road
36	Lower Fox Creek Log Cabin Ruins	SEW-00839	Confluence of Fox and Resurrection creeks, KP	Cabin remains reported by local resident to have been mining associated; not relocated / early 1900s.	Unknown	Undetermined	Apparently no on-site inspection.	Cabin
37	Granite Mine [002 095 0226]	SEW-00951	West side of Port Wells, PWS	2001 / Three adits, stamp mill, flotation cells, waste rock and tailings, residential and support facilities, heavy equipment, nearby hydroelectric equipment and associated aqueduct / 1913-1964.	Normal weathering	Recommended eligible under criteria A and D (refer to Volume II).	Forest Service has not submitted AHRS form (refer to Volume II).	Lode mine and mill with support facilities including residences and power plant
38	Gold King Mine [002 086 0021]	VAL-00266	East side of Columbia Glacier, PWS	Adit, building remains (collapsed and scattered) / 1911 - 1914.	Disturbed	Undetermined	Noted in 1994 as having played an important role in mining history of the area; not clear whether an on-site inspection occurred.	Lode mine with support facilities
39	Mayfield Mine [002 086 0026]	VAL-00267	East side of Columbia Glacier, PWS	Upper adit with explosives mentioned; no additional description / mid to late 1930s.	Disturbed	Undetermined	Noted in 1994 as having played a role in mining history of the area; not clear whether an on-site inspection occurred.	Lode mine

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
40	Rough and Tough Mine [002 086 0020]	VAL-00322	Nunatak Mtn., PWS	Mining camp remains (collapsed and scattered) / mid to late 1930s.	Disturbed	Undetermined	Noted in 1994 that the site may provide data on mining history of the area [known to be a mine as well as a mining camp]. Not clear whether an on-site inspection occurred.	Lode mine and mining camp
Tongass National Forest								
1	Coppermount	CRG-00005	Hetta Inlet, Prince of Wales Island	1986 / Standing concrete smelter and brick and iron furnace, numerous wooden foundations, machinery, and historic debris. / 1897 - 1915	Disturbed	NRJ 1986	Coppermount is an abandoned mining settlement and the location of Alaska's first copper smelter.	Settlement with smelter
2	Kiam Port Site (Khayyam)	CRG-00017	Kasaan Bay, Prince of Wales Island, SE	1992 / Two collapsed log structures, semi-subterranean structure, ore car remains, stack of metal rails, tramline segments, scattered trash; port for the Kiam Mine / 1901 - 1907.	Partially destroyed, investigated	Undetermined.	Noted under Significance that "site is representative of mining activity on south Prince of Wales Island during the first decade of the 20th century." Property is related to mine and transfer station (all connected by tramlines).	Mining seaport with support facilities
3	Salt Chuck Mines (Goodro Claims, Joker Group) [002 119 0135]	CRG-00019	Kasaan Bay, Prince of Wales Island, SE	1981 / Remains of mine, stamp mill, generator shop, machinist's shed, 3 cabins, 2 sheds, smokehouse, and scattered debris / 1904 - 1941, 1960s, 1979 - 1981.	Investigated	NRE 1981; recommended eligible under criteria A, B, and D (refer to volume II).	(Refer to Volume II.)	Lode mine and mill with support facilities including residences and tidewater docks
4	Niblack	CRG-00042	Prince of Wales Island, SE	Abandoned mining camp and mine? / 1901-1908	Unknown	Undetermined	Apparently no on-site inspection.	Mining camp
5	Jumbo Mine [002 114 0049]	CRG-00050	Hetta Inlet, SE	1980 / Ore bunkers and a wharf reported in 1917; no description of anything observed in 1980. / early 1900s.	Unknown	Undetermined	It is possible that no on-site inspection occurred.	Tidewater dock
6	Egg Harbor Caves	CRG-00068	Coronation Island, SE	1984 / Two caves with mining cores and a sluice box or water trough; evidence of tunneling in one cave / early 1900s?.	Investigated	Undetermined		Lode or placer prospect
7	Khayyam [002 119 0036]	CRG-00089	Prince of Wales Island, SE	AHRS form not available.				
8	McCullough Mine (Lake Bay Copper Mine) [002 119 0043]	CRG-00154	Northern PWI, SE	1992 / Sawmill, mineshaft, cabin, diversion dam, log supports suggestive of a tramway, Pelton wheel, gears, wheels, and other metal equipment, log foundations of wooden road. / 1922; 1903 - 1922, 1929 - 1930, 1944	Normal weathering, investigated	Undetermined	Noted that site represents early copper mining on Prince of Wales Island. Recorders comment that mine is in good shape because of distance from salt water and remote location.	Lode mine with support facilities including residences and sawmill
9	Trocadero Copper Mine Camp	CRG-00284	Trocadero Bay, SE	1986 / Mining camp remains with several tent platforms and scattered trash. / 20th century	Normal weathering	Undetermined		Small mining camp
10	[unnamed]	CRG-00355	Cleveland Peninsula, SE	1989 / Circular shaft 2 meters in diameter, 5 meters deep; dates not reported.	Investigated	Undetermined		Lode prospect

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
11	Flagstaff / Last Chance [002 119 0113]	CRG-00384	Granite Mtn., SE	1993 / compressor, collapsed buildings, automobile remains, corduroy road, ore cars, scattered trash, and one standing building; workings not visited. Corduroy road, aerial tramway, and workings originally known to be present; gold mine / 1938 - 1942.	Normal weathering	Undetermined	Noted under Significance, "Early gold mining site of Southeast, Alaska.	Lode mine with support facilities
12	Rush and Brown Mine [002 119 0006	CRG-00388	Karta Bay, PWI, SE	1992 / Originally contained tramway, steam locomotive on narrow-gauge railroad, mess hall, bunkhouse, wharf, ore bunkers, 2 boilers, and mineshaft(s). Collapsed buildings, rusted ore cars, machinery parts, lengths of railroad track, and trash observed in 1992; copper and gold mine / 1904 - 1934?	Normal weathering, disturbed, investigated	Undetermined	Noted as one of the earliest copper mines in SE, and one of the longest running claims.	Lode mine with support facilities including residences, a railline and a tidewater dock
13	Chomondeley Sound Mine Site (Lepers Leg Mine)	CRG-00451	Hill above Chomondeley Sound, SE	1995 / Adit with drill tests and pick holes, a few artifacts in adit including milled lumber, rusted can, and shovel fragments / early 1900s.	Disturbed, investigated	NRJ 1998	Despite NRJ, under Significance, recorders state, "This site has the potential to provide info about small scale private mining operations ... And economic and land use activities in SE, AK."	Lode prospect
14	Charlie Parker's Cabin	JUN-00004	Excursion Inlet, SE	1998 / Originally reported as cabin fronting on silver mine. In 1998 just stove pipe and scattered lumber observed; no description of mine; dates not reported, but statement that mine continues to be worked.	Investigated	NRJ 1999	Under Significance, recorders state, "Site appears to lack integrity."	Lode mine with cabin
15	Jualin Mine*	JUN-00022	Mainland near Berners Bay	1988 / Ruins of gold mining operation and camp spread over 4 square miles (no standing structures); connected by tramway to oil storage tank and dock (extant?) on Slate Bay. / 1896 - 1923	Disturbed, investigated	Undetermined	Under Significance recorders comment that site's integrity is greatly diminished, thus limiting its information potential.	Lode mine with mining camp, lengthy tramline and dock with support facilities
16	Amalga (Eagle River Mine) [002 112 0084]	JUN-00024	Eagle River northwest of Juneau, SE	Current condition not described. 1910s: adit, 20-stamp mill, wharf, aerial tramway, 7-mile roadway, post office, and support facilities / 1902 - 1927.	Investigated	Undetermined	Apparently there was no on-site inspection.	Lode mine and mill with support facilities including residences, a lengthy road or trail and tidewater dock
17	Comet Landing (Seward City)	JUN-00033	Sherman Creek on the east shore of Lynn Canal, SE	Recording date unclear; 1981? / Mining camp and landing with wharf and railroad originally. When recorded the remains of a Portland Mill, tramway, tram, cabin, 2 small wood framed pits, 11 (not described) structures, roadbed, narrow gauge railroad, and wharf were noted. / 1897 - 1936.	Disturbed, investigated	NRJ 1983	Under Significance, recorders state, "Recent historic activities have extensively impacted the site."	Mining camp with mill and dock
18	Treadwell Group Mines*	JUN-00058	Douglas Island, SE	1986 / Ruins of four lode gold mines and mills, associated town, power plants, tramways, foundry, post office, bunkhouses and dining halls. / 1880 - 1922	Investigated	NCL not date	Noted as the richest gold mining operation in Alaska.	Lode gold mines and mills with associated support facilities including power plants, company town, and seaport

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
19	Alaska-Juneau Mining Co., SW Complex*	JUN-00079	Just south of Juneau, SE	1994 / Ruins of a multi-story mill building, carpentry shop and office, steam power plant, wharves and other buildings, and the foundation of a substation. Built to expand production capacity of the Alaska Juneau Mining Company with addition of the 8,000-ton-per-day mill. / 1913 - 1944	Partially destroyed, investigated	NRE 1994	Noted as significant for association with larger Alaska Juneau gold mining operations in the Juneau area.	Mill with support facilities and seaport (one aspect of more extensive mining operation)
20	Thane (Sheep Creek)*	JUN-00082	On Gastineau Channel 4 miles southeast of Juneau, SE	1986 / Company mining town for the Alaska Gastineau mine; housed the huge mill; also boated a large wharf, warehouses, general store and post office. / 1881 - 1921	Partially destroyed	NRE 1992	Named for Bartlett L. Thane, general manager of the Alaska Gastineau Mining Company and highly innovative mining engineer; not mentioned is the extreme importance of the milling process Thane developed and operationalized at the mill site.	Company town with mill, support facilities and seaport (one aspect of more extensive mining operation).
21	Occidental Bar (Miner's Hall, Crystal Palace)*	JUN-00118	Juneau, SE	1986 / Two-story, flat-roofed concrete building; formerly a popular bear and music hall; currently a bar with apartments on the second floor. / ca. 1891	Normal weathering	NHS 1994	A contributing building within the Juneau Historic District.	Saloon (in town)
22	C.W. Fries Cottage/Mine Workers House VI*	JUN-00163	Juneau, SE	1986 / One and 1/2-story wood frame building with gable roof; apparently built for mine workers by the Alaska Juneau Gold Mining Company. / 1913	Normal weathering, investigated	NHR 1988	One of 6 houses within the Fries Miners Cabins Historic District	Cabin (in town)
23	Annex Creek Hydroelectric Plant*	JUN-00175	Juneau vicinity, SE	1980 / Hydroelectric plant built originally for the Alaska Gastineau Mining Company. Primary extant features include tunnel with steel pipe, timber dam, metal frame powerhouse with 2 Pelton wheels and an overhead crane, and 3 small wood frame houses. Tramway and railroad are no longer extant. / 1915	Normal weathering, disturbed	Undetermined		Powerplant with associated dam, tunnel, railroad and residences (one aspect of more extensive mining operation)
24	Sheep Creek Hydroelectric Plant*	JUN-00214	Thane vicinity, SE	1980 / Hydroelectric plant built by the Treadwell mines companies. The timber frame, corrugated iron building with a concrete foundation and wood truss roof is extant along with an overhead crane. Not clear whether dam, flume, penstock and Pelton wheels still exist. / 1910	Normal weathering	NRE 1994		Power plant with associated dam and flume (one aspect of a larger mining operation)
25	Bessie Creek Mine (Aurora Mill) [002 112 0077]	JUN-00215	Bessie Creek, SE	1981 / Remains of abandoned mining operation consisting of deteriorating log cabin, deteriorating frame cabin, frame out building, mine shafts, corduroy road segments, trestle or tram remains, steam engine, mining artifacts, and stamp mill remains. / 1888 - 1920s	Investigated	Undetermined		Lode mine and mill with support facilities including residences

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
26	Treadwell Ditch Tender's Camp	JUN-00216	Douglas Island, SE	1981? 1994? / Four collapsed or collapsing buildings, one standing building, four dump areas, one water wheel / 1890s.	Investigated	NRE 1981	Noted that ditch tender's camp is significant for association with Treadwell Ditch and Treadwell Mine	Small camp associated with ditch and water wheel (one aspect of a more extensive mining operation)
27	Kensington Mill Site	JUN-00240	Sherman Creek on the east shore of Lynn Canal, SE	1980s? / Complex consisted originally of an assay office, machine shop, mill and engine room, coal bunkers, locomotive house, blacksmith's shop, 2 tram terminals, hospital, bunkhouse, store, and residences. When recorded in the 1980s, all buildings and structures had deteriorated and collapsed with the exception of 2 small structures; gold mill and support facilities. / 1897 - 1930.	Disturbed, investigated	NRJ 1983		Mill with support facilities and company town
28	Nugget Creek Power Project	JUN-00241	Northwest of Juneau, SE	1985 / Associated with Treadwell Mining Company. Extant features include concrete foundation and intake pipes of the powerhouse, a pipeline/tramline, a tunnel, 2 construction camps, and a dam. / 1911 - 1943	Investigated	NRE 1985	Significant for association with Treadwell Mine.	associated dam, tunnel, pipeline and two construction camps (one aspect of a larger mining operation)
29	Behrends Cabin I*	JUN-00284	Juneau Townsite, SE	1986 / Standing wood frame cabin built for mine workers. / ca. 1915	Normal weathering	Undetermined		Cabin (in town)
30	Behrends Cabin II*	JUN-00285	Juneau Townsite, SE	1986 / Standing wood frame cabin built for mine workers. / ca. 1915	Normal weathering	Undetermined		Cabin (in town)
31	Behrends Cabin III*	JUN-00286	Juneau Townsite, SE	1986 / Standing wood frame cabin built for mine workers. / ca. 1915	Normal weathering	Undetermined		Cabin (in town)
32	Behrends Cabin IV*	JUN-00287	Juneau Townsite, SE	1986 / Standing wood frame cabin built for mine workers. / ca. 1915	Normal weathering	Undetermined		Cabin (in town)
33	C.W. Fries Cottage/Mine Workers House V*	JUN-00308	Juneau Townsite, SE	1986 / One and 1/2-story wood frame building with gable roof; apparently built for mine workers by the Alaska Juneau Gold Mining Company. / 1913	Normal weathering, investigated	NHR 1988	One of 6 houses within the Fries Miners Cabins Historic District	Cabin (in town)
34	C.W. Fries Cottage/Mine Workers House IV*	JUN-00309	Juneau Townsite, SE	1986 / One and 1/2-story wood frame building with gable roof; apparently built for mine workers by the Alaska Juneau Gold Mining Company. / 1913	Normal weathering, investigated	NHR 1988	One of 6 houses within the Fries Miners Cabins Historic District	Cabin (in town)
35	C.W. Fries Cottage/Mine Workers House III*	JUN-00310	Juneau Townsite, SE	1986 / One and 1/2-story wood frame building with gable roof; apparently built for mine workers by the Alaska Juneau Gold Mining Company. / 1913	Normal weathering	NHR 1988	One of 6 houses within the Fries Miners Cabins Historic District	Cabin (in town)
36	C.W. Fries Cottage/Mine Workers House II*	JUN-00311	Juneau Townsite, SE	1986 / One and 1/2-story wood frame building with gable roof; apparently built for mine workers by the Alaska Juneau Gold Mining Company. / 1913	Normal weathering	NHR 1988	One of 6 houses within the Fries Miners Cabins Historic District	Cabin (in town)

