THE 1990 EXXON CULTURAL RESOURCE PROGRAM:

SITE PROTECTION AND MARITIME CULTURAL ECOLOGY IN

PRINCE WILLIAM SOUND AND THE GULF OF ALASKA

by

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Cover photo by Ron Riehs. Sea lions hauled out on "The Needle" Prince William Sound.

EXECUTIVE SUMMARY

The Exxon Cultural Resource Program was developed and implemented in 1989 by Exxon Company, USA to protect archaeological and architectural sites in the *Exxon Valdez* oil spill area during emergency shoreline cleanup. A second summer of treatment in 1990 included a similar program focused on mitigating potential impacts to cultural resources in compliance with state and federal historic preservation law. Fourteen professional contract archaeologists, assisted by state and federal agency and Native organization personnel, protected cultural resource sites during treatment with the cooperation of Exxon managers, field supervisors, and crews. This final report of the 1990 Exxon Cultural Resource Program describes the administrative and regulatory process involved in minimizing disturbance to cultural resource sites during a large-scale oil spill response, and integrates the archaeological, historical, and cultural ecological results of the endeavor.

Shoreline treatment was a federal undertaking because it occurred on federally managed land, required federal permits, and involved federal agencies. Federal undertakings trigger the Section 106 process of the National Historic Preservation Act of 1966 which requires consultation among affected and interested parties. Site identification, determination of effect, and mitigation procedures were agreed upon and conducted to protect cultural resources potentially affected by shoreline treatment. These procedures were followed as described in the 1990 Exxon Cultural Resource Program Work Plan (Appendix A).

Sites were identified by combining new data recovered through shoreline survey early in the1990 field season with the comprehensive site database compiled during the 1989 response. The determination of effect of treatment on cultural resources was addressed by the Cultural Technical Advisory Group (CTAG), a forum initiated in 1990 comprised of state and federal agency and Native organization representatives involved in cultural resource management in the project area. CTAG representatives reviewed cultural resource documentation in light of the type and intensity of proposed treatment, and approved the appropriate archaeological constraint needed to protect cultural resources. These constraints were then signed by the State Historic Preservation Officer (SHPO) and the Federal On-Scene Coordinator (FOSC) prior to treatment. Contract archaeologists spent approximately five and a half months in the field educating treatment personnel regarding cultural resource sensitivities, ensuring that the approved archaeological constraints were followed, investigating site incidents, and inspecting and monitoring archaeological sites at work locations throughout Prince William Sound and the Gulf of Alaska.

The archaeologists contracted by Exxon worked to ensure that disturbance to cultural resources was minimized during shoreline treatment while the amount, quality, and interpretive potential of data recovered for all sites found or visited within the spill area was maximized. Data from archaeological sites which fall within the boundaries of the major land-managing agencies

have been compiled, analyzed, and interpreted in this report. This report also examines the environmental and cultural context of sites documented or updated during 1989 and 1990 program activities, and synthesizes settlement and subsistence data of all known Alutiiq sites listed in the Alaska Heritage Resource Survey (AHRS). This report satisfies the permitting requirements under which the work was conducted, and illustrates Exxon's efforts to ensure that oil spill treatment was conducted in compliance with state and federal historic preservation laws.

The 1990 Exxon Cultural Resource Program contributed to the knowledge of archaeology in the Alutiiq region by identifying wet sites, dating ancient habitation deposits in rockshelters and selected tephra layers throughout the project area, documenting large previously-unknown villages, and identifying numerous intertidal artifact scatters. These contributions enhance our understanding of Native history in the region prior to European contact. The project also documented many sites related to human occupation and use during the post-contact period. These sites contain information about the Russian fur trade, fox-farming, mineral prospecting and mining, logging, commercial fishing, and World War II-era military defense. In satisfying permit requirements, this report also expands the available knowledge of the human history of the project area.

The 1990 Exxon Cultural Resource Program's administrative structure, the field expertise of contract archaeologists, and the direct involvement of agencies and Native organizations in the CTAG process resulted in an effective mitigation and data collection program. The archaeological data transmitted in this report and in a limited-distribution confidential volume provide information pertinent to future archaeological research and cultural resource management in Prince William Sound and the Gulf of Alaska.

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Assistance and support throughout the field season and during report preparation were received from many Exxon employees and contractors. From Exxon Company, USA, we thank Otto Harrison, General Manager, and Bob Mastracchio, Technical Supervisor, for their continued interest in and support of the Cultural Resource Program; Andy Teal, Shoreline Cleanup Advisory Team Supervisor, for counsel, support, and commitment to the goals and objectives of the program; Mark Silbert for support and assistance with CTAG; Tom Krueger for care and advice in reviewing drafts of this report; Michael Smith, Mike Barker, and Rick Harrelson for providing editorial comment on sections of the report; Tena Chamberlain, Dan Taft, Dan Egging, and Tim O'Connor for their help in compiling archaeological and natural resource data on GIS and printing the maps used in this volume; Chera Thomison (now of Creative Computer Technologies, Inc.), Tim Doyle, Roger Williams, and Bill Frost for their timely response to our computer needs; Bill Stillings, Scott Nauman, Mark Meyer, Bruce Bellingham and all of the Exxon field supervisors for cooperation and assistance in getting the job done on the beach; Russell Tait, Sara McMillan, and Chris Dash for their cooperation and assistance with monitoring Exxon biological field programs; Bebe Wilson for making travel arrangements for project staff; and John Wilkinson, Rex Coulter, Tom Kelly, John Phillips, Julie Arin, Laura Kent, and Jack Rickner for their daily help, encouragement, and support during CTAG and the field season.

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List of Acronyms and Abbreviations

ACC	Alaska Commercial Company
ACHP	Advisory Council on Historic Preservation
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
AHRS	Alaska Heritage Resource Survey
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ARPA	Archaeological Resources Protection Act
BIA	Bureau of Indian Affairs
CAC	Chugach Alaska Corporation
CCC	Civilian Conservation Corps
CTAG	Cultural Technical Advisory Group
DOI	Department of the Interior
DNR	Department of Natural Resources
DPOR	Division of Parks and Outdoor Recreation
EPA	Environmental Protection Agency
FOSC	Federal On-Scene Coordinator
GIS	Geographic Information System
ISCC	Inter-agency Shoreline Cleanup Committee
ITZ	Intertidal Zone
KANA	Kodiak Area Native Association
MAC	Multi-agency Committee
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
OHA	Office of History and Archaeology
OSRT	Oil Spill Response Technician
PWS	Prince William Sound
RAC	Russian American Company
SCAT	Shoreline Cleanup Assessment Team
SHPO	State Historic Preservation Office
SSAT	Spring Shoreline Assessment Team
TAG	Technical Advisory Group
UAF	University of Alaska Fairbanks
USCG	United States Coast Guard
USDAFS	United States Department of Agriculture Forest Service
USFWS	United States Fish and Wildlife Service

CHAPTER 1

INTRODUCTION

This volume reports the results of Exxon's 1990 Cultural Resource Program in the Prince William Sound and Gulf of Alaska project area (Figure 1). The primary goal of the program was to ensure that disturbance to cultural resources during 1990 shoreline oil spill treatment was minimized. The area is rich in Native, Russian, and American history and contains cultural sites that span over 7,000 years of Alaskan heritage. The original people of this region were members of hunting and gathering societies who harvested the bounty of the North Pacific marine environment including sea mammals, fish, birds, shellfish, and plant foods. Traces of this way of life - villages, campsites, tools, and art - are found along the shores of Prince William Sound and the Gulf of Alaska. The remains left by European and American explorers, traders, fishermen, miners, loggers, fox farmers, and settlers are also important cultural resources which are present in the region and were included in site identification and protection efforts.

Information about the region's archaeological sites is managed by the State of Alaska Office of History and Archaeology (OHA). Specific site information generated by the Exxon Cultural Resource Program has been fully reported to OHA and forms a restricted distribution report due to its extremely sensitive nature. In compliance with state and federal law, recipients of the confidential report include state, federal, and Native landowners and land managers.

This report is written from a combined cultural resource management/interpretation perspective. Throughout the 1990 program, compliance tasks were fulfilled while maximizing the interpretive potential of the cultural resource sites being protected. By presenting both the compliance and interpretive aspects of the program, we hope to enhance appreciation for the importance of site inventory, protection, management, and study as an integrated approach toward a better understanding of past, present, and future life in the region.

We use the term "Alutiiq" in this volume as the cultural designation for coastal Native groups from the region including Chugach of Prince William Sound, Unegkurmiut of the outer Kenai Peninsula, and Koniag of the Kodiak Archipelago and the Alaska Peninsula. Alutiiq is essentially synonymous with "Pacific Eskimo," but the people prefer to be known as Alutiiq, and Alutiiq is the term used by linguists for the Yupik language spoken throughout the region. In addition, we have limited use of the term "prehistoric" and have substituted "pre-contact" in keeping with the fact that Native history began long before European contact.

The grounding of the T.V. *Exxon Valdez* on Bligh Reef in Prince William Sound on March 24, 1989 resulted in the implementation of an emergency shoreline treatment program during the spring and summer of 1989. In direct response to this emergency program, Exxon developed and funded a Cultural Resource Program whose primary objective was to minimize potential impact to cultural resources located within the spill area during periods of shoreline treatment. The results of the 1989 Exxon Cultural Resource Program are summarized and presented in Mobley and Haggarty (1989a, 1989b) and Mobley *et al.* (1990).

In 1990, Exxon implemented a smaller, FOSC-approved (Federal On-Scene Coordinator) shoreline treatment program based on the field survey results of multi-agency Spring Shoreline Assessment Teams (SSAT). The field component consisted of systematic archaeological survey of approximately 265 linear km (164 mi) of shoreline comprising 139 treatment subdivisions; site consultation and inspection of 98 treatment areas; on-site monitoring of 34 treatment areas; updating of 157 AHRS site records; investigation of 28 site incidents; and collection of 47 artifacts within the project area. There were no known incidents of site vandalism related to Exxon treatment activities in 1990. All site location information was kept confidential in keeping with professional ethics and in observance of permit stipulations.

The approach employed in 1990 incorporated significant consultation and coordination with parties involved in cultural resource protection within the spill area. The Forest Service (USDAFS), a major federal land manager in the Prince William Sound region, continued to function as lead federal agency for cultural resources, advising the Coast Guard (USCG) accordingly. A Memorandum of Agreement (MOA) and a Memorandum of Understanding (MOU), established for the 1989 program under Section 106 of the National Historic Preservation Act, remained in effect in 1990 to formalize the consultation process. The Advisory Council on Historic Preservation, citing emergency circumstances in 1989, declared that all cultural resources would be treated as if they were potentially eligible for the National Register of Historic Places. This condition also applied during the 1990 field season.