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
37	C.W. Fries Cottage/Mine Workers House I*	JUN-00312	Juneau Townsite, SE	1986 / One and 1/2-story wood frame building with gable roof; apparently built for mine workers by the Alaska Juneau Gold Mining Company. / 1913	Normal weathering	NHR 1988	One of 6 houses within the Fries Miners Cabins Historic District	Cabin (in town)
38	Alaska Gastineau Mine Workers House I*	JUN-00315	Lower Salmon Creek, Northwest of Juneau, SE	1986 / One-story, wood frame house with pitched gable roof and wood post foundations, built for Alaska Gastineau Mining Company Workers near Salmon Creek Powerhouse No. 1. / prior to 1920	Normal weathering	Undetermined	It is unclear if this building was actually observed in 1986.	Cabin (in town)
39	Alaska Gastineau Mine Workers House II*	JUN-00316	Lower Salmon Creek, Northwest of Juneau, SE	1986 / One-story, wood frame house with pitched gable roof and wood post foundations, built for Alaska Gastineau Mining Company Workers near Salmon Creek Powerhouse No. 1. / prior to 1920	Normal weathering	Undetermined	It is unclear if this building was actually observed in 1986.	Cabin (in town)
40	Alaska Gastineau Mine Workers House III*	JUN-00317	Lower Salmon Creek, Northwest of Juneau, SE	1986 / One-story, wood frame house with pitched gable roof and wood post foundations, built for Alaska Gastineau Mining Company Workers near Salmon Creek Powerhouse No. 1. / prior to 1920	Normal weathering	Undetermined	It is unclear if this building was actually observed in 1986.	Cabin (in town)
41	Nugget Shop (Miner Publishing, Cheney Building)*	JUN-00372	Juneau Townsite, SE	1994? / Two-story wood frame building with flat roof, a partial basement and a concrete foundation. / no date provided.	Investigated	NH? 1994	This is a non-contributing building within the Juneau Downtown Historic District.	Commercial building (in town)
42	Last Chance Basin Historic District*	JUN-00454	Three miles West of Juneau in the Coastal Mountain Range, SE	1990 / A series of placer and lode gold mining claims along Gold Creek. The 121.4-acre district includes standing and collapsed buildings and structures, sites and objects that were part of the Alaska Juneau Gold Mining Company operations (includes Jualpa Mining Camp). / 1887 - 1944	Investigated	Nomination approved by Alaska Historical Commission n.d.	Under Significance recorders note association with Alaska Juneau Gold Mining Company.	Lode and placer prospects, mines and support facilities including residences, and a company town (one aspect of a larger mining operation)
43	Fries Miners Cabins (Kennedy Street Historic District)*	JUN-00455	Starr Hill in Juneau, SE	1986 / Six residential buildings, craftsman style bungalows, constructed to provide housing for mine workers and their families. / 1913	Normal weathering	NHR 1988	Noted as significant for association with Juneau's mining history, and as one of the first residential areas to be developed beyond the Juneau Townsite.	Cabins (in town)
44	300 Stamp Mill*	JUN-00491	Douglas, SE	1991 / Concrete foundation of building that was the largest gold crushing mill in the world in 1889; located within the Treadwell [Mine] Historic District. / 1889	Partially destroyed, investigated	Undetermined	Under Significance recorders note age and association with the industrial mining development of Douglas.	Mill (one aspect of a larger mining operation)
45	The Glory Hole*	JUN-00496	Douglas, SE	1991 / Flooded open pit connected to underground tunnels; measures 420 by 1700 feet in surface area and 450 feet deep; mine flooded originally in 1917. Within Treadwell [Mine] Historic District. / late 1800s and early 1900s	Not given	Undetermined	Under Significance recorders note that over 5 million tons of ore were taken from the pit between the early 1880s and 1906 (when tunnels were initiated).	Huge open pit (one aspect of a larger mining operation)

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
46	Nowell/Experimental Mill*	JUN-00513	Sheep Creek Valley near Thane, SE	1991 / Remains of a 10-stamp mill constructed by the Silver Queen Mining Company. Features include 4 aligned battery frame foundations, flooring remains, a motor mount on a concrete block, vanners, a 300-gallon water tank, a horizontal boiler, 4 iron-sheave wheels, a large iron wheel, an accumulation of rail segments, and scattered wood planking. / 1889 - 1915	Normal weathering, investigated	NRE 1992	Under Significance recorders note that the mill represented a consolidation of the Silver Queen and Glacier deposits, and that the mine and mill were the focus of human activity in the area during the 1890s.	Mill
47	Gastineau Coarse Crushing Plant*	JUN-00518	Sheep Creek Valley near Thane, SE	1991 / Steel beams and concrete foundation; originally covered with corrugated metal and housed various crushing equipment. / 1912 - 1921	Disturbed	NRE 1992	Significant as a major component of the Alaska Gastineau Mining Company complex, which was one of the most efficient and innovative mining enterprises of its time.	Mill (one aspect of a larger mining operation)
48	Gastineau Concentrating Mill and Retreatment Plant*	JUN-00519	Sheep Creek Valley near Thane, SE	1991 / Concrete foundation with numerous subterranean chambers, the remains of a building used to house concentrating equipment; and the concrete foundation of a retreatment plant. Together these two buildings were the scene of the final refining process for ore from the Alaska Gastineau mine / 1912 - 1921	Disturbed	NRE 1992	Significant as a major component of the Alaska Gastineau Mining Company complex, which was one of the most efficient and innovative mining enterprises of its time.	Mill (one aspect of a larger mining operation)
49	Sheep Creek Adit and Perseverance Mine*	JUN-00524	Sheep Creek Valley near Thane, SE	1991 / A total of 19 miles of underground workings of the Perseverance mine (14 levels from 2,500 feet above sea level to 1,000 feet below sea level) and the connected 10,500-foot-long Sheep Creek adit. / 1880 - 1944	Disturbed	NRE 1992	Under Significance recorders note that the Sheep Creek adit is widely recognized as one of the greatest mining achievements of its time and was the longest tunnel in the western hemisphere when constructed in record time.	Lode mine (major engineering achievement)
50	Jualpa Mining Camp*	JUN-00525	Last Chance Basin near Juneau, SE	1990 / Mining camp remains. Extant features include 5 standing industrial buildings, a railway with in-situ rolling stock, and tunnels. Part of the Last Chance Basin Historic District. / 1910	Investigated	NHR 1993	Significant as the support camp for the Alaska Juneau Gold Mining Company, which was the most productive lode gold mining operation in the Juneau area.	Company town with railroad (one aspect of a larger mining operation)
51	Rail System*	JUN-00531	Last Chance Basin near Juneau, SE	1987 / Remains of 2 parallel railways used to transport ore from the Gold Creek Adit to the mill on Gastineau Channel (Alaska Juneau Mining Company operations). Steel rails and switching gear are in place as is in-situ rolling stock with the boundaries of the Last Chance Basin Historic District. / 1911 - 1913	Investigated	NPD no date	Significant as part of the Jualpa Mining Camp support operations for the Alaska Juneau Gold Mining Company.	Railroad (one aspect of a larger mining operation)

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
52	Mine Portal*	JUN-00532	Last Chance Basin near Juneau, SE	1987 / Main entrance to the Gold Creek adit of the Alaska Juneau Mining Company; supports of heavy timber and beam construction, steel doors; portal within Jualpa Camp and part of the Last Chance Basin Historic District. / 1913	Investigated	NPD no date	Significant as part of the Jualpa Mining Camp support operations for the Alaska Juneau Gold Mining Company.	Entrance to lode mine (one aspect of a larger mining operation)
53	Tunnel #1*	JUN-00533	Last Chance Basin near Juneau, SE	1987 / One of five extant entrances to the Alaska Juneau mine, and one of three entrances from Jualpa Camp; timber construction. Part of the Last Chance Basin Historic District. / 1910 - 1913	Investigated	NPD no date	Significant as part of the Jualpa Mining Camp support operations for the Alaska Juneau Gold Mining Company.	Tunnel [adit] (one aspect of a larger mining operation)
54	18 Ton Baldwin Westinghouse Locomotive 1*	JUN-00535	Last Chance Basin near Juneau, SE	1987 / Electric powered steel locomotive; power was supplied by an overhead trolley wire in mine tunnels and snowshed. Locomotive is in-situ on tracks within Jualpa Mining Camp. Used to haul ore from Jualpa Mining Camp railyard to mill on Gastineau Channel. Part of the Last Chance Basin Historic District. / ca. 1916	Investigated	NPD no date	Significant as part of the Jualpa Mining Camp support operations for the Alaska Juneau Gold Mining Company.	Locomotive (one aspect of a larger mining operation)
55	18 Ton Baldwin Westinghouse Locomotive 2*	JUN-00536	Last Chance Basin near Juneau, SE	1987 / Electric powered steel locomotive; power was supplied by an overhead trolley wire in mine tunnels and snowshed. Locomotive is in-situ on tracks within Jualpa Mining Camp. Used to haul ore from Jualpa Mining Camp railyard to mill on Gastineau Channel. Part of the Last Chance Basin Historic District. / ca. 1916	Investigated	NPD no date	Significant as part of the Jualpa Mining Camp support operations for the Alaska Juneau Gold Mining Company.	Locomotive (one aspect of a larger mining operation)
56	Steam Power Plant*	JUN-00601	Juneau, SE	1994 / Two-story, steel frame building with concrete foundation and floor; walls are wood covered with corrugated iron. Originally used to power the Alaska Juneau Mining Company's operations; in current use as a warehouse. / 1916	Normal weathering, investigated	NRE 1994	Under Significance recorders note the plant was part of the Alaska Juneau Mining Company's southwest complex and associated with lode gold mining in the Juneau area.	Power plant (one aspect of a larger mining operation)
57	Alaska-Juneau Mill Building*	JUN-00605 (also recorded as part of JUN-00079)	Just south of Juneau, SE	1994 / Ruins of a massive, multi-story concrete and steel mill building designed as a crucial part of the Alaska Juneau Mining Company's expanded operations to process 8,000 tons or low grade gold ore per day using ball crushing equipment. Most interior machinery removed in the 1960s and building burned in a 1965 fire, with portions of metal frame salvaged thereafter. / 1916 - 1944	Partially destroyed, investigated	NRE 1994	Under Significance recorders note the mill was part of the Alaska Juneau Mining Company's southwest complex and associated with lode gold mining in the Juneau area.	Mill (one aspect of a larger mining operation)
58	Charles Ward Cabin and Associated Mine Shaft	JUN-00671	West shore of Lynn Canal, SE	1995? / Collapsed cabin, timbered mine shaft, scattered trash / ca. 1930s.	Normal weathering	NRE 1995	Under Significance, recorders state, "Given the site's age and its valuable cultural material, this site may yield info on hist[oric] uses of the area."	Lode prospect with cabin

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
59	Hyder (Portland City)*	KET-00004	Mouth of the Salmon River on the west shore of the Portland Canal, SE	1985 / Mining community established in 1907; practically deserted when recorded. No description provided. / 1907 - 1980s	Not given	Undetermined		Mining town
60	Sealevel [002 120 0026]	KET-00028	SE	AHRS form not available. Reported by Mobley (2001).		Recommended eligible under criteria A, C, and D by Mobley (2001).	Recommended eligible as a district.	Lode mine with support facilities including residences
61	Gold Standard Mine [002 122 0026]	KET-00277	Cleveland Peninsula, SE	1980s / remains of tramway, flume, dam, mill (?), 2 mine shafts, and machinery. Originally reported to contain a shaft, a tunnel, 2 excavated levels, a steam hoist, a 10-stamp, water powered mill, concentrators, an iron tramway, a boarding house, an assay office, and other buildings. / 1898 - 1942.	Investigated	Recommended eligible under criteria A, C, and D by Mobley (2001).	Recommended eligible as a district.	Lode mine and mill with support facilities including residences
62	Rainy Day Mine	KET-00285	Helm Bay, Cleveland Peninsula	1989 / Features occur in four groups: mine portal area, tramway, tidewater tramway terminus, and streamside cabin. Mine portal is collapsed with miscellaneous machinery and debris noted. Tramway remains noted. Cabin reported collapsed. / ca. 1900	Not given	Undetermined		Lode mine with tramway and single residence (plus tidewater dock?)
63	North Thorne Arm Cabin	KET-00439	East side of Thorne Arm, Revillagigedo Island	1995 / Collapsed log cabin with roof of milled planks covered with cedar shake shingles; no associated artifacts. / date undetermined	Natural weathering	NRJ 1996		Cabin
64	Baltic Mine	KET-00440	Revillagigedo Island, SE	1995 / Partially collapsed, timbered tunnel [adit] and open cut assumed to be the never developed Baltic mining claim; cabin remains and road 1/4-mile distant may be related. / ca. 1908.	Normal weathering, investigated	NRJ 1996		Lode prospect
65	Baltic Creek Cabin and Road	KET-00441	Revillagigedo Island, SE	1995 / Collapsed log cabin with roof constructed of log beams withshiplap lumber, tar paper and wooden shingles. Road (16 feet wide) leads from beach past cabin then turns north. Recorders note cabin may be associated with Baltic adit, which is situated 4/10 of a mile to the east. / date undetermined	Natural weathering	NRJ 1995?		Cabin and access road or trail
66	Goo Goo Mine	KET-00442	Revillagigedo Island, SE	1995? / Adit, tramline remains, log cabin remains, possible outhouse remains, semi-subterranean pit house, kiln remains, cleared areas, and debris scatter / 1905 - 1937.	Normal weathering, investigated	NRJ 1996		Lode mine with residence and outbuildings

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
67	Mahoney Zinc Mine [002 120 0024]	KET-00473	Revillagigedo Island, SE	1996 / Three collapsed buildings, outhouse and tramline remains, 2 adits (one partially collapsed), 3 wooden platforms, 8 pilings, a concrete platform, and rusted mining equipment (an ore car, 2 mounted engines, portion of a ball mill and flotation devise) and household furnishings. / 1904; 1947.	Disturbed	No recommendation on form, but later recommendation of not eligible due to loss of integrity by Mobley (2001). Mobley recommends that a nearby cabin is eligible under Criterion D.	Under Significance on form, recorders note that the Mahoney Mine was the first zinc producer in Alaska.	Lode mine and mill with support facilities including residences
68	Portland [002 119 0114]	KET-00506	SE	AHRS form not available.				
69	Seal Cove Historic Debris Field	KET-00588	Gravina Island, SE	1999 / Individual building remains could not be discerned, but large quantities of trash and debris are reported, some apparently mining associated (for example, trestles, carts, and screens); also household trash. / 1901 - 1912	Normal weathering	Undetermined		Mining debris
70	Seal Cove Adits #1 and 2	KET-00589	Gravina Island, SE	1999 / Remains of 2 timbered adits and partially eroded tailings [waste rock?) piles; thought to be a copper mine based on rock type. / 1901 - 1912.	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Under Significance recorders indicate site is associated with turn of the century mining activities in the area.	Lode prospect
71	Seal Cove Tent Platform Cluster	KET-00590	Gravina Island, SE	1999 / Mine shaft, rock core storage rack, and 9 tent platforms. / 1901 - 1912.	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Under Significance recorders indicate site is associated with turn of the century mining activities in the area.	Lode prospect or mine with small mining camp
72	Seal Cove Assay Laboratory	KET-00591	Gravina Island, SE	1999 / Log tent platform with associated debris suggestive if assaying. Three mine shafts and 7 associated trench are nearby. / 1901-1912	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Under Significance recorders indicate site is associated with turn of the century mining activities in the area.	Lode prospect or mine with minor support facilities
73	Seal Cove Mine*	KET-00592	Gravina Island, SE	1999 / Several tailings [waste rock?] piles, rails, 3 shafts, 4 adits, 2 trenches, road segments, a steam boiler, a steam piston, remains of several wooden framed buildings, and several tent platforms. / 1908	Natural weathering	NRJ 1999?		Lode mine with support facilities including residences

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
74	Dall Bay Shaft and Core Samples* [002 120 0225]	KET-00595	Gravina Island, SE	2000 / Collapsed core storage rack made of logs, numerous rock core fragments, cylindrical steel boiler, mine shaft, trench, waste rock pile, and cut stumps. / 1905	Natural weathering	NRJ 2000?		Lode prospect
75	Londevan Mine	KET-00644	South Revillagigedo Island, SE	2000 / Timbered adit, waste rock pile, rock crib, rock and log crib that may be dock remains, road segment, and debris suggestive of a camp but no structural indications. / 1913	Normal weathering	No recommendation on form, but Forest draft "clearance report" contains a determination of "not eligible."	Under Significance recorders indicate site is associated with turn of the century mining activities in the area and state that the Londevan Mine produced gold, zinc, copper and lead.	Lode mine with support facilities (probably) including residences and a tidewater dock
76	Six Mile Mine* [002 120 0186]	KET-00645	About 5 miles north of Hyder	2000 / Two timbered adits; no additional features or artifacts observed. / early 1900s	Vandalism and erosion noted	NRJ 2000		Lode prospect
77	Fallen Chimney Cabin	KET-00646	Gravina Island, SE	2000 / Collapsed frame cabin with concrete fireplace (furnace). / early 1900s	Partially destroyed	NRJ 2000	Under Significance recorders note site is probably related to turn of the century mining in the area.	Cabin
78	Concord Group Mine Shaft and Trenches	KET-00648	Gravina Island, SE	2000 / Mine shaft (timbered), caved adit, 8 trenches, and waste rock piles. / 1900s - 1970s	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Noted as evidence of early 20th century copper, zinc, gold and silver mining in the area.	Lode prospect
79	Dall Bay Shaft and Tent Platform [002 120 0225]	KET-00649	Gravina Island, SE	2000 / Tent platform, 2 trenches, log racks nailed to trees above a deep shaft, waste rock piles and minor amounts of debris. / late 1800s - early 1900s	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Noted as evidence of early 20th century copper and silver mining activities in the area.	Lode prospect
80	Nehenta Bay Exploration Camp and Trenches	KET-00652	Gravina Island, SE	2000 / Remains of an exploration camp (probably Amoco Minerals Co.), a log trail, 3 trenches and a log dam. Tent platform and rock cores noted along with PVC pipe and visquine. / 1902 - 1970s	Normal weathering	NRJ 2000	Noted as evidence of early 20th century mining activities and 1970s mining exploration in the area.	Prospect with small mining camp
81	Grant Cove Adit*	KET-00657	Gravina Island, SE	2000 / Single timbered adit (supports mostly collapsed) with waste rock accumulation; no additional features or artifacts observed. / 1901 - 1902	Natural weathering	NRJ 2000		Lode prospect

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
82	South Nelson Cove Adits and Camp	KET-00659	Gravina Island, SE	2000 / Two adits, 2 trenches, 2 log tent platforms, and a rock alignment thought to be a boat haulout; various concrete features noted. / 1901 - 1902	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Noted as evidence of early mining activities in the area.	Prospect with two cabins
83	Grenadier Claim Exploration Trench	KET-00666	Gravina Island, SE	2000 / Trench and waste rock pile assumed to be associated with copper exploration. / 1908	Normal weathering	No recommendation on form, but Forest "clearance report" contains a determination of "not eligible."	Noted as evidence of early mining activities in the area.	Lode prospect
84	Airport Waterfall Adit*	KET-00667	Gravina Island, SE	2000 / Adit with waste rock accumulation; assumed to reflect prospecting; no additional features or artifacts noted. / date not provided	Natural weathering	NRJ 2000		Lode prospect
85	Hattie Camp Claims (Woedsky) [002 117 0016]	PET-00166	Southwest Woewodsky Island, SE	1982 / Remains of a coastal settlement and associated mine. A wharf was connected to the mine by a tramway. The mine comprised a tunnel [adit?], shaft and below ground drifts. It is unclear from site report what aspects of the settlement and mine are extant. / 1900 - 1907	Investigated	Undetermined	Noted as one of the earliest large-scale mining developments within the Kupreanof Mining District.	Lode mine associated with mining town, tramway and seaport
86	North Marble Creek Mine	PET-00188	North Prince of Wales Island	1990 / Adit, mining equipment, 2 collapsed log buildings, and a collapsed log bridge; scattered debris noted as well. Recorders suggest at least two periods of activity are represented. / early 1900s	Partially destroyed	No recommendation on form, but note that a buffer zone has been established to protect the site from logging activities.	Noted as representative of early 20th century mining in the area.	Lode prospect or mine with support facilities (possibly residential)
87	Maid of Mexico Mine [002 117 0015]	PET-00237	Western Woewodsky Island	1984 / Trail, collapsed cook or bunkhouse, collapsed log cabin, modern log cabin, 2 adits, several additional collapsed buildings including a possible powder house, waste rock and tailings piles, railroad track segments, and various pieces of mining equipment. / 1915 - 1939	Investigated	Undetermined	Under Significance recorders noted this was an early claim and reported to be the only producing mine in the Wrangell Mining District in 1915.	Lode mine with support facilities including residences
88	Olympia Mining Company Residences (Smith's Camp)	PET-00248	Western Woewodsky Island	1984 / Collapsed buildings and trail remnants. / 1902 - 1915	Investigated	Undetermined		Mining camp
89	Cobol (Cobal, Kobal)	SIT-00018	Southwest coast, Chichagof Island, SE	Abandoned mining camp associated with Cobol Mine. / ca. 1921	Unknown	Undetermined	Apparently no on-site inspection.	Mining camp

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
90	Apex El Nido Mine Complex (Beach Camp)	SIT-00020	Chichagof Island	1993 / Upper camp includes 5 collapsed buildings and 1 standing cabin. Beach camp includes terminus of corduroy road, pack trail segment, a collapsed cabin, other structural debris, a trash scatter. Between the two camps are the remains of a watchman's cabin and a 10-stamp mill. / 1920s	Investigated	NRE 1993	Significance is described in terms of gold and silver production figures from 1924 - 1928 as related to other Chichagof Island mines during that period.	Mining camp with mill and support facilities
91	Rodman Bay Mine [002 114 0075]	SIT-00058	Baranof Island, SE	Originally contained railroad track; mining venture failed and track partially removed. / ca. 1900	Unknown	Undetermined	Apparently no on-site inspection.	Lode prospect
92	Mine Mountain Mine (Goulding Harbor Mine)	SIT-00103	Chichagof Island, SE	1997 / Adit, tramline remains, mining equipment, a [CCC] trail with collapsed log bridge, and remains of a sawmill. / 1921 - 1938	Investigated, preservation planned	NRE 1994	Noted as associated with historic pattern in the area and as embodying Chichagof area mining workmanship and CCC workmanship.	Lode mine and sawmill
93	Powerhouse (Chichagof Mine) [002 115 0233]	SIT-00110	Chichagof Island, SE	Powerhouse, power line and dam apparently associated with Chichagof Mine and Hirst-Chichagof Mine. / early 1900s	Unknown	Undetermined	Apparently no on-site inspection.	Power plant with dam (one aspect of a larger mining operation)
94	Cobol Mine [002 114 0026]	SIT-00116	Chichagof Island	Abandoned mine associated with Cobol mining camp. / 1920s	Unknown	Undetermined	Apparently no on-site inspection.	Lode mine
95	Apex-El Nido Mines	SIT-00117	Chichagof Island	Two abandoned gold mines associated with Apex El Nido Mine Complex (El Nido Camp). / 1920s	Unknown	Undetermined	Apparently no on-site inspection.	Lode mines
96	Hirst-Chichagof Mine (Kimshan Cove, Hirst Cove) [002 114 0003]	SIT-00227	West Chichagof Island	1983 / Collapsed and deteriorated remains of a mill, powerhouse, sawmill, assay office, blacksmith shop, bunkhouses, cookhouse, mess hall, shower and drying rooms, store, post office, and married employee housing. / 1905	Investigated	Undetermined	Recorders indicate the Hirst-Chichagof mine was a major gold and silver producer that stimulated the growth of the community of Kimshan. Despite site name, this description includes no mention of mine workings.	Company town with mill and support facilities (possibly lode mine as well)
97	Flemming Island Cabin	SIT-00380	North Flemming Island off the west coast of Chichagof Island, SE	1992 / Wood frame cabin (metal roof added in 1968), wood shed, storage shed and outhouse. Cabin originally served as office for nickel-copper mining operations. Associated mine shaft is mentioned; blacksmith shop and bunkhouse no longer extant. / 1911 - 1942	Normal weathering, investigated	NRJ 1992	Recorder states that the "historic remains at this site have deteriorated and have lost structural integrity."	Lode mine with support facilities including residences
98	Cook Prospect	SIT-00422	West Chichagof Island	1993 / Mine shaft, tailings [waste rock?], tool shed, corduroy road or trail, ore carts and other scattered tools and machinery. / no date reported.	Disturbed, investigated	Undetermined	Recorders note that archival research and archaeological investigation might lead to a better understanding of mineral extraction methods in the area.	Lode prospect or mine with minor support facilities
99	Joe Ryan Burial	SIT-00426	West Chichagof Island	1993 / Headstone and cabin remains with electrical wire and insulators. Recorders suggest site may be associated with nearby Hirst-Chichagof mine. / 1943	Natural weathering	NRJ 1994	Recorders note the site may contribute information regarding Euroamerican settlement during a period when hardrock mining was important in the area.	Cabin and burial

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
100	Lake Anna Cabin	SIT-00498	Chichagof Island, SE	1995 / Deteriorated and remodeled standing cabin, building remains, building foundation, remains of a log water catchment system, and mining era artifacts. / no dates provided.	Disturbed	NRJ 1995	Noted that based on some artifacts and structural debris, site may date to Chichagof Mining Era.	Cabin with outbuildings
101	Halleck Island Prospect (Baranof Mining Prospect) [002 114 0152]	SIT-00522	Halleck Island, SE	2001 / Timbered portal, shaft, waste rock accumulation, and a few pieces of mining equipment. Originally reported to contain a bunkhouse, Compressor house, powderhouse, oil house, blacksmith shop, and dock facilities including dock house. Serious development, but apparently never reached production stage. / late 1930s	Normal weathering	Recommended not eligible because property is a developed prospect only, and has lost much integrity of design (refer to Volume II).	(Refer to Volume II.)	Lode prospect with support facilities including residences and tidewater dock
102	Porcupine Historic District*	SKG-00015	Porcupine Creek 50 kilometers northwest of Haines, SE	1972 / Remains of a mining camp; 25 buildings identified (most constructed between 1927 - 1936; 11 buildings reported to be in good condition, one that predates 1915. / 1898 - 1936	Disturbed, investigated	NHR 1976	Significance is not discussed on site report.	Mining camp
103	Windham	SUM-00010	Windham Bay on mainland east of Admiralty Island, SE	1985 / Remains of a gold mining camp; 16 buildings (condition not reported), a corduroy road segment (1930s), and water drainage tunnel (1888) were observed. / late 1800s, early 1900s.	Investigated	NRE	Recorders suggest "site will likely provide important data on gold mining in the area during the early 1900s."	Mining camp
104	Riverside Mine* [002 118 0053]	XBC-00031	On Salmon River about 10 kilometers north of Hyder, SE	2000 / Site of tungsten mines and mill site; site area partially covered by a road; no mining remains reported. / 1915 - 1961	Destroyed	Undetermined		Lode mine and mill
105	Texas Creek Cabin (Blasher Cabin, Blacer Cabin, Chickamin Cabin) [002 118 0006]	XBC-00036	West fork of Texas Creek near Hyder, SE	1992 / Two-story log cabin in area where mining exploration took place ca. 1920s to 1940. WPA and CCC crews known to have used the cabin in the 1930s. Routine maintenance and repair (including replacement of porch and metal roofing in 1985 and emergency stabilization in 1993) are known to have occurred. / construction date undetermined	Weathered but in relatively good condition	Undetermined		Cabin
106	Minerals Incorporated Mining Camp*	XMF-00039	Glacier Bay National Park, SE	1968 / Eight tent frames and heavy equipment representing the 1960-61 Minerals incorporated mining camp with nearby demolished log cabin and mining equipment that may date from the 1930s. / 1930s?; 1960-61	Investigated	Undetermined		Mining camp
107	Baranof Queen Mine	XPA-00071	West Baranof Island	Early silver mine. / 1885	Unknown	Undetermined	Apparently no on-site inspection.	Lode mine

	Name [MAS No. if Assigned]	AHRS Numbers	Location	Date Recorded** / Features Observed or Reported / Dates of Discovery and Principal Mining Activity if Known	Condition	Eligibility	Comments	Property Type(s)
108	Silver Bay Sheer Zone Mining Site	XPA-00072	West Baranof Island	Six-mile long corridor in vicinity of early prospects and use of an arastra at the Hanlon mines (discovered 1872), and scene of 1930s gold claim patents by Edgecumbe Exploration Company. Sheer zone likened to areas in California's mother lode country. / 1880s; 1930s	Unknown	Undetermined	Apparently no on-site inspection.	Lode prospects and mine with milling equipment
109	Twin Glacier Camp (Taku Lodge)*	XTR-00017	East bank of Taku River across from Hole-in-the-Wall Glacier	1988? / T-shaped log building with poured concrete basement built in 1923 by Dr. DeVigne of the Alaska Juneau Gold Mining Company. / 1923	Normal weathering	NHR 1988	Significance not discussed; possibly association with DeVigne and Alaska Juneau Gold Mining Company.	Lodge

* This listing is not exhaustive, especially for the Chugach and includes some sites located beyond Forest boundaries (starred) to provide a broad regional basis for comparison. The list also includes properties that may be (but are not definitively) related to mining (cabins and sawmills, for example). Sources include OHA AHRS Site Forms, Tongass AHRS Site Reports, and Tongass Site Inventory Records. Some mining properties in SE have been assigned AHRS numbers, but the Tongass AHRS Site Reports contain nothing but locational information. Those properties are not included in this listing.