Ten archaeological permits were obtained from state and federal land-managing agencies involved in cultural resource protection in Prince William Sound and the Gulf of Alaska in compliance with existing state and federal law. A total of 14 professional contract archaeologists, 11 in the field and up to three in the Anchorage office, implemented the 1990 program. All archaeologists were required to have at least an M.A. in archaeology or anthropology plus appropriate regional field experience, as specified in the Secretary of the Interior's Standards and Guidelines.

The field schedule for the 1990 program paralleled the shoreline treatment schedule. Field work began in Prince William Sound on March 29 and expanded into the Kenai Peninsula, Kodiak Island, and the Alaska Peninsula areas (Figures 2 through 5) as shoreline treatment expanded outward from Prince William Sound. Exxon treatment activities and archaeological field work ended on September 15, 1990, five and a half months after the first field crew started work in Prince William Sound. Field archaeologists conducted archaeological surveys and worked with Exxon treatment crew supervisors to ensure compliance with approved archaeological constraints.

Close cooperation and coordination was established and maintained with state and federal agencies involved in the management and protection of cultural resources within the treatment area. In addition to the four permitting agencies - OHA, NPS (National Park Service), USDAFS, and the USFWS (US Fish and Wildlife Service) - the Coast Guard, Bureau of Indian Affairs (BIA), Chugach Alaska Corporation (CAC), and the Kodiak Area Native Association (KANA) were also directly involved in the process, primarily through participation in pre-treatment (CTAG) meetings. A significant effort was made to address concerns raised in 1989 such as the need for increased involvement in the decision-making process by CAC, a major Native corporation in the region. CTAG provided a forum for

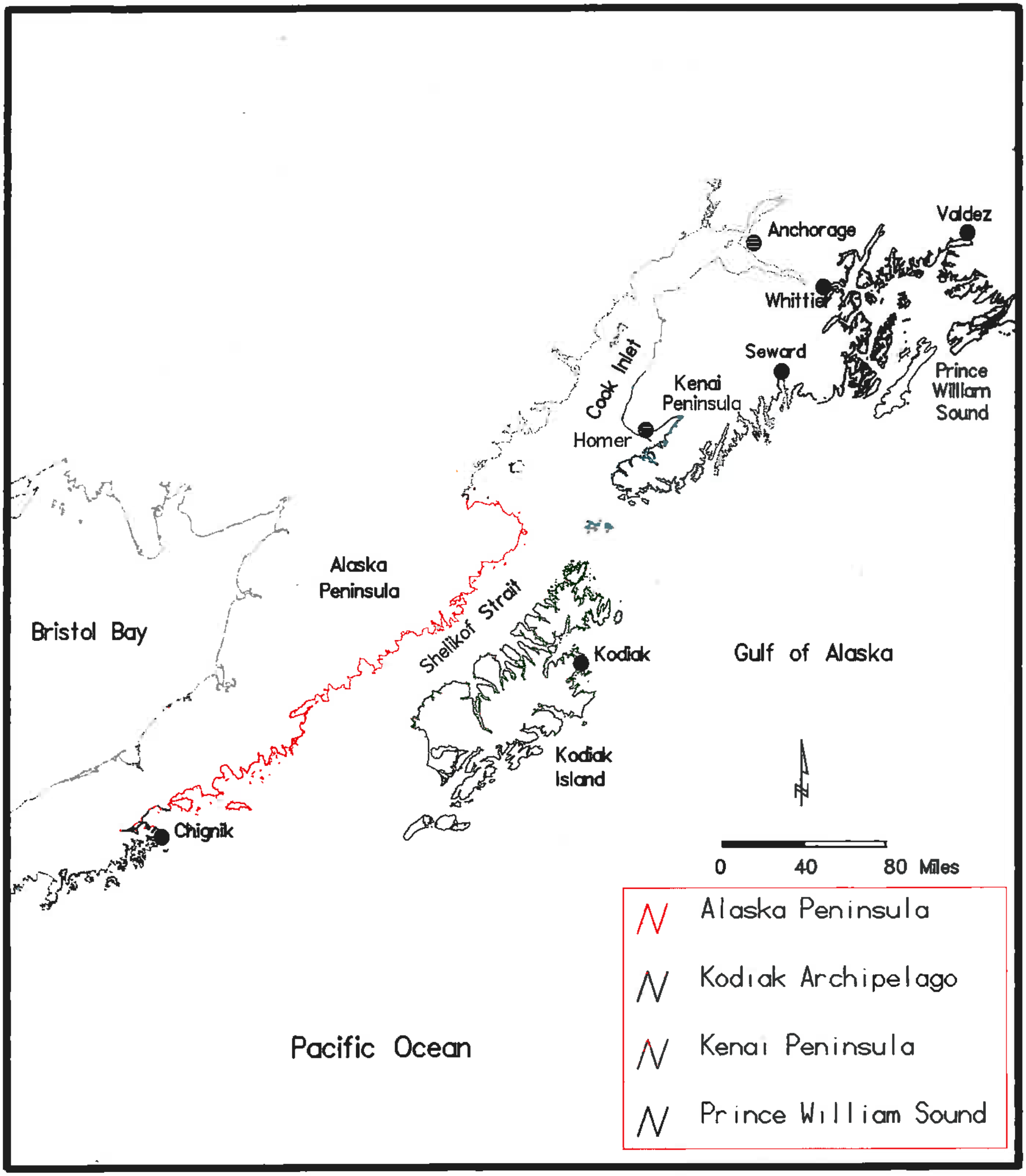


Figure 1 **1990 Exxon Cultural Resource Program project area**

airing and solving specific problems regarding cultural resource issues. All organizations had the opportunity to review site-specific treatment plans and ensure that cultural resources received protection commensurate with planned treatment.

This report and an earlier Interim Report (Haggarty and Wooley 1990) were prepared in partial fulfillment of the conditions specified in nine of the 10 permits issued to the program. The compliance stipulations contained in the tenth permit, issued by the NPS to cover specific treatment activities at site SEL-188 on the Kenai Peninsula, are addressed in a separate report (Betts *et al.* 1991). A paper presented at a professional meeting addresses the archaeological results of the project (Erlandson *et al.* 1991).

State and Federal Laws and Regulations

State and federal laws and regulations which protect cultural resources applied to Exxon's shoreline treatment in Prince William Sound and the Gulf of Alaska. The Alaska Historic Preservation Act (AS 41.35) is intended:

> . . . to preserve and protect the historic, prehistoric, and archaeological resources of Alaska from loss, desecration, and destruction so that the scientific, historic, and cultural heritage embodied in these resources may pass undiminished to future generations.

This act applies to all historic, prehistoric, archaeological, and paleontological resources on state administered lands (including tidelands), and provides a permitting system for archaeological investigations administered by the OHA. Compliance with the National Historic Preservation Act of 1966 and other federal laws was also overseen by the OHA through their role as State Historic Preservation Office (SHPO).

Summary of the 1989 Cultural Resource Program

Exxon's 1989 Cultural Resource Program was a major compliance effort involving over 5,400 km (3,400 mi) of shoreline in Prince William Sound and the Gulf of Alaska (Mobley and Haggarty 1989a, 1989b; Mobley *et al.* 1990). As oil spread from Prince William Sound to the Kenai Peninsula, Kodiak Island, and the Alaska Peninsula, Exxon increased the number of personnel and amount of equipment needed to treat sections of shoreline. The Cultural Resource Program expanded accordingly. Twenty-six professional archaeologists, all with regional experience and M.A. or Ph.D. degrees in anthropology, were contracted to implement the program and minimize disturbance to cultural resources during the treatment effort.

Each Shoreline Cleanup Assessment Team (SCAT) was composed of an oil geologist, a biologist, and an archaeologist. SCAT archaeologists identified and documented previously unknown cultural sites and inspected known sites in the oil spill area during reconnaissance-level surveys in 1989. This task was essential because no complete inventory of cultural sites existed for the spill area. Two hundred and seventy one (271) new sites were documented and their descriptions entered onto the Alaska Heritage Resource Survey (AHRS) as a result of these surveys, along with the updated descriptions of 238 previously-known sites.

Archaeological constraints for shoreline segments scheduled for treatment were devised in consultation with state and federal agencies and other interested parties. Constraints on treatment in specific site areas included avoidance, access restrictions, and archaeological monitoring during cleanup.

Ten permits to conduct reconnaissance-level survey and site monitoring during shoreline treatment were issued to Exxon in 1989 by state and federal agencies. An interim report (Mobley and Haggarty 1989b) and a final report (Mobley *et al.* 1990) were written and submitted to the state and federal agencies in fulfillment of the permit requirements. Under permit stipulations, artifacts judged to be at risk due to treatment activities could be collected. Two hundred and seventy-three artifacts were collected under this provision.

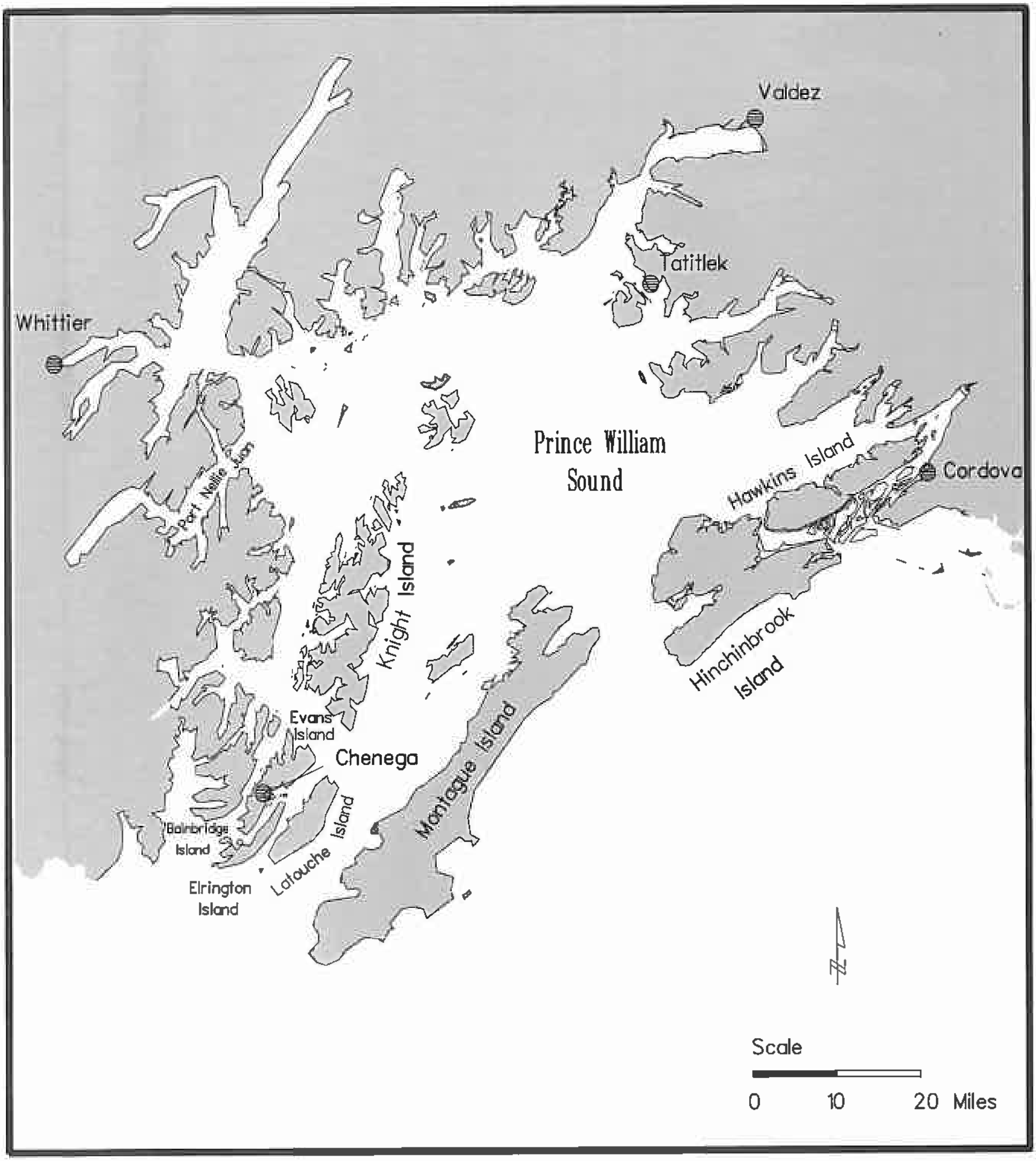


Figure 2 **Prince William Sound area**

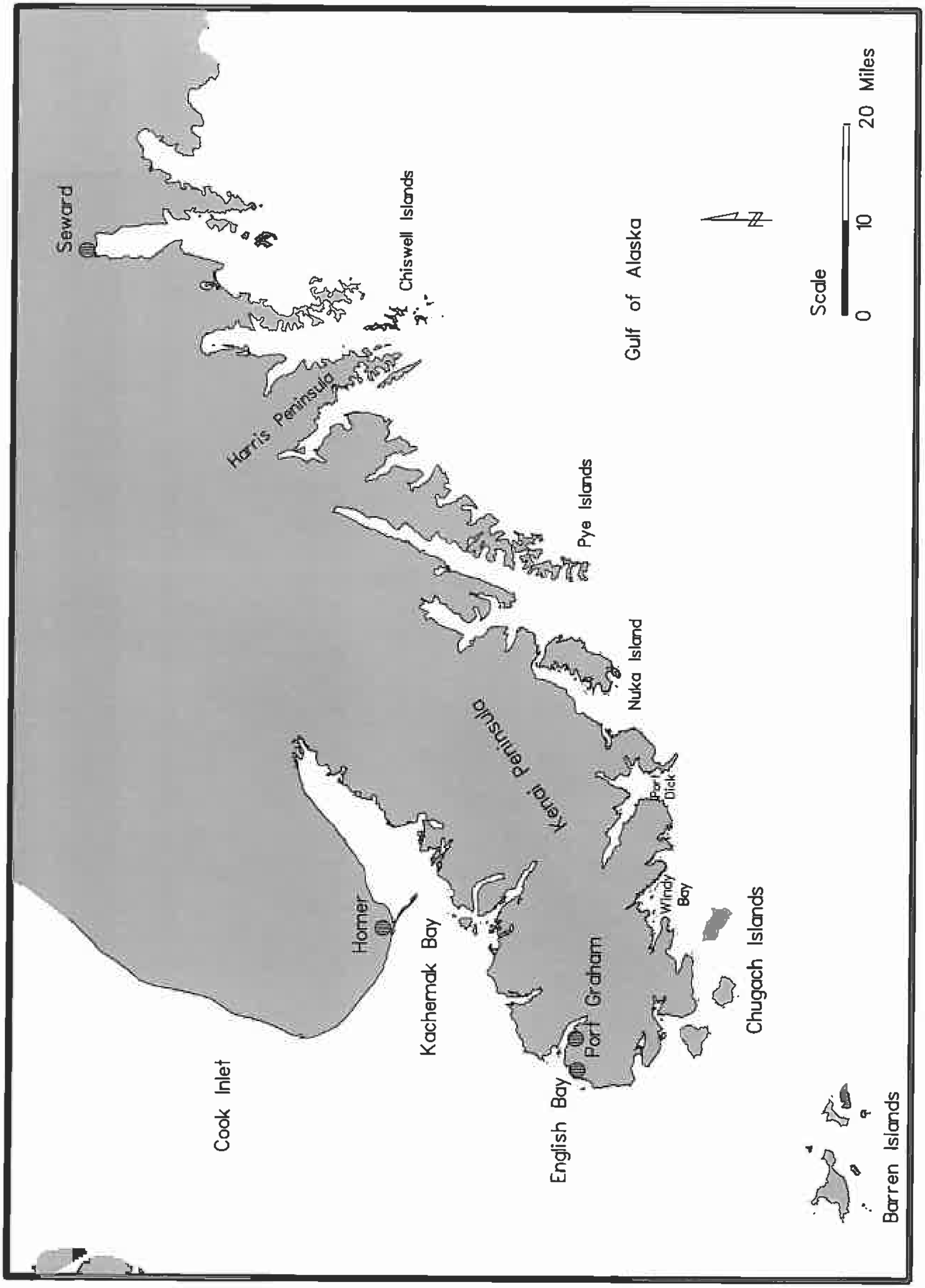


Figure 3 **Outer Kenai Peninsula area**

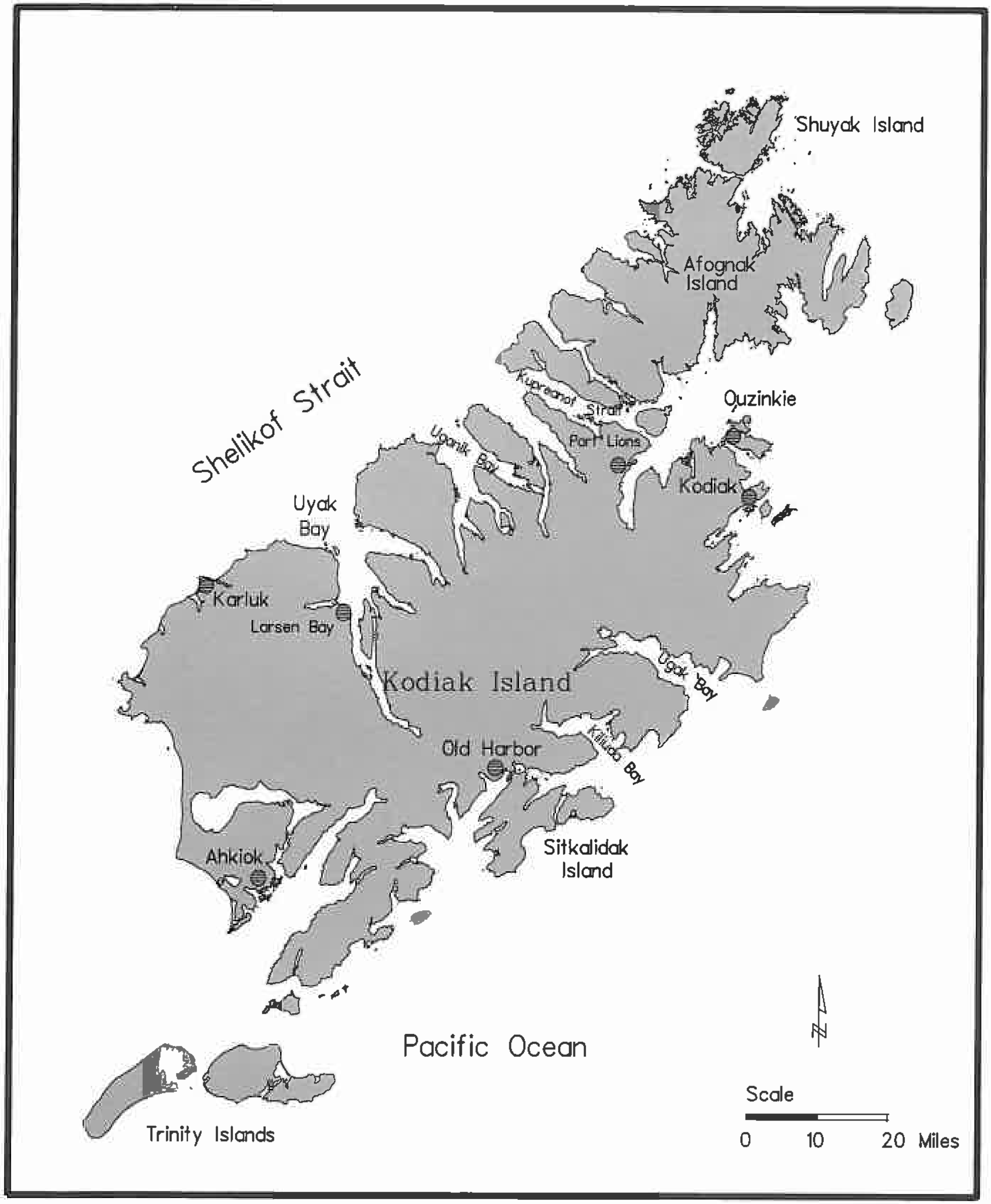


Figure 4 **Kodiak Archipelago area**

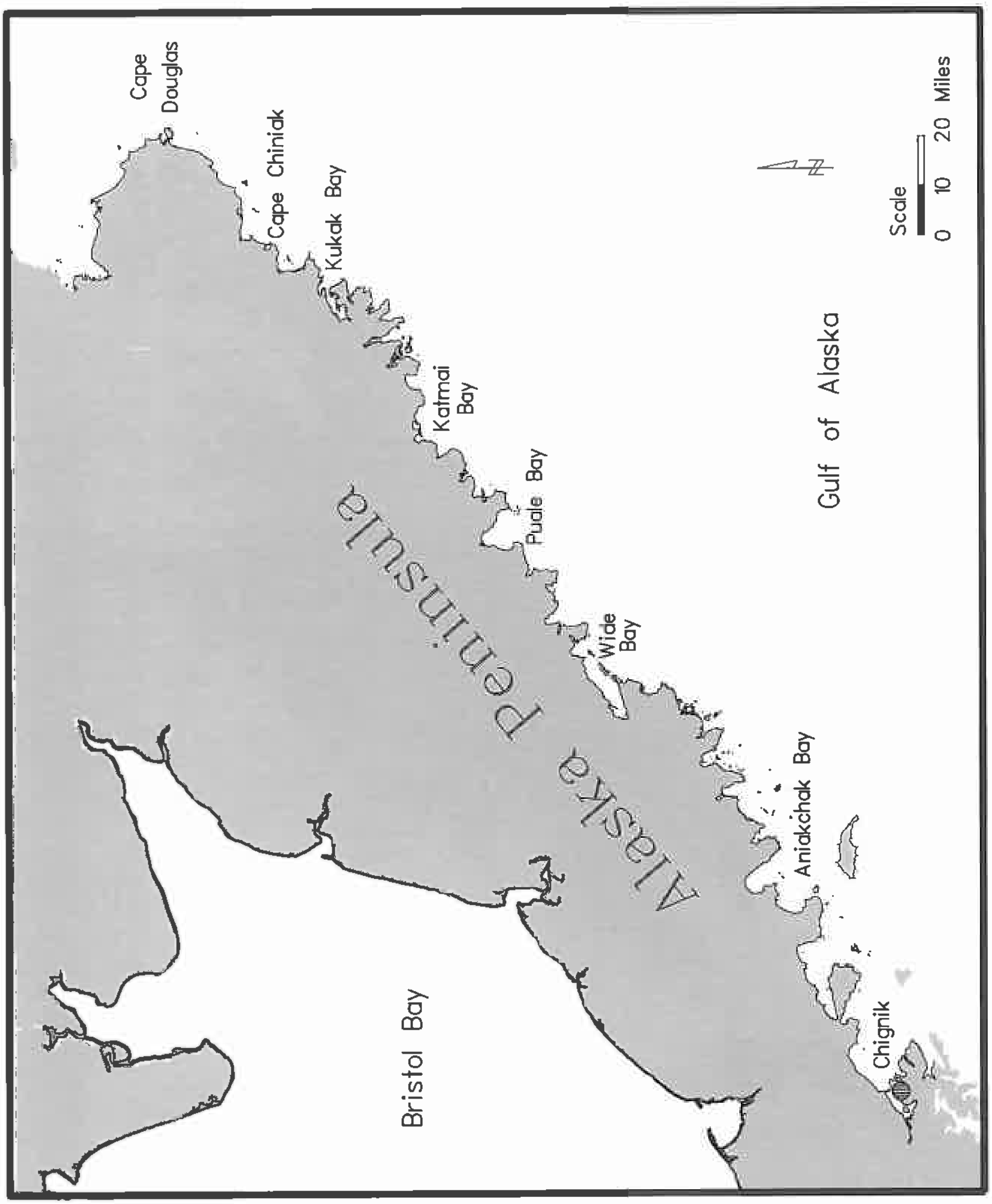


Figure 5 **Alaska Peninsula area**

Exxon developed an educational program which consisted of handouts, an instructional videotape, and field briefings. This program informed treatment personnel of Exxon's cultural resource policy and procedures, and of the legal protection afforded cultural sites. A post-cleanup assessment program was implemented to document the condition of a sample of sites following treatment.

Exxon's 1989 Cultural Resource Program was designed to minimize disturbances to cultural resources within the oil spill area during shoreline treatment. It appears that no significant disturbance to cultural sites directly resulted from treatment efforts. Indirect, non-malicious disturbances such as pedestrian traffic and littering were observed and documented. Sixteen sites in the oil spill area were vandalized during the summer of 1989, but only two were determined to have been response-related. One vandal was apprehended and successfully prosecuted by the Forest Service.

Exxon's Cultural Resource Program collected and compiled a substantial body of archaeological site information as a result of 1989 site protection activities. These data already have been useful for cultural resource management on state, federal, and private lands in Prince William Sound and the Gulf of Alaska, and they were essential to 1990 treatment program planning.

The 1990 Cultural Resource Program

The field component of the 1990 Cultural Resource Program, unlike the 1989 program, functioned independently of the SSAT survey. The multi-agency survey assessed oiling and biological conditions present in shoreline subdivisions and recommended specific treatment techniques based on the location and extent of remaining oil. The decision not to conduct additional reconnaissance archaeological survey during the 1990 spring assessment surveys was based on the fact that any additional reconnaissance data would not add substantially to archaeological knowledge within the spill area. The rapid pace of the joint surveys was not conducive to the more intensive level of archaeological survey deemed necessary in 1990. However, close coordination between CTAG (Cultural Technical Advisory Group) and TAG (Technical Advisory Group) resulted in intensive archaeological survey of specific treatment areas.

Goals, Objectives, and Procedures

The 1990 Cultural Resource Program Work Plan (Appendix A) followed the procedures outlined in 36 CFR Part 800 for implementing Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470). The 1990 Work Plan superseded the 1989 Work Plan, an appendix to the signed Memorandum of Agreement developed to facilitate the Section 106 process. Three procedures - identification, determination of effect, and mitigation - were developed to identify and protect cultural properties per Stipulation B.2 of the Agreement. The work plan was executed under the supervision of the Coast Guard, with advice from the Forest Service as lead federal agency for cultural resources.

Identification

Known sites within the 1990 treatment area were identified from AHRS files and Alaska Native Claims Settlement Act 14(h)(1) records maintained by the State of Alaska Office of History and Archaeology. The records of 271 cultural properties documented during the 1989 field season and entered onto the AHRS prior to the 1990 field season were a major consideration in 1990 planning. Additional site data held by other landowning agencies and Native organizations, but not included in the AHRS files, were provided during CTAG review. These data were used in intensive surveys, inspection and on-site monitoring tasks, and AHRS site updates. Site-specific data were not provided to Exxon treatment personnel or other contractors involved in shoreline assessment or treatment due to the sensitive and confidential nature of the information.

CTAG review concluded that 106 of the 600 subdivisions slated for treatment required intensive survey before appropriate constraints could be assigned. The SHPO made the final determination regarding the adequacy of existing archaeological data for particular beach segments. The SHPO recommended intensive archaeological survey of the subdivision in question when existing archaeological data were inadequate for deciding the appropriate constraint. The degree of confidence which Exxon and the CTAG representatives had in the existing archaeological data for the subdivision, the sensitivity of known cultural resources in the subdivision, and the type and intensity of 1990 planned treatment in the subdivision were all criteria for deciding the necessity of intensive survey.

Intensive archaeological survey of 106 subdivisions enabled application of appropriate archaeological constraints on planned treatment. Information was collected on the appearance, significance, integrity, and boundaries of each site, as outlined in the Secretary of the Interior's Standards and Guidelines for Identification. The information enabled CTAG to evaluate whether cultural resources were present in a subdivision scheduled for treatment, and, if present, how susceptible they were to treatment impacts and other oil spill-related activities.