** Refers to date of most pertinent citation if an on-site archaeological inspection appears to have been made. Some site records were created using documents only; in those cases, no recording date is given.

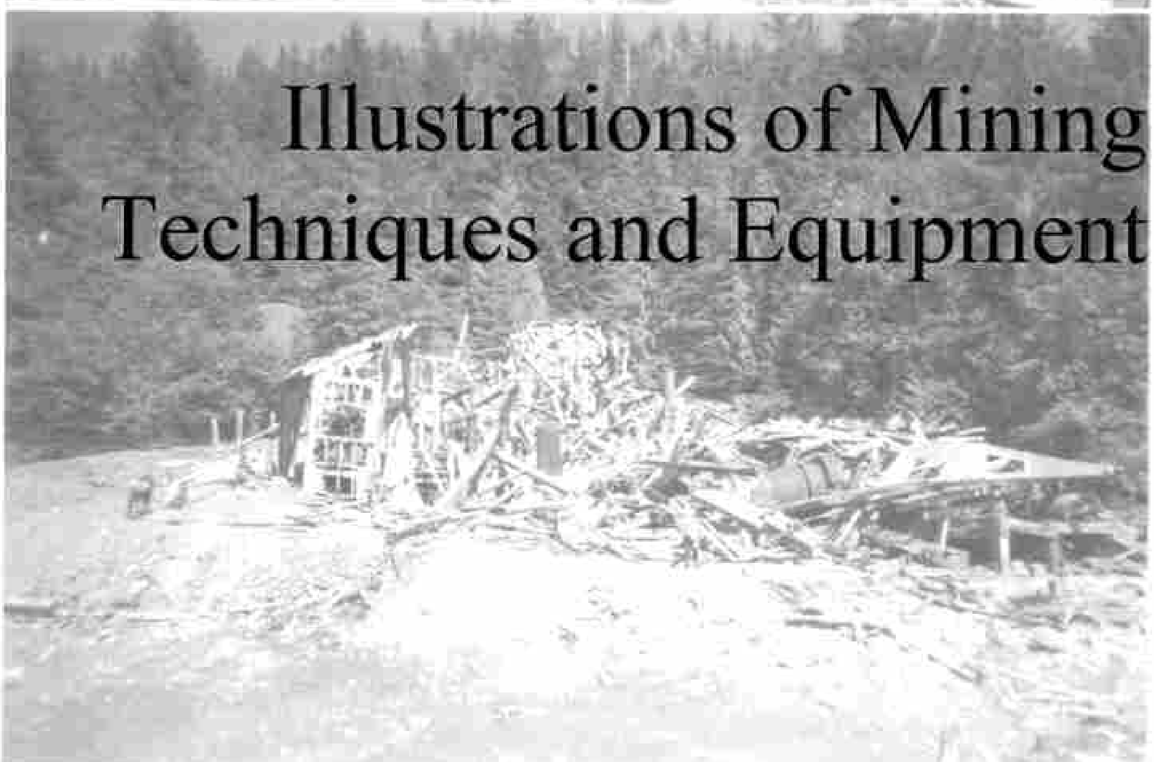
KP = Kenai Peninsula
PWS = Prince William Sound
SE = Southeast

NHR = Property listed on the National Register of Historic Places
NHS = Listed property within the boundaries of a larger listed property
NRE = Property determined eligible for listing on the National Register of Historic Places
NPD = National Register nomination pending
NCL = National Register nomination closed; often means property is eligible but landowner objects to listing
NRJ = Property determined not eligible for National Register listing
NH? = Un-listed property within a listed property's boundaries

Note: A number of properties recorded on the Kenai Peninsula in 1988 are described as significant for their association with the Iditarod Trail and were recorded during investigation of that transportation route.

Appendix E

Illustrations of Mining Techniques and Equipment



APPENDIX E. ILLUSTRATIONS OF MINING TECHNIQUES AND EQUIPMENT

(Contributor: Donald K. Chancey)

Illustrations of a variety of mining techniques and equipment are included here and referenced as appropriate in Chapter 5. There are numerous sources for illustrative and descriptive information on the subject of mining. Particularly useful illustrations and general descriptive material may be found in early documents as well as later compilations including the *Mining Engineer's Handbook* (Peele 1918, revised 1927 and 1941), *The Mining Camps Speak* (Sagstetter and Sagstetter 1998), the *Handbook of Mineral Dressing* (Taggart 1927, revised 1945), *Elements of Ore Dressing* (Taggart 1951), *Anatomy of a Mine* (USDA Forest Service 1995), and issues of the *Mining and Scientific Press* (a newspaper published in San Francisco during the early 1900s; selected articles are on file at the Loussac Public Library in Anchorage).

In *The Quest for Gold*, Saleeby (2000) describes techniques and equipment specific to Alaska. Her consideration of placer mining relies especially on *Methods and Costs of Placer Mining in Alaska* (Purington 1905), and *Placer Mining Methods and Costs in Alaska* (Wimmler 1927). One additional source we found particularly helpful is *Frozen Gold, A Treatise on Early Klondike Mining Technology* (Gould 2001).

Page intentionally left blank.

Image E-1 Alaska Gold Panner
(Source: T. A. Rickard, *Through the Yukon and Alaska*, Mining and Scientific Press, San Francisco, 1909)

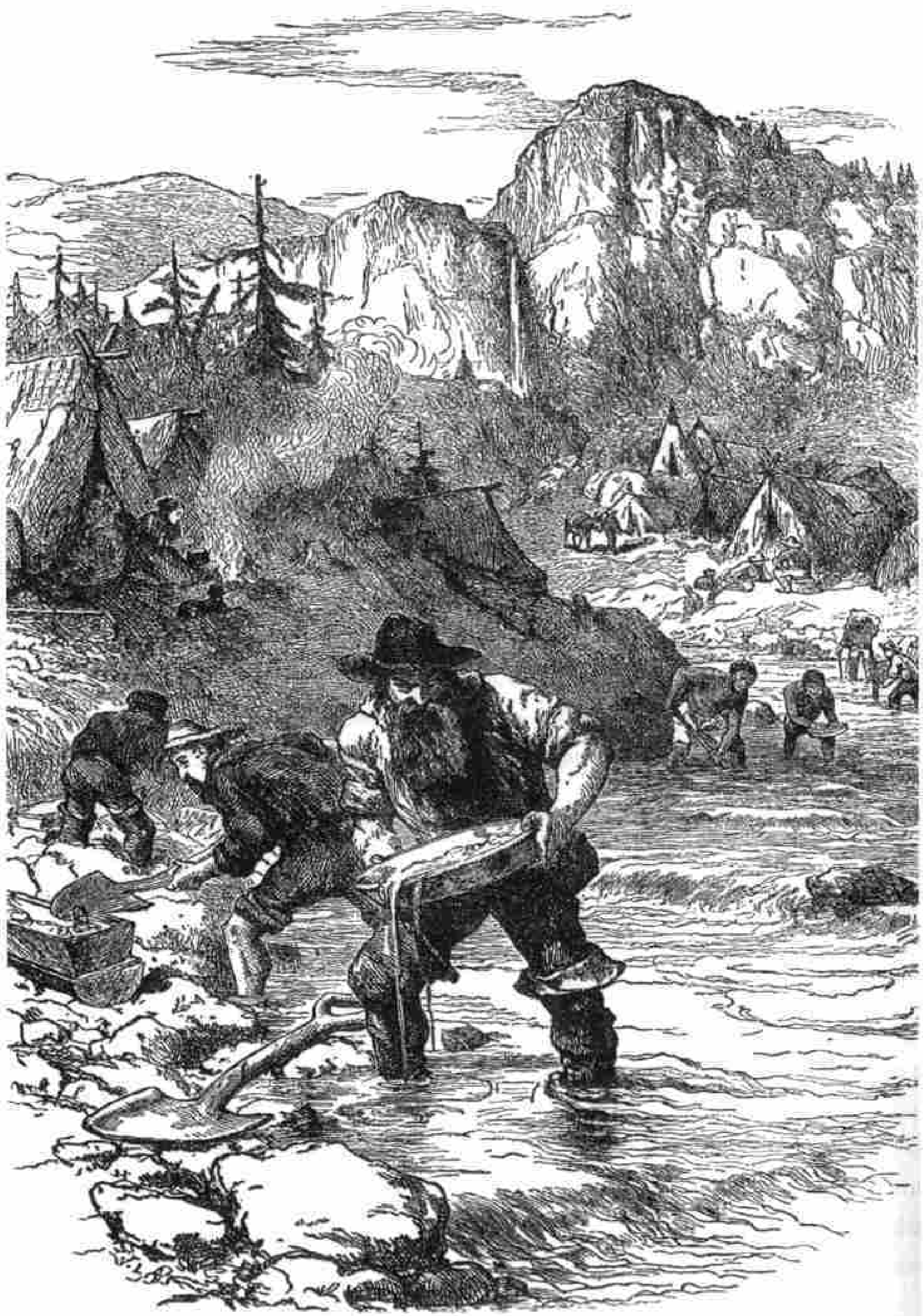


Image E-2 Gold Panning Scene (A. C. Harris engraving)
(Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

Image E-3 Rockers Used to Wash Gravel (Yukon Archives 3298)
(Source: John A. Gould, *Frozen Gold, A Treatise on Early Klondike Mining Technology, Methods and History*, Pictorial Histories Publishing Company, Inc., 2001)

Image E-4 Sluice Box Operation
(Source: John A. Gould, *Frozen Gold, A Treatise on Early Klondike Mining Technology, Methods and History*, Pictorial Histories Publishing Company, Inc., 2001)

Image E-5 Shoveling Rock into a Sluice at Anvil Creek
(Source: *Mining and Scientific Press* (newspaper), San Francisco, January 9, 1909)

Image E-6 Bulldozer Moves Ore Bearing Gravels at Knight Placer Mine (Norman F. Day, 1983)
(Source: Norman F. Day, *Knight Association and Bench #1 Placer Claims*, U.S. Forest Service, 1985)

Image E-7 Hand-Stacked Tailings at Sunrise City (Martha Rudolph, 1997)
(Source: Rolfe Buzzell, *Cultural Resources Survey of the Southern Part of Sunrise City, Alaska*, Preservation Research & Evaluation, Anchorage, 2001b)

Image E-8 Boomer Dam Used in Ground-Sluicing at Gold Run Creek
(Source: Becky M. Saleeby, *The Quest for Gold*, National Park Service, 2000)

Image E-9 Hydraulic Surface Mining at the Last Chance Mine (A.H. Brooks Collection 572 U.S Geological Survey)
(Source: Becky M. Saleeby, *The Quest for Gold*, National Park Service, 2000)

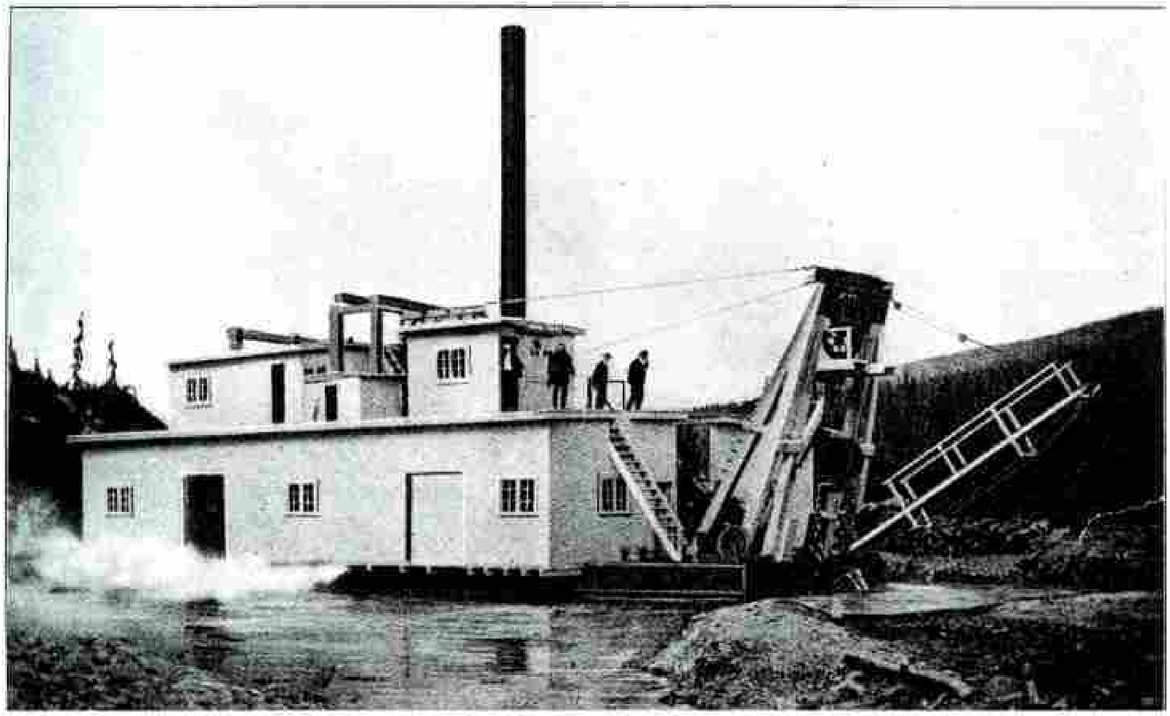
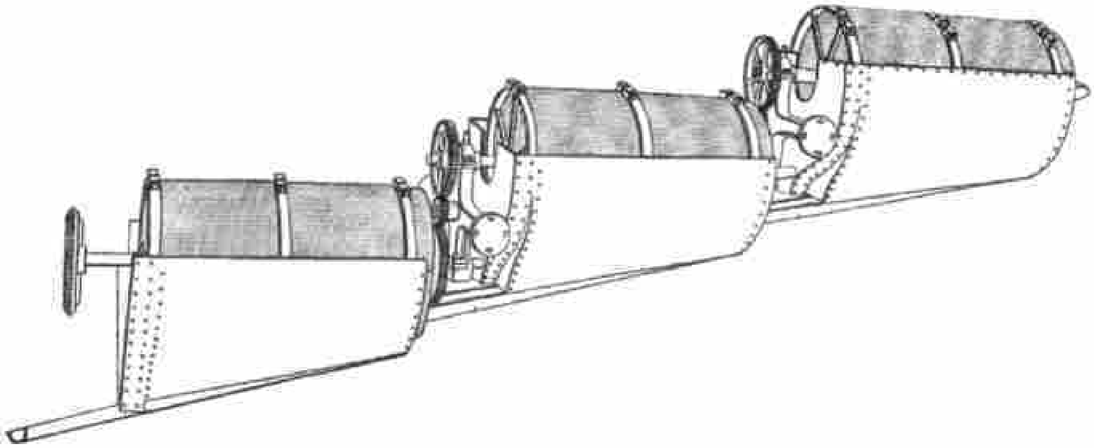