Subsurface testing, including the regular use of soil probes, was limited to circumstances where archaeological judgement and environmental considerations suggested the possibility of a buried site not otherwise confirmed by surface evidence, or where information on the subsurface boundaries of a known site was necessary to judge its susceptibility to treatment-related impacts. Subsurface testing was conducted in accordance with the variable restrictions specified in the project permits, and in accordance with the known wishes of the Native corporation landowners within the spill area. Artifacts were collected only if found in subsurface tests or if potentially threatened by treatment activities.

The 1990 educational program was designed to sensitize Exxon supervisors and other personnel to the presence of cultural resources, given the possibility that treatment crews might encounter isolated artifacts or previously unknown sites during shoreline treatment. Exxon archaeologists instructed Exxon treatment supervisors regarding cultural resource policies and procedures prior to the commencement of work. A new educational video, produced in conjunction with SHPO staff, was shown to all treatment supervisors, their crews, and other Exxon personnel and contractors who would be present on shorelines within the oil spill area. The video was shown to treatment crews on several occasions, and cultural resource policies and procedures were reinforced by field archaeologists who were in close contact with the treatment workers throughout the summer of 1990.

Determination of Effect

The Determination of Effect consisted primarily of the CTAG subdivision review process. To ensure consultation required by Section 106, CTAG reviewed the archaeological constraints proposed by Exxon prior to final sign-off. In 1989, constraint review took place at the Inter-agency Shoreline Cleanup Committee/Multi-agency Committee (ISCC/MAC) level (Mobley *et al.* 1990:4).

Ordinarily, CTAG had 48 hours to review the planned treatment activity and extant cultural resource data for each subdivision and to advise the SHPO on potential effects. Exxon's Cultural Resource Program Director recommended constraints appropriate to the type and intensity of planned treatment. CTAG agreed to or modified the constraint and it was entered on the Shoreline Evaluation Form. This form was then signed by the SHPO and, when combined with the TAG recommendations, was sent to the FOSC for final approval. At this stage, the land manager had 48 hours to review the TAG - CTAG recommendations.

Once the work order was approved by the land manager and signed by the FOSC, Exxon was cleared to conduct treatment in the subdivision under the archaeological constraint specified on the work order. The archaeological constraints, when followed in the field, allowed shoreline treatment to proceed without damage to any identified or potential sites in the subdivision.

Mitigation

A number of mitigative options were employed to protect cultural resources potentially impacted by the planned treatment program: avoidance, site consultation and inspection, on-site monitoring, site mapping, artifact collection, and cultural resource awareness education programs. A strictly enforced "no uplands access" policy applied to all Exxon and agency personnel throughout the treatment area with few exceptions. This access constraint provided protection for all cultural sites located in the uplands through a policy of avoidance.

Avoidance was the primary mitigative technique employed for cultural resources located in both intertidal and near uplands areas. This was accomplished mainly through the archaeological constraints formulated by CTAG. To ensure site avoidance in sensitive areas, the Exxon crew supervisor was required to consult an Exxon archaeologist prior to treatment (Figure 6). Many site areas were inspected by archaeologists and the cultural sensitivities of these areas were discussed with the appropriate Exxon treatment crew supervisor. An Exxon archaeologist remained on-site to monitor treatment and advise the Exxon supervisor in subdivisions where planned treatment could potentially impact a cultural site or feature.

Artifacts were collected only when material was in primary context within an archaeological test pit or when the material was on the surface and in potential danger of damage or removal due to treatment. Surface artifacts were a particular focus of the project. The Cultural Resource Program's policy was to leave all surface artifacts in place unless they were directly threatened by planned treatment. Intertidal artifact scatters were preserved in place after being mapped, photographed, and videotaped. The field archaeologist usually consulted the Anchorage office prior to collecting an artifact as each situation was considered on a case-by-case basis.

All Exxon employees and contractors were educated during safety training regarding the types of sites and artifacts in the region, and the employees and contractors were informed of Exxon's strict policy concerning the protection of cultural resources. Otto Harrison, General Manager of Exxon Alaska Operations, stated the official policy in a letter sent to all employees and contractors:

> Anyone found vandalizing, moving, or taking away cultural materials will be subject to immediate dismissal from the work, and an incident report may be filed with law enforcement authorities, requesting prosecution under applicable law.