Image E-10 Dredge Used at Forty Mile Creek
(Source: *Mining and Scientific Press* (newspaper), San Francisco, September, 12, 1908)



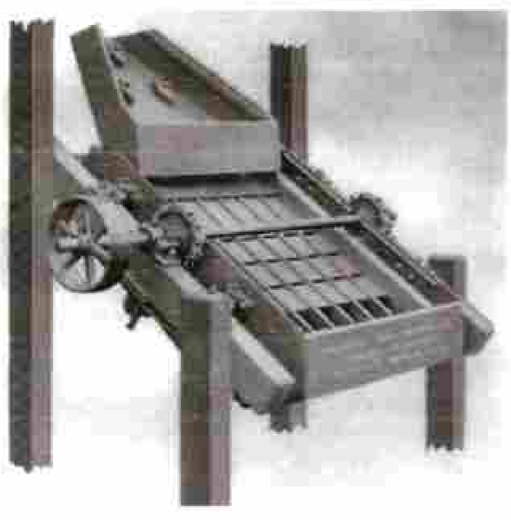


Image E-11 Revolving Trommels Screens and Impact Screens Used to Sort Rock (trommel illustration from International Correspondence School Reference Library, impact screen illustration from Colorado Iron Works Company catalogue, and two photos by Beth and Bill Sagstetter) (Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

Image E-12 Investigation Team Approaching the Portal to an Adit at Salt Chuck Mine (Stefanie Ludwig, 2001)
(Source: J. Simon Bruder, *Pilot Field Study Results: Historic Context for Mining Properties, Chugach and Tongass National Forest, Alaska, 1850s-1950s*, Michael L. Foster & Associates, 2002)

Image E-13 Air Compressor at Granite Mine (Stefanie Ludwig, 2001)
(Source: J. Simon Bruder, *Pilot Field Study Results: Historic Context for Mining Properties, Chugach and Tongass National Forest, Alaska, 1850s-1950s*, Michael L. Foster & Associates, 2002)

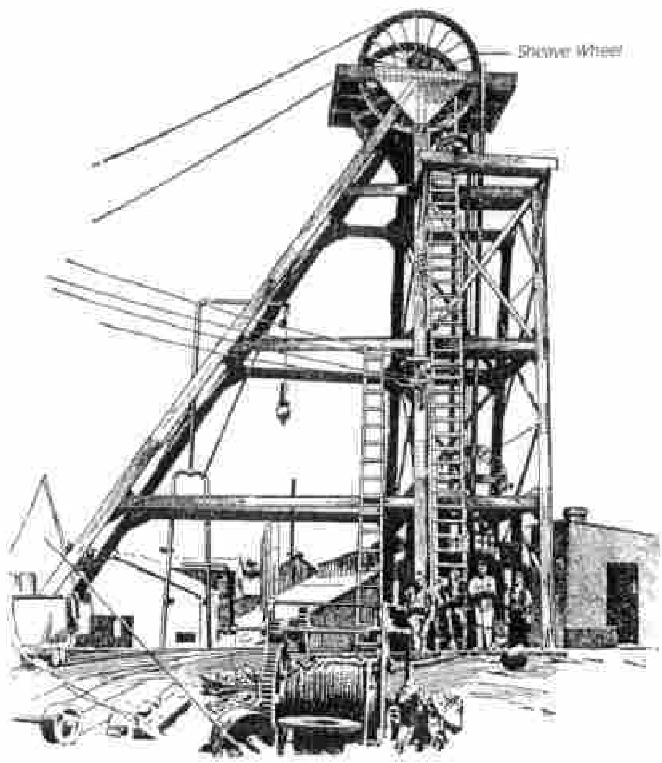


Image E-14 Headframe Used to Transport Personnel and Equipment in a Mine Shaft (International Correspondence School Reference Library, volume 148)
(Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

Image E-15 Rail Tracks Near Main Adit at Salt Chuck Mine (Jane Smith, 2001)
(Source: J. Simon Bruder, *Pilot Field Study Results: Historic Context for Mining Properties, Chugach and Tongass National Forest, Alaska, 1850s-1950s*, Michael L. Foster & Associates, 2002)

Image E-16 Tramway on a Trestle Leading from the Rock Crusher to the Mill at Sealevel Mine (Source: *Mining and Scientific Press* (newspaper), San Francisco, May 9, 1903)

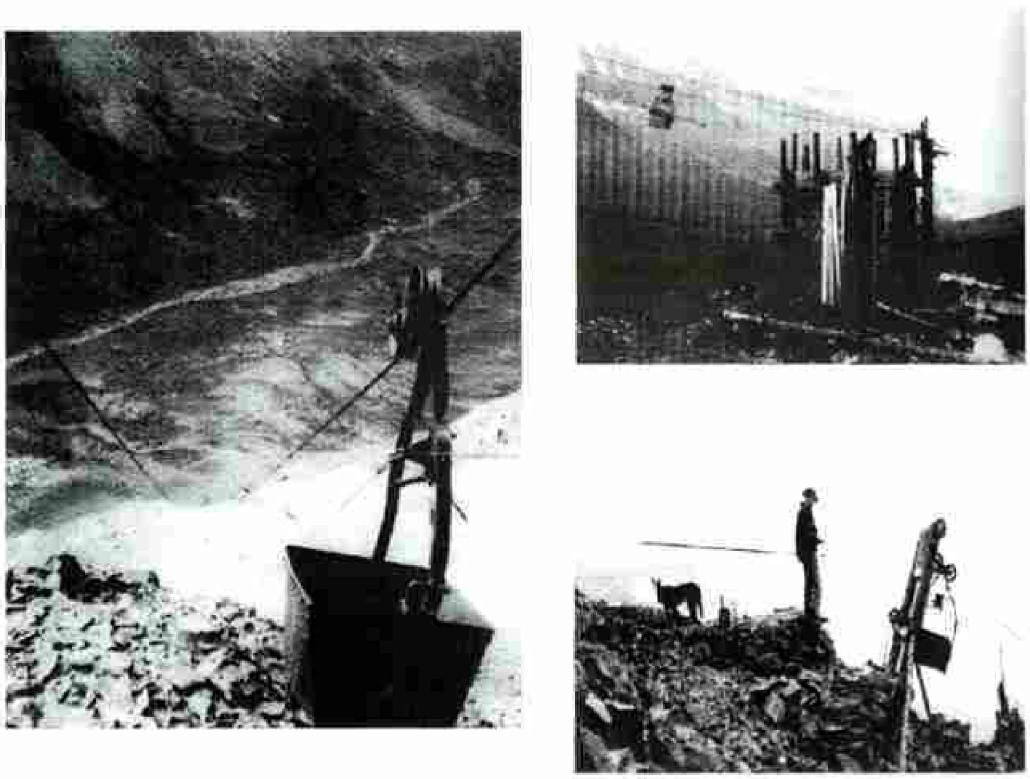


Image E-17 Aerial Trams to Transport Rock from the Mine to the Mill at Yellow Band Mine (photo courtesy of Sylvia Baldwin) (Source: Paul J. White, *Cultural Landscape Report, Bremner Historic District*, Michigan Technological University for National Park Service, 2000)

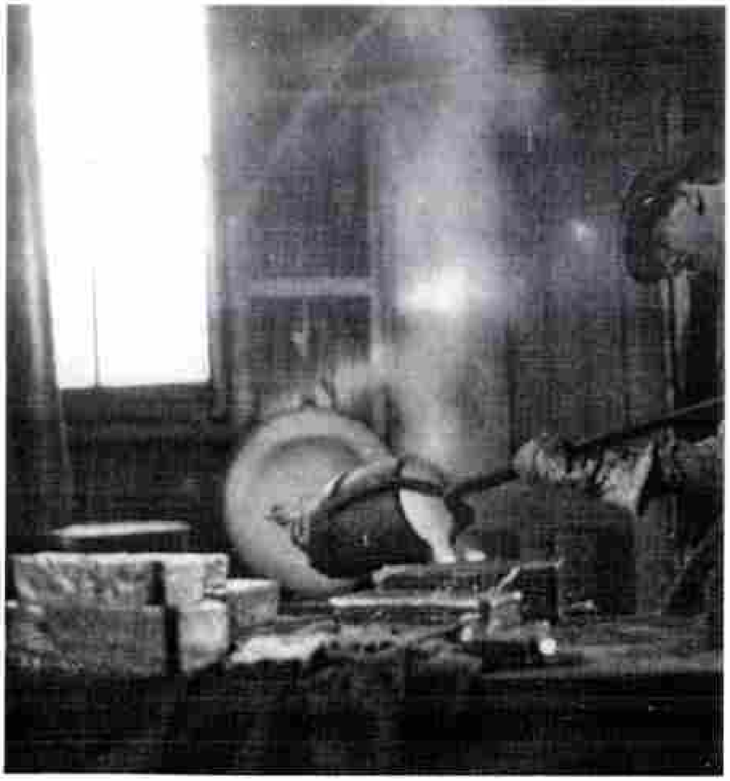


Image E-18 Melted Ore Poured During Evaluation Procedures at an Assay Office (photo courtesy of Pat Roppel) (Source: Richard P. Emanuel, *Alaska Geographic – The Golden Gamble*, The Alaska Geographic Society, Volume 24, Number 2, 1997)

Image E-19 Pelton Wheel (middle back) in Granite Mine Hydroelectric Plant Ruins (Stefanie Ludwig, 2001)
(Source: J. Simon Bruder, *Pilot Field Study Results: Historic Context for Mining Properties, Chugach and Tongass National Forest, Alaska, 1850s-1950s*, Michael L. Foster & Associates, 2002)

Image E-20 Nozzle and Pelton Wheel at Treadwell Mine Walking Tour (Holly L. Morris, 2001)
(Source: Michael L. Foster and Associates, 2001)

Image E-21 Trestle Supporting Aqueduct Transporting Water to the Mill at Sealevel Mine
(Source: *Mining and Scientific Press* (newspaper), San Francisco, May 9, 1903)

Image E-22 Metal Aqueduct Used to Transport Water to Granite Mine Hydroelectric Plant (Holly L. Morris, 2001) (Source: Michael L. Foster and Associates, 2001)

Image E-23 Fairbanks-Morse Engines in Mill Ruins at Salt Chuck Mine (Jane Smith, 2001) (Source: J. Simon Bruder, *Pilot Field Study Results: Historic Context for Mining Properties, Chugach and Tongass National Forest, Alaska, 1850s-1950s*, Michael L. Foster & Associates, 2002)

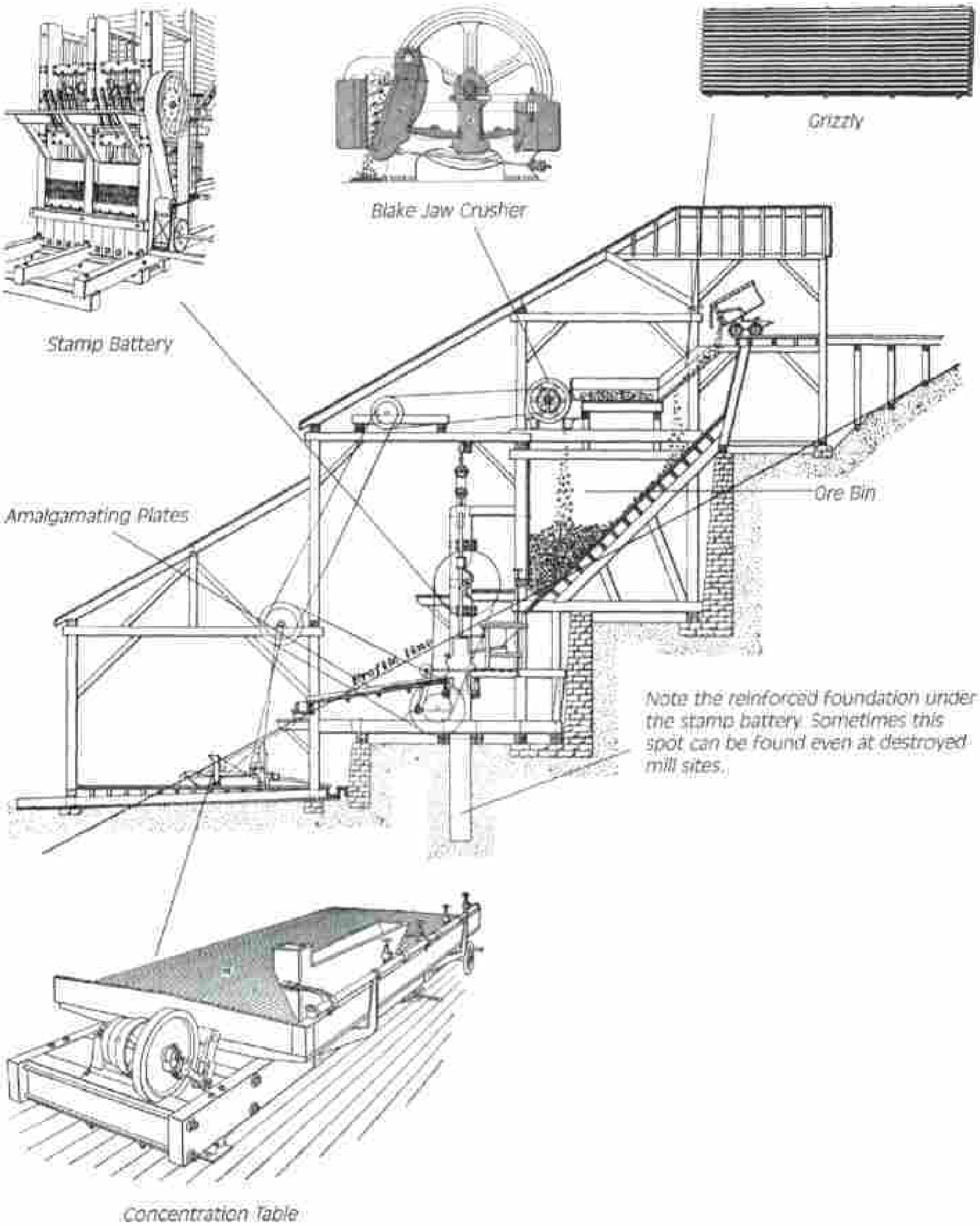


Image E-24 Typical Amalgamation/Concentration Mill (International Correspondence School Reference Library)
(Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