The education program helped identify and mitigate effects to sites because employees and contractors followed company policy of site avoidance and called archaeologists when artifacts were found.

Permitting Requirements

Archaeological sites in Alaska are protected under both state and federal law, and archaeological permits are required when conducting activities which may affect sites on state and federal land. In 1990, the Exxon Cultural Resource Program applied for, and was issued, four ARPA (Archaeological Resources Protection Act) and five Special Use permits to conduct intensive survey and site monitoring associated with Exxon's 1990 shoreline treatment program. Three ARPA permits were issued to cover general activities of the program, and the fourth was an unsolicited permit issued by the National Park Service to cover monitoring activities at SEL-188, an archaeological site located in Kenai Fjords National Park. A separate compliance report was written and submitted to the state and National Park Service to fulfill conditions of this ARPA permit (Betts *et al.* 1991).

The different permits contained specific conditions pertinent to the issuing agency, park, or refuge. An interim report (Haggarty and Wooley 1990) and this final report have been submitted to state and federal agencies and Native organizations as required under conditions of the permits. Specific conditions of each permit issued to Exxon's Cultural Resource Program are discussed in detail in the following chapter.

Records Management System

One of the first tasks the Exxon Cultural Resource Program Director faced in 1989 was to compile and organize archaeological site data pertinent to site protection, then transmit the data to archaeologists conducting SCAT shoreline survey in advance of treatment crews. As oil spread outward from Prince William Sound into the Gulf of Alaska, archaeological data from the Kenai Peninsula, Kodiak Island, and the Alaska Peninsula also had to be quickly compiled and organized. This essential task was accomplished under emergency conditions.

Immediate response to extensive shoreline treatment consumed the time and energy of all archaeological personnel working on the Cultural Resource Program during 1989. The first opportunity to organize project records occurred after the field program ended on September 15, 1989. All Cultural Resource Program administrative and field records were organized during the fall of 1989. This records management system was expanded and modified to accommodate the 1990 program records.

These records consist of both hard copy and electronic files. The hard copy files are organized into an original and a duplicate set of project files. The original files are organized by function, the duplicate set by segment (1989) and subdivision (1990). An inventory summary of program data and a list of electronic files and data bases are presented in Appendix B.

Research Goals and Objectives

The primary purpose of the Exxon Cultural Resource Program was to protect cultural resources in Prince William Sound and the Gulf of Alaska as sections of shoreline were treated. Under the emergency conditions of 1989, all resources of the Cultural Resource Program were directed at minimizing disturbance to archaeological sites potentially impacted by treatment activity. The mitigative nature of the 1989 program notwithstanding, an important contribution to the regional prehistory of southcentral Alaska was the addition of 271 archaeological sites to the spill area AHRS inventory. At the end of 1989, these new sites comprised 54% of the site total (532) for the project area.

Although the 1990 project remained focused on response to planned shoreline treatment, specific tasks were structured to maximize data recovery. In 1990, 62 new sites were found and recorded, 51 during intensive survey. Areas identified during 1989 reconnaissance survey as having high site potential were investigated in more detail. Sites originally noted by Frederica de Laguna that had not been investigated since the 1930s were targeted for investigating the effect of geotectonic processes and erosion on sites. Sites reported to BIA investigators by Native elders during 14(h)(1) investigations, but

[C. Wooley 91-1:18]

Figure 6 **Exxon supervisor Randy Boyer consults with archaeologist Jim Haggarty**

where no remains had yet been found, were also slated for inspection should the opportunity arise.

While the documentation of new sites was a priority during the CTAG-required surveys, the reassessment, mapping, and videotaping of previously known sites was an equally important goal. It was recognized that a major contribution to understanding the area's human history was possible within the context of the program. As many previously known sites in the spill area as possible (157) were visited, and the existing AHRS site data were augmented with new information. Archaeologists inspecting or monitoring sites produced detailed site maps and recorded specific site attributes, features, and conditions. Previously unavailable data on site erosion and vandalism were also collected.

The project has contributed a substantial amount of archaeological data to the permitting agencies and Native organizations. This report transmits the data gathered during the site protection program and presents the results in context of the archaeology of the Alutiiq region. Background information on the environment, history, and culture of the region, as well as analysis of regional site distribution and attributes, places the data collected under permit and presented in this report in a regional site framework.

Report Structure and Organization

This final report satisfies the reporting stipulations in the permits issued by the four permitting agencies. The report structure reflects an integrated approach to the compliance and research aspects of a large-scale mitigation project. The report content indicates both the scope of the compliance effort and the breadth of the region's research potential.

Following this introduction, the *Administrative Structure* chapter summarizes the land management status and permit requirements of the agencies in the region, and describes the process by which all agencies and interested parties provided input into the program. *Environmental Setting* summarizes the geological and biological factors influencing human settlement and subsistence. *Cultural, Historical, and Archaeological Background* describes the language, customs, technology, and history of the region's inhabitants through time, and characterizes our knowledge of the region's prehistory through examination of past archaeological research. *1990 Site Protection Program* describes the 1990 treatment methods, their potential impacts to cultural resources, the measures taken to mitigate those impacts, the site identification and update efforts, and the archaeological inspection/monitoring efforts and results. The *Summary of 1989/1990 Field Investigations* relates this project's contributions to the identification and assessment of cultural resources within specific land management units. *Maritime Cultural Ecology* synthesizes archaeological and natural resource data from the Alutiiq culture area in an examination of the prehistoric cultural ecology of the region. *Summary and Conclusions* reviews the accomplishments of the 1989 and 1990 programs and concludes the text. Appendices provide site type data and tabulations of site survey and inspection activities.

CHAPTER 2

ADMINISTRATIVE STRUCTURE

This chapter addresses the administrative component of shoreline treatment decision-making and the role of the Cultural Resource Program in the process. The first section identifies the major land managers and owners in the area, their lands, and their management responsibilities. This is followed by a discussion of the state and federal permits issued to the Exxon Cultural Resource Program for the protection of archaeological resources during shoreline treatment. The next section provides details on the CTAG process, a consultative mechanism developed in response to National Historic Preservation Act requirements. The final four sections of the chapter review, evaluate, and summarize the TAG and CTAG processes.

Current Land Management

The project area is an immense geographic region containing state and national parks, wildlife refuges, and a patchwork of corporate and private lands. Only small fractions of the management units described below were surveyed during 1989 and 1990, and even smaller proportions of these areas were oiled. The extent of the landholdings surveyed by the project and described in this chapter and throughout the report in no way relates to the degree of oiling which occurred in the region. Approximately 8,050 km (5,000 mi) of shoreline were surveyed during the 1989 SCAT process; however, only intermittent portions of the shorelines were oiled, and oiling conditions varied considerably from segment to segment.

Direct involvement of all major land managers and owners in the 1990 shoreline treatment program began with their participation in the August 1989 and April 1990 shoreline assessment teams and continued with their participation in TAG and CTAG meetings. Issues and concerns regarding the location and degree of oiling were addressed during the field surveys while treatment methods and constraints were considered by representatives during the TAG and CTAG process. Major land managers and owners were provided the opportunity for direct input into the decision-making process on a subdivision-by-subdivision basis through TAG and CTAG and during final review as requested by the FOSC.

Treatment activity in 1990 was almost exclusively confined to the intertidal zone. Access to the upland zone (above mean high tide) was required during specific types of shoreline treatment such as storm berm relocation, and on rare occasions to store equipment. Intertidal and upland zones were traversed by Exxon archaeologists during all phases of the field program including intensive survey, site updating, inspection, and on-site monitoring. These activities involved access to both private and public lands.

There are eight major land-managing agencies or organizations with significant land holdings in the project area (Figures 7 through 10). Three federal agencies and one state agency are responsible for managing public lands in the area in addition to four private landowners. Permission to conduct archaeological survey on a few parcels of private land on the Kenai Peninsula and on Kodiak Island was requested and granted.

The Alaska Department of Natural Resources (DNR) manages intertidal and submerged lands as well as certain upland parcels, although state ownership of the intertidal zone is contested by the Forest Service and the Fish and Wildlife Service in different regions of the project area (DNR 1989; USFS 1989a). The three federal land-managing agencies include the Forest Service (Department of Agriculture), the Park Service (Department of the Interior), and the Fish and Wildlife Service (Department of the Interior). The Forest Service manages Chugach National Forest lands in Prince William Sound; the Park Service manages Katmai National Park and Preserve, Aniakchak National Monument and Preserve, and Kenai Fjords National Park; and the Fish and Wildlife Service manages lands encompassed by the Kodiak, Becharof, Alaska Maritime, and Alaska Peninsula National Wildlife refuges.

Most large private land parcels in the region are Native lands formally conveyed under the 1971 Alaska Native Claims Settlement Act (ANCSA). Although some lands have been formally conveyed from federal to Native ownership, large tracts of land have been selected but remain unconveyed. The status of these lands complicates management issues in the region. Shorelines adjacent to uplands owned or selected by regional (Chugach Alaska Corporation and Koniag, Inc.) or village corporations within the project area were treated in both 1989 and 1990.

Native village corporation lands are owned and managed independently from lands owned by Native regional corporations. Village corporations with lands in the Chugach region of the project area include Chenega, Port Graham, and English Bay village corporations; the Koniag area landholders include Afognak Native Corporation, Inc., Akhiok-Kaguyak, Inc., Old Harbor Native Corporation, and Ouzinkie Native Corporation.

KANA, the non-profit Native association responsible for cultural resources in the Koniag area, encouraged site survey and updating of known sites. The two Native organizations and the four permitting agencies have been provided with copies of all field data generated by Exxon's Cultural Resource Program in 1989 and 1990.

These and other land-managing agencies and Native organizations are discussed here in terms of their management mandate, input into the 1990 Exxon Cultural Resource Program, and their role in the protection of cultural resources within the project area (see Mobley *et al.* 1990). An overview of archaeological data generated and compiled in 1989 and 1990 as part of Exxon's Cultural Resource Program is presented by agency and management unit in Chapter 6.

State of Alaska

The State of Alaska manages 27 million hectares (69 million acres) of tide (below mean high tide) and submerged lands up to three miles offshore, and 34 million hectares (85 million acres) of uplands throughout the state as granted under the Alaska Statehood Act of 1959. The intertidal zone within the project area generally is considered state land although ownership of certain portions is contested by both the Forest Service in Prince William Sound and by the Fish and Wildlife Service for lands adjacent to their upland holdings. These issues are currently under review before the Interior Board of Land Appeals and the United States Supreme Court.