Image E-25 Stamp Mill Used to Crush Ore at Treadwell Mine Walking Tour (Holly L. Morris, 2001) (Source: Michael L. Foster & Associates, 2001)

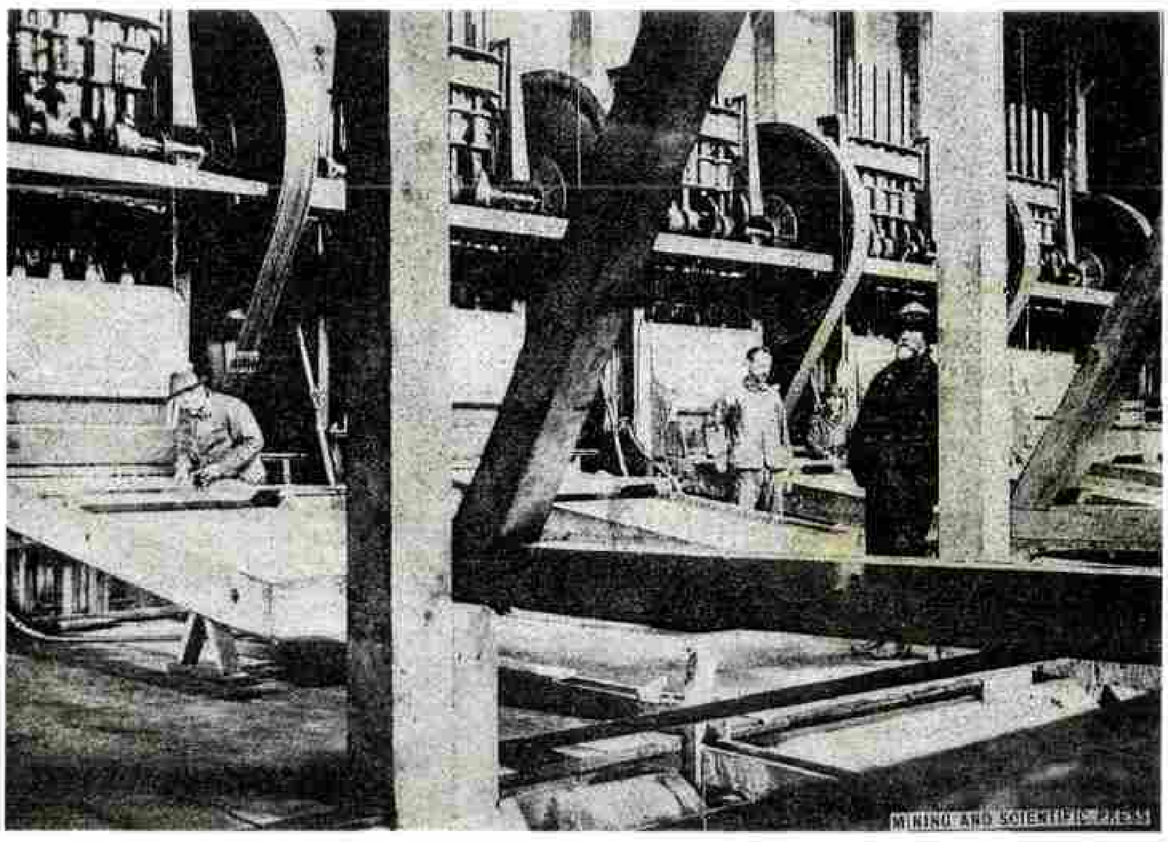


Image E-26 Stamp Mill and Amalgamation Plates for Catching Ore at Sealevel Mine (Source: *Mining and Scientific Press* (newspaper), San Francisco, May 3, 1903)

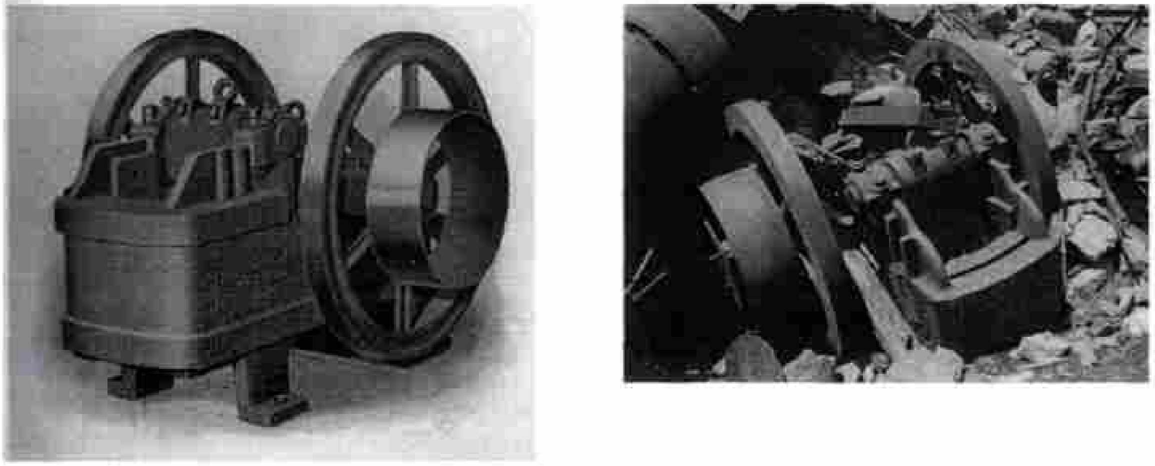


Image E-27 Jaw Crusher to Crush Ore (Illustration from The Colorado Iron Works Company catalogue and photo by Beth and Bill Sagstetter)
(Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

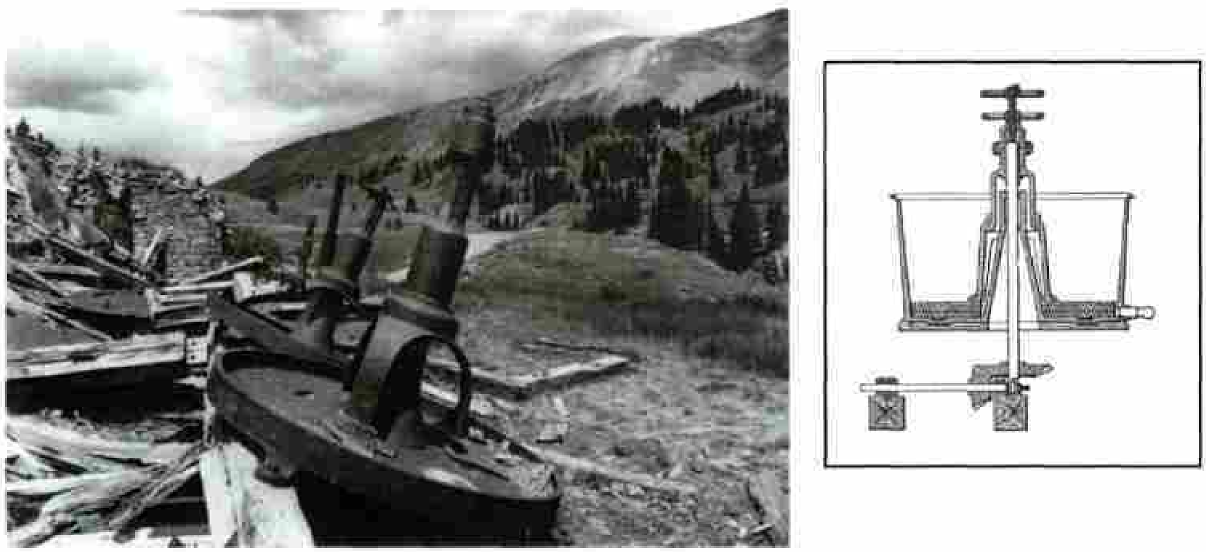
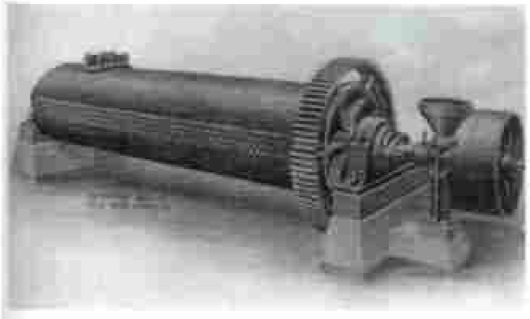
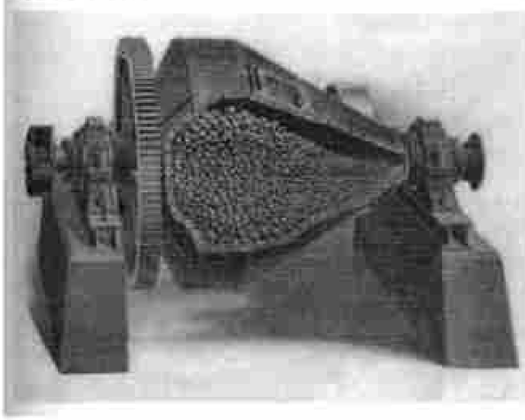


Image E-28 Remains of Amalgamating Pans to Separate Ore at Alpine Loop in San Juan Mountains (Illustration from International Correspondence School Reference Library and photo by Beth and Bill Sagstetter)
(Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

ROD MILL



BALL MILL



CRUSHING ROLLS

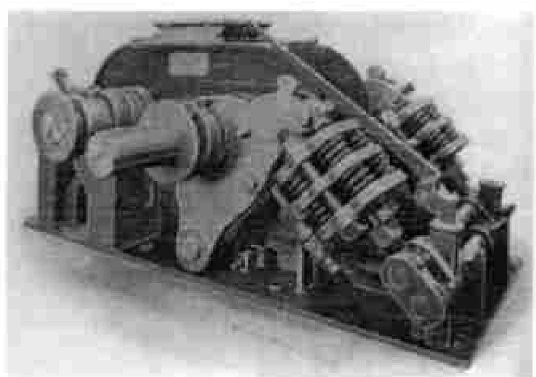


Image E-29 Rod Mill, Ball Mill, and Roll Crusher Used for Grinding Ore (Illustrations from Colorado Iron Works Company catalogue and photos by Beth and Bill Sagstetter) (Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

CONCENTRATION TABLES

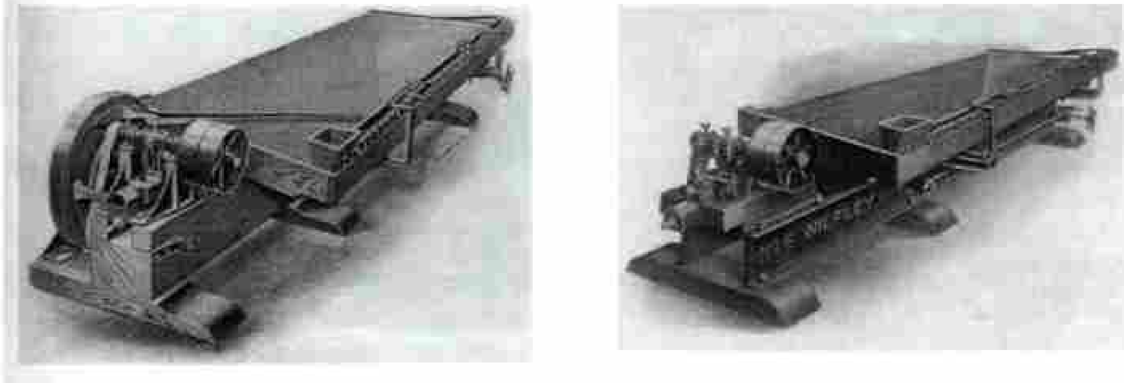
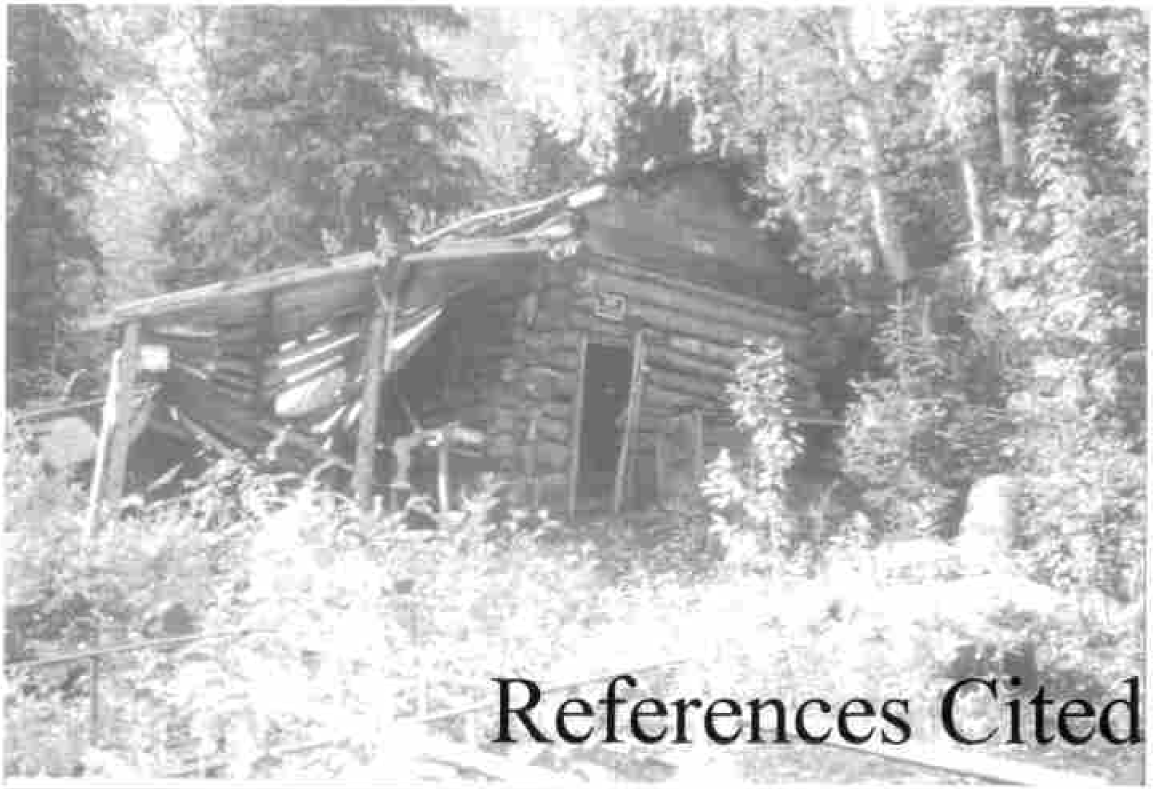


Image E-30 Wilfley Concentration Tables Used to Separate Ore (Colorado Iron Works Company catalogue)
(Source: Beth and Bill Sagstetter, *The Mining Camps Speak*, Benchmark Publishing of Colorado, Denver, 1998)

Image E-31 Floatation Cells at Granite Mine (Stefanie Ludwig, 2001)
(Source: J. Simon Bruder, *Pilot Field Study Results: Historic Context for Mining Properties, Chugach and Tongass National Forest, Alaska, 1850s-1950s*, Michael L. Foster & Associates, 2002)



References Cited

REFERENCES CITED

Alaska Geographic
1985 *Alaska's Forest Resources.* Volume 12, Number 2. The Alaska Geographic Society, Penny Rennick Editor.

Arndt, Katherine L., Russell H. Sackett, and James A. Ketz
1987 *Cultural Resource Overview of the Tongass National Forest, Alaska.* GDM, Inc., Fairbanks, Alaska.

Autrey, John T., and Martin V. Stanford
2001 *Heritage Resource Investigations for the Proposed Gravina Island Timber Sale, Southeast Alaska.* Ketchikan/Misty Fjords Ranger District, Tongass National Forest, Ketchikan, Alaska.

Barry, Mary J.
1997 *A History of Mining on the Kenai Peninsula, Alaska.* MJP BARRY, Anchorage.

Beikman, Helen M.
1980 *Geologic Map of Alaska.* United States Geological Survey.

Berton, Pierre
1972 *Klondike: The Last Great Gold Rush, 1896-1899.* Anchor Canada.

Birnbaum, Charles A.
1994 *Protecting Cultural Landscapes.* National Park Service.

Bittenbender, Peter E., Jan C. Still, Kenneth M. Maas, and Mitchell E. McDonald, Jr.
1999 *Mineral Resources of the Chichagof and Baranof Islands Area, Southeast Alaska.* United States Department of the Interior, Bureau of Land Management, Alaska State Office, Anchorage, Alaska.

Bittenbender, Peter E., Jan C. Still, Mitchell E. McDonald, Jr., and Edward C. Gensler
2000 *Mineral Investigations in the Stikine Area, Central Southeast Alaska, 1997-1998.* United States Department of the Interior, Bureau of Land Management, Alaska State Office, Anchorage, Alaska.

Boland, Beth Grosvenor
n.d. *Guidelines for Evaluating and Documenting Properties Associated with Significant Persons.* National Register Bulletin 32, National Park Service.

Bourne, Russell
1995 *Americans on the Move: A History of Waterways, Railways, and Highways with Rare Photographs from the Library of Congress.* Fulcrum Publishing, Golden, Colorado.

Bowers, Peter M., Bruce A. Ream, William H. Adams, Stefanie Ludwig, and Robert Sattler
1991 *Cultural Resources Inventory and Assessment of the Proposed A.J. Mine Project, Juneau, Alaska.* Northern Land Use Research, Fairbanks.

Brew, David A., and Donald Grybeck
1984 Geology of the Tracy Arm-Fords Terror Wilderness Study Area and Vicinity, Alaska. In *Mineral Resources of the Tracy Arm-Fords Terror Wilderness Study Area and Vicinity, Alaska*, pp. 19-104 (Appendix A). U.S. Geological Survey Bulletin 1525.

Brew, David A., Arthur L. Kimball, Donald Grybeck, and Jan C. Still
1984 Summary. In *Mineral Resources of the Tracy Arm-Fords Terror Wilderness Study Area and Vicinity, Alaska*, pp. 1-7. U.S. Geological Survey Bulletin 1525.

Brew, David A., Susan M. Karl, David F. Barnes, Robert C. Jachens, Arthur B. Ford, and Robert Horner
1991 A Northern Cordilleran Ocean-Continent Transect: Sitka Sound, Alaska, to Atlin Lake, British Columbia. *Canadian Journal of Earth Sciences* 28:840-853.

Brooks, A.H.
1902 *Preliminary Report on the Ketchikan Mining District, Alaska, with an Introductory Sketch of the Geology of Southeastern Alaska.* U.S. Geological Survey Professional Paper 1.

Bufvers, John
1967 *History of Mines and Prospects, Ketchikan District, Prior to 1952.* State of Alaska, Department of Natural Resources, Division of Mines and Minerals, Juneau.

Bureau of Land Management (U.S. Dept. of the Interior BLM)
1996 *Mining Claims and Sites on Federal Lands.* U.S. Department of the Interior. Bureau of Land Management.

1999 *Mining District Studies.* U.S. Department of the Interior. Bureau of Land Management.

Bureau of Mines (U.S. BOM or USBM)
1944 *Yakobi Island, Sitka Mining District, Alaska:* War Minerals Report 174, 73 p., available from Bureau of Land Management, Juneau.

1945 Mirror Harbor, Chichagof Island, Alaska. War Minerals Report 333, 9 p., available from Bureau of Land Management, Juneau.

1989 *Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988.* United States Department of the Interior, Bureau of Mines.

1989 *Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988.* Volume I. United States Department of the Interior, Bureau of Mines.

Buzzell, Rolfe G.
1994a *Cultural Resources Survey for the Thane Road Reconstruction Project, Juneau, Alaska.* Office of History and Archaeology Report No. 37, Alaska Department of Natural Resources, Anchorage.

1994b *Memories of Old Sunrise, Gold Mining on Alaska's Turnagain Arm.* Cook Inlet Historical Society, Anchorage.

1997 *Sunrise City Historic District.* National Register Nomination.

1998 *The Turnagain Arm Gold Rush,* 1996-1998, In International Symposium on Mining (Circa 1850 – 2000 and beyond): Proceedings Publication. Papers from the International Symposium on Mining, Fairbanks, Alaska, September 9-14, 1997 Festival Fairbanks, Inc., Fairbanks, PP. 231-240.

2001a *Cultural Resources Evaluation of the McKinley Lake Mine Site, Near Cordova, Alaska, 1999.* Office of History and Archaeology Report No. 79. Division of Parks and Outdoor Recreation, Alaska Department of Natural Resources, Anchorage.

2001b *Cultural Resources Survey of the Southern Part of Sunrise City, Alaska.* Preservation Research & Evaluation, Anchorage, Alaska.

Buzzell, Rolfe G., and J. David McMahan
1986 *Cultural Resources Survey of the Seward Highway, Milepost 50-65.5, Kenai Peninsula, Alaska.* Office of History and Archaeology Report No. 2. Alaska Department of Natural Resources, Anchorage.

Campbell, L.J.
1995 Alaska's Mineral Industry Today. In *Rich Earth: Alaska's Mineral Industry*. Alaska Geographic Vol. 22:3:29-65, Anchorage.

Catton, Ted and Janene M. Caywood
1999 *Historic Mining Properties in National Park Service Units in the Pacific Northwest: National Register of Historic Places Multiple Property Documentation Form*. Missoula, Montana.

Chambers Group and Tetra Tech, Inc.
2001 *Draft Archaeological Evaluation: Mineral King Mine and Granite Mine, Chugach National Forest, Alaska*. Redlands, California and Seattle, Washington.

Chapin, T.
1916 *Mining Developments in Southeast Alaska*. Ch. In Mineral Resources of Alaska, Report on Progress of Investigations in 1915. U.S. Geological Survey Bulletin 642.

1918 *The Structure and Stratigraphy of Gravina and Revillagigedo Islands, Alaska*. U.S. Geological Survey Professional Paper 120-D.

Chugach National Forest
1998 *Geology Including Fault Lines, Chugach National Forest*. Chugach National Forest, Anchorage.

City and Borough of Sitka
2001 http://www.cityofsitka.com/

Cobb, Edward
1973 *Placer Deposits of Alaska, an Inventory of the Placer Mines and Prospects of Alaska, Their History and Geologic Setting*. U.S. Geological Survey Bulletin 1374:1-213.

Daley, E. Ellen, editor
n.d. *Guide to Alaska Geologic and Mineral Information*. Information Circular 44, Division of Geological & Geophysical Surveys.

Darlin, Marie, and Janet Ruotsala
1998 *Alaska Gold Rush Pioneers of the Juneau-Douglas Area, 1880-1921*. Available at the Juneau-Douglas City Museum, Juneau.

Day, Norman F.
1985 *Knight Association and Bench #1 Placer Claims*. United States Department of Agriculture, Forest Service.

DeArmond, R.N.
1979 *Alaska Weekly (Seattle) 1923-1948: Index by Date with Subject Guide: A Selective Index of Cordova Daily Times, the Pathfinder, the Alaska Miner, Alaska Mining Record*. Alaska Historical Library, Juneau.

1980 *The Founding of Juneau*. Gastineau Channel Centennial Association, Juneau.

1997 Haleys and Silver Bay. In Around and about Alaska; Notes and comments by Robert N. DeArmond: *Daily Sitka Sentinel*, series of 29 articles, April to October, 1997.

1997 Pande Basin. In Around and about Alaska; Notes and comments by Robert N. DeArmond: *Daily Sitka Sentinel*, series of 4 articles, March to April, 1997.

Division of Geological & Geophysical Surveys (DGGS)
1993 *Alaska's Mineral Industry*. Special Report 48, DGGS.

Emanuel, Richard P.
1997 *The Golden Gamble*. Alaska Geographic Vol. 24:2, Anchorage.

Feierabend, Carey
1990 Historic Mine Lands as Cultural Landscapes. In *Death Valley to Deadwood; Kennecott to Cripple Creek: Proceedings of the Historic Mining Conference, January 23-27, 1989, Death Valley National Monument*, edited by Leo R. Barker and Ann E. Huston, National Park Service, San Francisco.

Francaviglia, Richard V.
1991 *Hard Places: Reading the Landscape of America's Historic Mining Districts*. University of Iowa Press, Iowa City.

Francis, Julie
1994 *Historic Context and Evaluation of Automobile Roads in Wyoming*. Wyoming Department of Transportation.

Freeman, Curtis J.
2002 Platinum Group Elements—Metals of the New Millennium. *The Professional Geologist*: January / February 2002: 2-8.

Gallant, Alisa L., Emily F. Binnian, James M. Omernik, and Mark B. Shasby
1995 *Ecoregions of Alaska*. U.S. Geological Survey Professional Paper 1567.

Garrison, James
1985 *Transcontinental Railroading in Arizona, 1878-1940*. Arizona State Historic Preservation Office, Phoenix.

Gehrels, George E., and Berg, Henry C.
1994 Geology of Southeastern Alaska. In *The Geology of North America, Vol. G-1, The Geology of Alaska*, edited by George Plafker and Henry C. Berg, The Geological Society of America, Inc. Boulder, Colorado.

Gilbert, Cathy, Paul White, and Anne Worthington
2001 *Cultural Landscape Report, Kennecott Mill Town, Wrangell-St. Elias National Park and Preserve, Alaska*. National Park Service.

Gillette, Gary H.
1990 *Historic Structures Report; Jualpa Mine Camp of the Alaska Juneau Gold Mining Company, Last Chance Basin Historic District, Juneau, Alaska*. City and Borough of Juneau, Alaska, Juneau.

Goldfarb, Richard J.
1997 *Metallogenic Evolution of Alaska*. in *Mineral Deposits of Alaska*. Economic Geology Monograph 9, edited by Richard D. Goldfarb and Lance D. Miller, the Economic Geology Publishing Company, Stanford, California.

Gould, John A.
2001 *Frozen Gold: A Treatise on Early Klondike Mining Technology, Methods and History*. Pictorial Histories Publishing Company, Inc., Missoula, Montana.

Great Outdoor Recreation Pages 2001 Copper River Delta – Alaska Scenic Byway [Online]. Available December 20,2001: http://www.gorp.com/gorp/activity/byway/ak_coppe.htm

Hardesty, Donald L.

1990 Mining Property Types: Inventory and Significance Evaluation. In, *Death Valley to Deadwood: Kennecott to Cripple Creek: Proceedings of the 1989 Historic Mining Conference, Death Valley National Monument*, ed. By Leo R. Barker and Ann E. Huston; pp. 39-43. National Park Service Western Regional Office, San Francisco.

Hardesty, Donald L., and Barbara Little

2000 *Assessing Site Significance: A Guide for Archaeologists and Historians.* Altamira Press, New York.

Hartman, Charles W., and Philip R., Johnson

1984 *Environmental Atlas of Alaska.* University of Alaska, Fairbanks.

Hawley, Charles Caldwell

1998 Copper, Gold, and Science in the North: Charter Members of the Alaska Mining Hall of Fame. In *Alaska Miners Association 1998 Handbook and Service Directory.* Glacier House Publications, Anchorage.

Heiner, Virginia Doyle

1977 *Alaska Mining History: A Source Document.* History and Archaeology Series No. 17, Miscellaneous Publications, Office of History and Archaeology, Alaska Division of Parks, Anchorage.

Holmes, G.L.

1941 *Report on the Apex-El Nido Mine*; Unpublished Report, 20 p., available from Bureau of Land Management, Juneau.

Huber, Carol, and Joseph Kurtak

2001 *Gold Panning: A Guide to Recreational Gold Panning on the Kenai Peninsula, Chugach National Forest, Alaska.* USDA Forest Service, Alaska Region

Hutchings, O.

1976 *Stewart, the BC-Alaska Border Town That Wouldn't Die. Stewart, B.C.*, Available from Hub's Pharmacy Ltd., P.O. Box 130, Stewart, B.C., Canada, V0T IWO.

Jansons, Uldis, Robert B. Hoekzema, Joseph M. Kurtak, and Steven A. Fechner

1984 *Mineral Occurrences in the Chugach National Forest, Southcentral Alaska*, United States Department of the Interior, Bureau of Mines.

Johnson, B.L.

1915 *Mining on Prince William Sound.* U.S. Geological Survey Bulletin 622. U.S. Department of the Interior, U.S. Geological Survey.