The state owns nine major uplands parcels and some smaller tracts in the project area. Major upland parcels include lands in northeast Prince William Sound, including most of Esther Island and

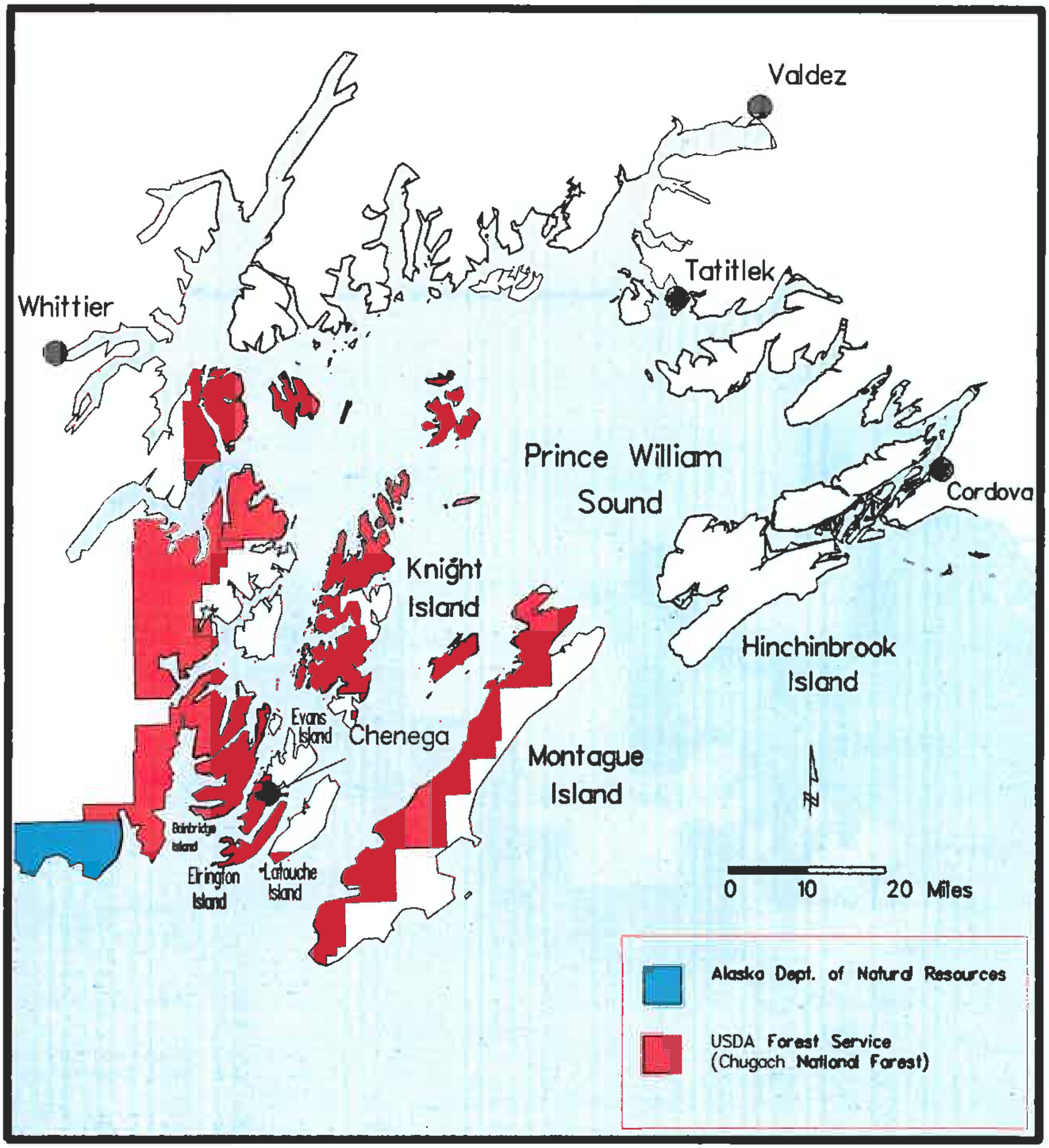


Figure 7 **Major agency landholdings in the Prince William Sound project area**

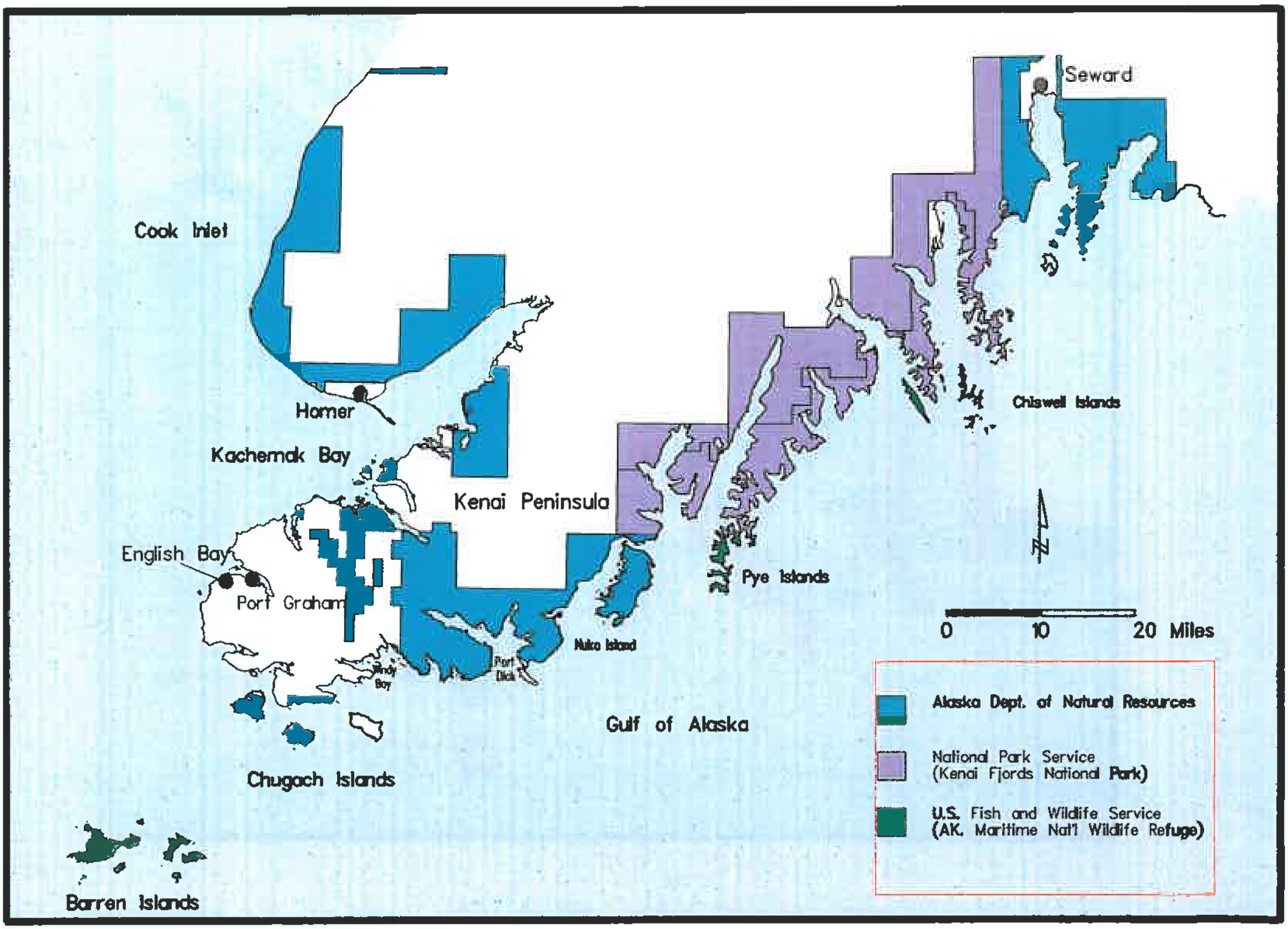


Figure 8 **Major agency landholdings in the outer Kenai Peninsula project area**

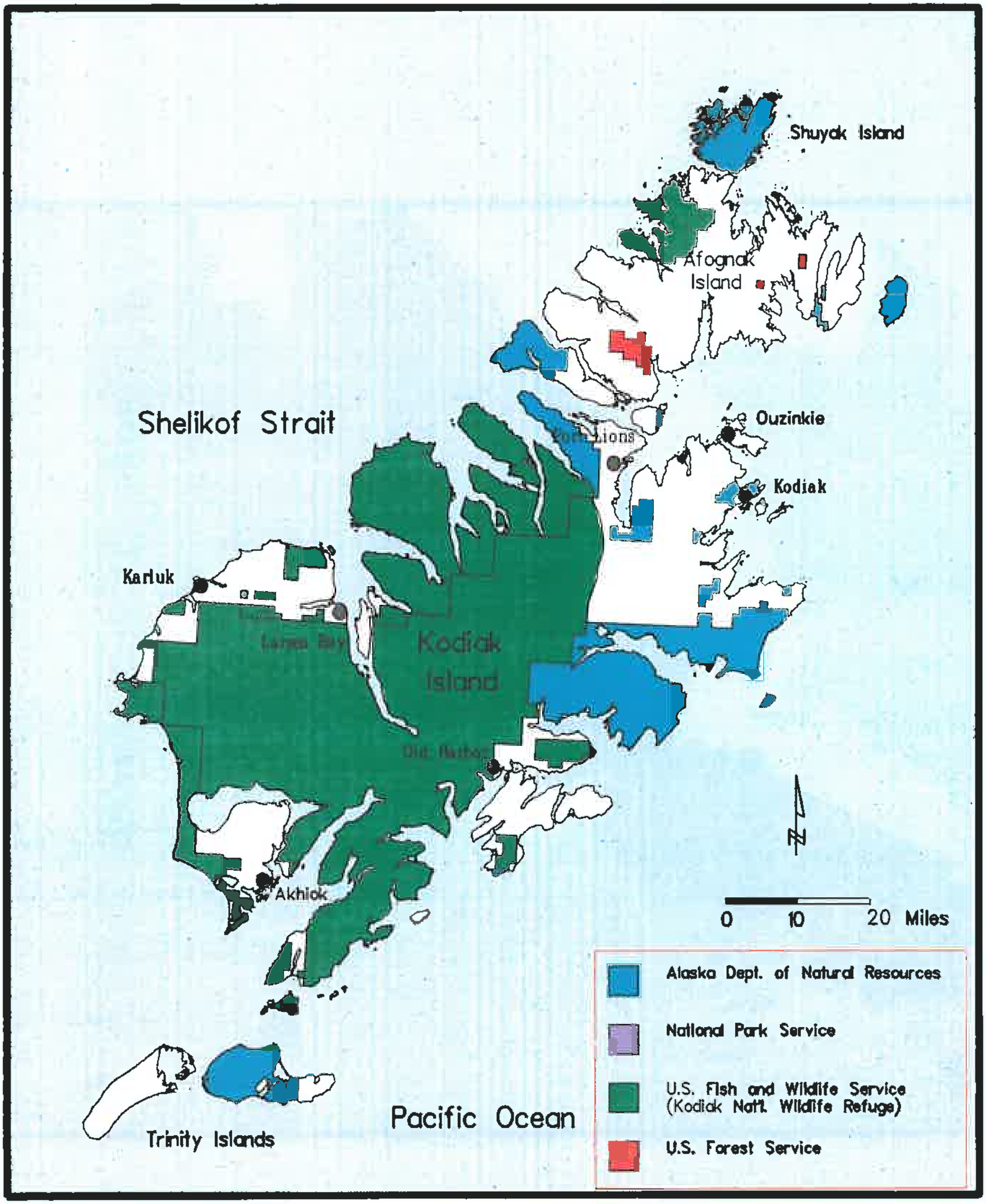


Figure 9 **Major agency landholdings in the Kodiak Archipelago project area**

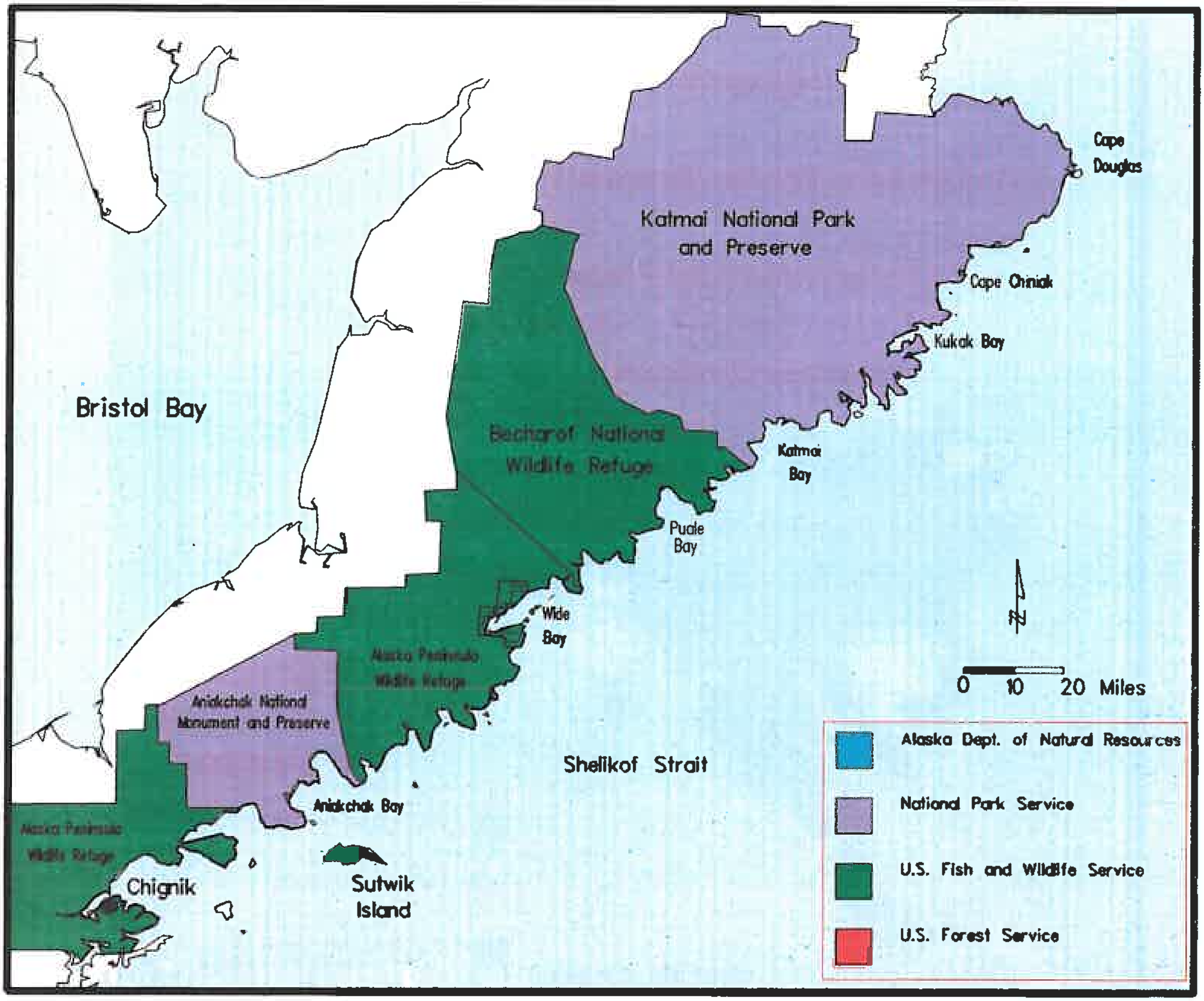


Figure 10 **Major agency landholdings in the Alaska Peninsula project area**

holdings in the Port Wells area (Figure 7); the eastern part of the south Kenai Peninsula, from Puget Bay to Resurrection Bay, bracketed to the northeast by Chugach National Forest and to the southwest by Kenai Fjords National Park; the southwest of Kenai Fjords National Park, from Nuka Island west to the Rocky Bay area, and including the south shoreline of Kachemak Bay State Wilderness Park (Figures 8, 11); the southern end of the Kenai Peninsula, including most of Elizabeth and Perl islands and a section of the adjacent mainland coast; all of Shuyak and Marmot islands in the Kodiak Archipelago including Shuyak State Park; the northwest half of Raspberry Island; shoreline on both sides of Ugak Bay, the north shore of Kiliuda Bay, and much of the Kupreanof Peninsula shoreline; most of the Trinity Islands at the south end of the Kodiak Archipelago (Figure 9); and the northwest shore of Wide Bay on the Alaska Peninsula (Figure 10). Numerous smaller coastal holdings administered by the state are scattered throughout the Kodiak Archipelago.

Interaction with DNR was through the Office of History and Archaeology (OHA), the section of the Division of Parks and Outdoor Recreation (DPOR) responsible for the management of cultural resources on state lands.

Alaska Statute 41.35 establishes the responsibilities of DPOR for the state's cultural resources. The

[V. Butler 7:8]

Figure 11 Port Dick, Kachemak Bay State Wilderness Park

DPOR has some management responsibility for the state's cultural resources, administers all state and federal grant programs for historic preservation, and manages the Alaska State Park System which includes some historic sites. The OHA includes the office and staff of the State Historic Preservation Officer, the state agency responsible for dealing with historic issues. Although OHA and SHPO have separate functions, there is much overlap in their respective responsibilities and staff, particularly in the field. Primary functions of the OHA and SHPO are outlined in Mobley *et al.* (1990:87).

OHA staff participated in the CTAG review process. Formal SHPO sign-off on subdivision-specific archaeological constraints was handled primarily by the oil spill coordinator, assisted occasionally by other staff members. OHA staff played a key role in the development, implementation, and progress of CTAG and in the protection of cultural resources throughout the area. OHA staff maintain the Alaska Heritage Resource Survey (AHRS), a comprehensive listing of archaeological sites in the state. The Cultural Resource Program transmitted all site information generated by the project to OHA staff and assisted in incorporating the new data into the AHRS.

USDA Forest Service

The Forest Service was made the lead federal agency in 1989 because of its extensive land holdings in the project area. They continued to work in this capacity throughout 1990. This meant that they advised the Coast Guard on all issues related to compliance under Section 106 of the National Historic Preservation Act. The formation and implementation of CTAG as the primary vehicle for consultation and review of constraints greatly reduced Forest Service responsibility in this area in 1990.