Kalstrom, Thor N. V., H.W. Coulter, A.T. Fernald, J.R. Williams, D.M. Hopkins, T.L. Péwé, H. Drews, E.H. Muller, and W.H. Condon

1964 *Surficial Geology of Alaska.* Miscellaneous Geologic Investigations Map I-357. United States Geological Survey.

Keane, Melissa, and J. Simon Bruder

1999 *Good Roads Everywhere: Historic and Regulatory Contexts for the Evaluation of Arizona Roads.* Dames & Moore Intermountain Cultural Resources Services Research Papers 42. Dames & Moore, Phoenix.

Keane, Melissa, and A.E. Rogge

1992 *Gold and Silver Mining in Arizona, 1848-1945: A Component of the Arizona Historic Preservation Plan.* Dames & Moore, Phoenix, Arizona.

Kennedy G.C., and M.S. Walton
1946 *Geology and Associated Mineral Deposits of some Ultrabasic Rock Bodies in Southeastern Alaska.* U.S. Geological Survey Bulletin 947-D.

1946 *Nickel Investigations in Southeast Alaska.* U.S. Geological Survey Bulletin 947-C.

Kimball, A.L.
1982 *Mineral Land Assessment of Yakobi Island and Adjacent Parts of Chichagof Island, Southeastern Alaska.* U.S. Bureau of Mines Mineral Land Assessment report, MLA 97-82.

Kimball, Arthur L., Jan C. Still, and Jeanne L. Rataj
1984 Mineral Deposits and Occurrences in the Tracy Arm-Fords Terror Wilderness Study Area and Vicinity, Alaska. In *Mineral Resources of the Tracy Arm-Fords Terror Wilderness Study Area and Vicinity, Alaska*, pp. 105-210 (Appendix E). U.S. Geological Survey Bulletin 1525.

Knopf, A.
1912 *The Sitka Mining District, Alaska.* U.S. Geological Survey Bulletin 504. U.S. Department of the Interior, U.S. Geological Survey.

Kurtak, Joseph M.
n.d. *Of Rock and Ice. An Explorer's Guide to the Geology of Prince William Sound, Alaska.* U.S. Department of Agriculture, Forest Service, Bureau of Mines, U.S. Department of the Interior.

Laguna, Frederica de
1934 *Archaeology of Cook Inlet Alaska.* University of Pennsylvania Press.

Lethcoe, Jim
1990 *An Observer's Guide to the Geology of Prince William Sound, Alaska.* Prince William Sound Books, Valdez, Alaska.

Lethcoe, Jim, and Nancy Lethcoe
1994 *History of Prince William Sound, Alaska.* Prince William Sound Books, Valdez.

1998 *A Cruising Guide to Prince William Sound.* Prince William Sound Books, Valdez.

Little, Barbara, and Erika Martin Seibert
2000 *Guidelines for Evaluating and Registering Archeological Properties.* U.S. Department of the Interior, National Park Service, National Register, History, and Education.

Luciw, Wasyl and Theodore Luciw
1963 *Ahapius Honcharenko and the Alaska Herald.* Toronto Slavia Library.

Lutz, H.J.
1955 *Ecological Effects of Forest Fires in the Interior of Alaska.* U.S. Department of Agriculture Technical Bulletin 1133:82-86.

Maas, Kenneth M., Peter E. Bittenbender, and Jan C. Still
1995 *Mineral Investigations in the Ketchikan Mining District, Southeastern Alaska.* United States Department of the Interior, Bureau of Mines.

Maley, Terry S.
1996 *Mineral Law* (Sixth Edition). Mineral Land Publications, Boise.

Marriott, Paul Daniel
1998 *Saving Historic Roads: Design and Policy Guidelines.* Preservation Press, John Wiley and Sons, Inc., New York.

Massey, Rheba
1990 *Wyoming's Comprehensive Historic Preservation Plan.* State Historic Preservation Office, Department of Commerce, Cheyenne.

McCart, Dennie D.
1983 *The Hope Truckline and 75 Miles of Women.* Binford & Mort Publishers, Portland, Oregon.

McClelland, Linda Flint, J. Timothy Keller, Genevieve P. Keller and Robert Z. Melnick
1995 *Guidelines for Evaluating and Documenting Rural Historic Landscapes.* National Park Service.

McDonald, Mitchell E. Jr., Jan C. Still, Peter E. Bittenbender, and James R. Coldwell
1998 *Mineral Investigations in the Stikine Area, Southeast Alaska, 1997.* BLM-Alaska Open File Report 72, U.S. Department of Interior, Bureau of Land Management, Alaska State Office, Anchorage, Alaska.

Mertie, J.B.
1921 *Notes on the Salmon-Unuk River Region.* Chapter In *Mineral Resources of Alaska, Report on Progress of Investigations in 1919.* U.S. Geological Survey Bulletin 714. U.S. Department of the Interior, U.S. Geological Survey.

1969 *Economic Geology of the Platinum Metals.* U.S. Geological Survey Professional Paper 630. U.S. Department of the Interior, U.S. Geological Survey.

Mining and Scientific Press
1903-09 Published in San Francisco. Selected newspaper articles on file, Loussac Public Library, Anchorage.

Mobley, Charles M.
2001 *Three Historic Mines, Ketchikan, Alaska: A Cultural Resource Evaluation.* Charles M. Mobley & Associates, Anchorage.

Moffit, F.H.
1906 *Mineral Resources of the Kenai Peninsula, Gold Fields of the Turnagain Arm Region.* U.S.G.S. Bulletin 277. Washington, D.C., Government Printing Office.

1954 *Geology of the Prince William Sound region, Alaska:* U.S. Geological Survey Bulletin 989-E.

Montgomery Watson
1999 *Final Investigation of Third Party Liability, Salt Chuck Mine,* Volume I of III. Montgomery Watson, Anchorage.

National Park Service
1995 *How to Apply the National Register Criteria for Evaluation.* National Register Bulletin 15, National Park Service.

1995 *How to Complete the National Register Registration Form.* National Register Bulletin 16A, National Park Service.

National Wildlife Federation
2001 Copper River Delta [Online]. Available December 20, 2001: http://www.nwf.org/copperriver/ .

Nelson, Steven W., Marti L. Miller, David F. Barnes, J.A. Dumoulin, R.J. Goldfarb, R.A. Koski, C.G. Mull, W. J. Pickthorn, Uldis Jansons, Robert B. Hoekzema, Joseph M. Kurtak, and Steven A. Fechner
1984 *Mineral Resource Potential of the Chugach National Forest, Alaska, Summary Report.* Department of the Interior, United States Geological Survey.

Noble, Bruce G., and Robert Spude
1992 *Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties.* U.S. Department of the Interior, National Park Service, National Register History and Education, online edition (National Register Bulletin 42).

Orth, Donald J.
1971 *Dictionary of Alaska Place Names.* U.S. Geological Survey Professional Paper 567. U.S. Department of the Interior, U.S. Geological Survey, Washington D.C. (revised edition).

Overbeck, R.M.
1919 *Geology and Mineral Resources of the West Coast of Chichagof Island.* U.S. Geological Survey Bulletin 692-E.

Owens, Kenneth N.
1991 *Historical Trails and Roads in California: A Cultural Resources Planning Study.* California Department of Transportation, Sacramento.

Pearson, Roger W. and Marjorie Hermans
2000 *Alaska in Maps: A Thematic Atlas.* Alaska Geographic Alliance, Alaska Department of Education, University of Alaska Fairbanks, Fairbanks, Alaska.

Peele, Robert, editor
1918 *Mining Engineers' Handbook.* John Wiley & Sons, Inc., New York.

Periman, Richard D.
1995 *Deerlodge National Forest Historic Preservation and Management Plan for Historic Mining and Associated Properties, Deerlodge National Forest.* Studies in Heritage Management No. 14. United States Department of Agriculture, Forest Service Northern Region.

Plafker, George, J. Casey Moore, and Gary R. Winkler
1994 *Geology of the southern Alaska margin*, in *The Geology of North America, Vol. G-1, The Geology of Alaska*, edited by George Plafker and Henry C. Berg. The Geological Society of America, Inc. Boulder, Colorado.

Potter, Elisabeth Walton, and Beth M. Boland
1992 *Guidelines for Evaluating and Registering Cemeteries and Burial Places.* National Park Service.

Purington, C.W.
1905 *Methods and Costs of Gravel and Placer Mining in Alaska.* U.S. Geological Survey Bulletin 263.

Ransome, Alfred L., and William Kerns
1954 *Names and Definitions of Regions, Districts, and Subdistricts in Alaska.* U.S. Bureau of Mines Information Circular 7679.

Redman, Earl
1988 *History of the Mines and Miners in the Juneau Gold Belt: A Collection of Stories about the Mines, the Miners, and Their Dreams.* Earl Redman, Juneau, Alaska.

Redman, Earl C., Kenneth M. Maas, Joseph M. Kurtak, and Lance D. Miller
1989 *Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988. Volume 2—Detailed Mine, Prospect, and Mineral Occurrence Descriptions.* United States Department of the Interior, Bureau of Mines.

Reed, J.C. and R.R. Coats
1941 *Geology and Ore Deposits of the Chichagof Mining District, Alaska.* U.S. Geological Survey Bulletin 929.

Reed, J.C. and J.V.N. Door
1942 *Nickel Deposits of Bohemia Basin and Vicinity, Yakobi Island, Alaska.* U.S. Geological Survey Bulletin 931-F.

Rickard, T.A.
1090 *Through the Yukon and Alaska.* Mining and Scientific Press, San Francisco.

Ricks, Melvyn B.
1965 *Directory: Alaska's Postoffices and Postmasters, 1867-1963.* Tongass Publishing Company, Ketchikan.

Rieger, Samuel, Dale B. Schoephorster, and Clarence E. Furbush
1979 *Exploratory Soil Survey of Alaska.* U.S. Department of Agriculture, Soil Conservation Service, United States Government Printing Office, Washington, D.C.

Roehm, J.C.
1938 *Preliminary Report of Gold Standard Group, Helm Bay, Cleveland Peninsula, Alaska, June 24, 1938.* AK Territorial Department of Mines Property exam. PE-120-6.

1940 *Preliminary Report of the Lucky Chance Mine, Baranof Island, Sitka Precinct, June 28, 1940.* AK Territory Department of Mines Property Examination.

Roppel, Patricia
1991 *Fortunes from the Earth: An History of the Base and Industrial Minerals of Southeast Alaska.* Sunflower University Press, Manhattan, Kansas.

Sagstetter, Elizabeth M., and William E. Sagstetter
1998 *The Mining Camps Speak: A New Way to Explore the Ghost Towns of the American West.* Benchmark Publishing of Colorado, Denver.

Saleeby, Becky M.
2000 *The Quest for Gold: An Overview of the National Park Service Cultural Resources Mining Inventory and Monitoring Program (CRMIM).* U.S. Department of the Interior, National Park Service, Anchorage.

Seifert, Donna J.
2000 *Defining Boundaries for National Register Properties.* National Register Bulletin, National Park Service.

Selkregg, Lidia L.
1974 *Alaska Regional Profiles: Southeast Region.* Arctic Environmental Information and Data Center, University of Alaska, Anchorage.

1976 *Alaska Regional Profiles: Southeast Region.* Arctic Environmental Information and Data Center, University of Alaska, Anchorage.

Stevenson, Mark G.
1982 Toward an Understanding of Site Abandonment Behavior: Evidence from Historic Mining Camps in the Southwest Yukon. *Journal of Anthropological Archaeology* 1(3):237-265.

Still, J.C., and K.R. Weir
1981 *Mineral Land Assessment of the West Portion of Western Chichagof Island, Alaska*. U.S. Bureau of Mines Open File Report 89-81.

South Dakota State Historical Society
1987 *Proceedings of the Workshop on Historic Mining Resources*. South Dakota State Historical Society, Vermillion.

Spenser, A.C.
1906 *The Juneau Gold Belt, Alaska*. U.S. Geological Survey Bulletin 287.

Stone, David, and Brenda Stone
1980 *Hard Rock Gold: The Story of the Great Mines that Were the Heartbeat of Juneau*. Juneau Centennial Committee, City & Borough of Juneau, Juneau.

Szumoggala, D.J., R.C. Swainbank, M.W. Henning, and F.M. Pillifant
2000 *Alaska's Mineral Industry 2000*. Special Report 55. Division of Geological & Geophysical Surveys in cooperation with Division of Community & Business Development Division of Mining, Land & Water, Anchorage.

Taggart, Arthur F.
1951 *Elements of Ore Dressing*. John Wiley & Sons, New York.

USDA Forest Service (U.S. Dept. of Agriculture Forest Service)
1976 *Anatomy of a Mine – From Prospect to Production*. USDA Forest Service Intermountain Region, Ogden, Utah.

1994 *Tongass National Forest, Prince of Wales Island Road Guide*. USDA Forest Service.

1992 *Alaska, Minerals as Majestic as the Mountains*. USDA Forest Service.

1993 *Chugach National Forest, Alaska*. USDA Forest Service Regional Headquarters, Juneau.

2000 *Tongass National Forest, Wrangell Island Road Guide*. USDA Forest Service.

U.S. Geological Survey (U.S. Dept. of the Interior USGS)
1947 *Alaska Map A*. U.S. Geological Survey (reprinted 1996).

1967 Untitled map of Southeast, Alaska. U.S. Geological Survey (reprinted 1972).

Viereck, Leslie, and Elbert L. Little, Jr.
1972 *Alaska Trees and Shrubs*. U.S. Department of Agriculture, Forest Service, Agricultural Handbook No. 410, United States Government Printing Office, Washington, D.C.

Wahrhaftig, Clyde
1965 *Physiographic Divisions of Alaska*. Geological Survey Professional Paper 482. United States Government Printing Office, Washington D.C.

Weathernews, Inc.
2001 http://weather.yahoo.com.

Webster's New World College Dictionary
1999 Forth edition (Michael Agnes, editor-in-chief), Macmillan, USA.

White, Paul J.
2000 *Cultural Landscape Report: Bremner Historic District, Wrangell-St. Elias National Park and Preserve, Alaska.* National Park Service, Alaska Support Office, Anchorage.

Willis, C.S.
1926 *Report, Jacob Marty Mines at Windham, Alaska.* Territory of Alaska Department of Mines and Mineral Resources Report 115-2, with a 1927 supplement.

Wimmler, N.L.
1927 Placer-Mining Methods and Costs in Alaska. U.S. Department of Commerce. Bureau of Mines.

Wright, F.E. and C.W. Wright
1908 *The Ketchikan and Wrangell Mining Districts, Alaska.* U.S. Geological Survey Bulletin 347.

Yarborough, Linda Finn
1992 *National Register of Historic Places Registration Form for the Jack White Cabins.* Chugach National Forest, Anchorage.