The Chugach National Forest, second in size only to the Tongass National Forest in southeast Alaska, comprises 2,405,000 ha (5,936,000 acres). Chugach National Forest lands include large portions of the mainland and island areas of Prince William Sound (Figures 7, 12) as well as predominantly interior properties on Afognak Island at the northern end of the Kodiak Archipelago (Figure 9). The Chugach National Forest, originally much larger, has been reduced in size by the selection of lands by CAC and village corporations under ANCSA, and by the transfer of portions of Afognak Island to the state, USFWS, and Koniag, Inc.

Contact with John Mattson, Chugach National Forest archaeologist, was maintained throughout the 1990 field season. Forest Service participation in CTAG was delegated to Mike Yarborough, a contract archaeologist with experience in Prince William Sound and familiarity with the SCAT approach employed in 1989.

National Park Service

National Park Service lands in Alaska are distributed over 15 parks that comprise more than 20 million hectares (51 million acres). Three of these, Kenai Fjords National Park, Katmai National Park and Preserve, and Aniakchak National Monument and Preserve, are located within the project area (Figures 8,10), comprising 2.2 million ha (5.27 million acres), or 10.3% of national park land in Alaska.

Kenai Fjords National Park on the Kenai Peninsula, comprising 271,000 ha (669,000 acres), extends from the east side of the Aialik Peninsula to the west shore of Nuka Passage and includes the west side of Resurrection Bay, Aialik Bay, Harris Bay, McCarty Fjord, and Nuka Bay (Figure 8). Established in 1980, the park preserves a rugged fjord-dominated shoreline and a unique set of glacial features, including the seaward interface of the impressive Harding Icefield, one of four major ice caps in the United States. Approximately 30,350 ha (75,000 acres), or 11% of the current park shoreline ultimately will be transferred under the provisions of ANCSA to Port Graham and English Bay village corporations.

Katmai National Park and Preserve on the Alaska Peninsula extends from just north of Cape Douglas near the entrance to Cook Inlet to Cape Kubugakli opposite Kodiak Island and includes the shorelines of Sukoi, Hallo, Kukak, Kaflia, Kuliak, Missak, Kinak, Amalik, Dakavak, Katmai, and Kashvik bays, and several small, offshore islands (Figures 10, 13). Established in 1918 and expanded in 1980, the park presently encompasses 1.7 million hectares (4 million acres) and continues to serve as laboratory for the study of volcanic activity and brown bear behavior.

Aniakchak National Monument and Preserve is located in a remote part of the Alaska Peninsula about 200 km (125 mi) southwest of Katmai National Park and Preserve (Figure 10). Aniakchak consists of 243,000 ha (600,000 acres) and extends from Amber Bay on the northeast to the Chignik area on the southwest and includes the shorelines of Amber Bay, Aniakchak Bay, and the northeast part of Kujulik Bay.

In 1989, NPS conducted emergency pre-oiling baseline reconnaissance surveys of shorelines in Kenai Fjords National Park and Katmai National Park and Preserve (Gleeson 1989a, 1989b). In 1990, NPS archaeologists at the regional office in Anchorage were the major cultural resource contacts for the Exxon Cultural Resource Program. Several of the regional staff assisted Exxon archaeologists conducting intensive survey, inspection, and on-site monitoring in Katmai National Park and Preserve, and on-site monitoring in Kenai Fjords National

[P. Buck 10:21]

Figure 12 View of Prince William Sound from Lone Island, Chugach National Forest

Park. Most NPS full-time and temporary regional staff participated at one time or another in the CTAG process, especially Paul Gleeson, Michele Jesperson, Jeanne Schaaf, and Tim Smith.

US Fish and Wildlife Service

The Fish and Wildlife Service administers four refuges in the project area: Kodiak, Becharof, Alaska Maritime, and Alaska Peninsula (Figures 8 through 10). In addition to the regional office in Anchorage, the Kodiak refuge is administered from an office in Kodiak, the Becharof and Alaska Peninsula refuges are managed from an office in King Salmon, and the Alaska Maritime Wildlife Refuge is managed from an office in Homer.

National wildlife refuges, first established in the 1900s primarily to protect seabird nesting islands, were later expanded in size and number as the public recognized the need to protect more wildlife species. In 1980, under The Alaska National Interest Lands Conservation Act (ANILCA), existing refuges were expanded and nine new ones were added, doubling the size of the National Wildlife Refuge System.

The Kodiak National Wildlife Refuge, established in 1941, consists of 754,740 ha (1,865,000 acres) which include the southern two-thirds of Kodiak Island and 20,000 ha (50,000 acres) on Afognak Island, including Ban Island and the adjacent Foul Bay and Devil's Bay shorelines (Figures 9,14).

[R. Jordan 8:12]

Figure 13 Kinak Bay, Katmai National Park and Preserve

Located on the Alaska Peninsula, Becharof National Wildlife Refuge comprises over 485,623 ha (1,200,000 acres) of low rolling hills, tundra wetlands, volcanic peaks, and Becharof Lake. The refuge extends from Cape Kubugakli to Cape Igvak on the Alaska Peninsula and includes essentially the entire shorelines of Alinchak, Puale, Dry, Jute, and Portage bays (Figure 10).

The Alaska Peninsula National Wildlife Refuge, dominated by the rugged Aleutian Range and containing over 1,416,400 ha (3,500,000 acres) of lakes, rivers, tundra, and rugged coastline, consists of three units termed the Ugashik, Chignik, and Pavlof units. Extending from Cape Igvak to Cape Kunmik, the Ugashik Unit is bounded by the Becharof National Wildlife Refuge to the north and Aniakchak National Monument and Preserve to the south and includes the shorelines of Wide, Imuya, Agripina, Chiginagak, and Yantarni bays (Figure 10). The Chignik Unit extends from Cape Kumliun in the north to a point along the western shoreline of Stepovak Bay and includes the shorelines of Chignik, Castle, Kuiukta, Mitrofania, Anchor, Humpback, Ivanoff, and Stepovak bays. The Pavlof Unit extends from the southern boundary of the Chignik Unit, in Stepovak Bay, to False Pass to the south and includes the northern shoreline of Unga Strait, and Beaver, Pavlof, Canoe, Belkofski, Cold, and Morzhovoi bays.

The Alaska Maritime National Wildlife Refuge consists of over 2,400 islands and 1,800,000 ha (4,500,000 acres) of rugged coastline, islets, spires, and reefs. The refuge includes hundreds of large and small islands scattered throughout the project area. Larger islands within the project area include the Pye and Chiswell Island groups located off the south coast of the Kenai Peninsula, the Barren Islands situated at the entrance to Cook Inlet (Figure 8), and Sutwik Island located off the Alaska Peninsula (Figure 10). The Pye Islands form part of the east shore of Nuka Bay off the south coast of the Kenai Peninsula and include Ragged, Rabbit, and Outer islands. The Chiswell Islands are located at the entrance to Aialik Bay, south/southwest of the community of Seward. The Barren Islands lie isolated at the mouth of Cook Inlet, between the tip of the Kenai Peninsula, Cape Douglas, and the north end of the Kodiak Archipelago and include Ushagat, West and East Amatuli islands, and the smaller Sugarloaf, Sud, and Nord islands (Figures 8, 15). Sutwik Island is a relatively large offshore island located off the coast of Aniakchak National Monument and Preserve between the Ugashik and Chignik units of the Alaska Peninsula National Wildlife Refuge.

In 1990, Chuck Diters, the regional archaeologist for the USFWS, participated in the CTAG review process in Anchorage and functioned as the primary contact for the Exxon Cultural Resource Program. CTAG responsibilities were occasionally delegated by Diters to temporary staff. USFWS archaeologist Curt Wilson provided new USFWS site information to the Cultural Resource Program.

Native Organizations

Native organizations in Alaska consist of traditional tribal governments (chartered under the Indian Reorganization Act), village and regional for-profit corporations formed by the Alaska Native Claims Settlement Act of 1971, and other non-profit and for-profit associations formed under a variety of statutory authorities.

Under ANCSA, 13 regional and more than 200 village corporations were created and given land and cash payments as compensation for relinquishing aboriginal land claims in Alaska. Landownership is relatively complex with the surface estate generally held by the village corporations while title to the subsurface estate is held by the associated regional corporation. Village and especially regional corporations have the responsibility to develop and manage lands conveyed under ANCSA.

Chugach Region

Chugach Alaska Corporation, the regional for-profit Native corporation in the Prince William Sound and Kenai Peninsula areas, administers a 150,000 ha (375,000 acres) ANCSA land settlement on behalf of nearly 2,000 shareholders. Based on documentation provided by the Bureau of Indian Affairs ANCSA office, CAC applied for 270 14(h)(1) selections (historic places and cemetery sites). These small selections, totaling 7,696 ha (19,240 acres), are spread throughout their region. Larger tracts of CAC land in the project area include a parcel on east-central Knight Island and most of Latouche Island. Combined CAC and village corporation entitlements total 370,044 ha (925,110 acres), but all conveyances have not been approved, including many CAC 14(h)(1) selections and the Port Graham and English Bay selections in Kenai Fjords National Park.

Of the five Chugach village corporations, certain lands owned by Chenega, English Bay, and Port Graham were within the project area. Lands owned by Tatitlek and Eyak were not oiled and not surveyed. Shorelines adjacent to certain Chenega Village Corporation land holdings on Chenega, Knight, Latouche, Evans, Flemming, and Bainbridge islands, and the mainland, were treated as a result of the oil spill. Some lands owned by English Bay and Port Graham village corporations on the Kenai Peninsula were also treated.

CAC manages cultural resources on their lands through their corporate office. Although interaction with Chugach area village corporations was

[P. Buck 20:38]

Figure 14 Northwest Afognak Island, Kodiak National Wildlife Refuge

limited, CAC was directly involved in decision-making through their interaction at CTAG meetings. John Johnson, Cultural Resource Manager for CAC, provided helpful input during CTAG and throughout the summer, as did archaeologist Rita Miraglia. CAC archaeologist Lora Johnson assisted the NPS and Exxon archaeologists at SEL-188.

Koniag Region

Regional and village corporations in the Kodiak Archipelago manage their assets on behalf of 3,400 Native shareholders. Koniag, Inc., the regional corporation, has received interim conveyance or patent to 64,000 ha (160,000 acres) of surface and 292,000 ha (730,000 acres) of subsurface estate on Kodiak Island. Of the subsurface estate, 265,600 ha (664,000 acres) are under village surface land selections, 27,700 ha (68,000 acres) of which are on the Alaska Peninsula (Koniag, Inc. 1989). In 1980, Koniag, Inc. exchanged its surface holdings on the Alaska Peninsula for an ownership interest in a partnership with several Kodiak area village corporations. In 1989, this partnership, referred to as the Afognak Joint Venture, received 101,200 ha (253,000 acres) of surface estate on Afognak Island from the federal government for timber development.

The nine ANCSA village corporations in the Kodiak Archipelago have undergone realignment over the years. Old Harbor Native Corporation

[P. Bowers 10:25]

Figure 15 Ushagat Island, Alaska Maritime National Wildlife Refuge

(Old Harbor), Ouzinkie Native Corporation (Ouzinkie), and Leisnoi, Inc. (Woody Island) have remained unchanged while Natives of Akhiok, Inc. (Akhiok) and Kaguyak, Inc. (Kaguyak) have merged to create Akhiok-Kaguyak, Inc.; Natives of Afognak, Inc. (Afognak) and Port Lions Native Corporation (Port Lions) have merged to form Afognak Native Corporation, Inc.; and Karluk Native Corporation (Karluk) and Nu-Nachk Pit, Inc. (Larsen Bay) have merged with Koniag, Inc., the regional corporation in the area. All current village corporations have land holdings in the region. Historically, local village economies focused on commercial fishing but village corporations have become increasingly involved with timber development.

Koniag, Inc. delegated responsibility for the protection and preservation of archaeological sites on their lands to the Kodiak Area Native Association (KANA). KANA, formed in 1966 as a non-profit corporation by Koniag Natives, is responsible for implementing and administering programs in health, education, social services, economic development, and cultural preservation. Over the years, KANA has developed a number of programs in the areas of oral history, archival research, archaeology, and the Alutiiq language. A major goal is the construction and operation of a modern museum and cultural center in Kodiak to curate objects and data pertinent to Koniag history and culture. KANA personnel were unable to participate in CTAG because of the travel involved; however, KANA archaeologist Rick Knecht was kept abreast of developments as fieldwork in the Kodiak area progressed.

Other Native Regions

Interaction with regional and village corporations outside the Chugach and Koniag areas in 1990 was limited to the distribution of the 1989 report to those corporations consulted in the Memorandum of Agreement.

Summary

Through CTAG review and consultation, all permitting agencies and Native organizations were directly involved in decision-making associated with the protection of archaeological sites within areas of planned treatment. Cultural resource investigations were conducted under 10 ARPA and Special Use archaeological permits and a general State of Alaska Land Use permit. Of the 10 archaeological permits issued to the Cultural Resource Program, one was issued by the State Office of History and Archaeology/State Historic Preservation Office, one by the Forest Service, three by the Fish and Wildlife Service, and five by the National Park Service. Staff of the four permitting agencies, BIA, and CAC were all directly involved in the CTAG process.

Section 106 Process of the National Historic Preservation Act

The oil spill cleanup constituted an "undertaking" as defined in 36 CFR 800 because it potentially affected cultural resources on federal land. An undertaking is defined in 36 CFR Part 800:

> *Undertaking* means any project, activity, or program that can result in changes in the character or use of historic properties, if any such historic properties are located in the area of potential effects. The project, activity, or program must be under the direct or indirect jurisdiction of a Federal agency or licensed or assisted by a Federal agency. Undertakings include new and continuing projects, activities, or programs and any of their elements not previously considered under Section 106.

In addition, the cleanup was authorized and assisted by federal agencies and involved federal permits. Review and consultation with agency archaeologists and the SHPO helped insure compliance with state and federal cultural resource laws. Section 106 of the National Historic Preservation Act of 1966, as amended, states:

> The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any funds on the undertaking or prior to the issuance of any license . . . take into

> account the effect of the undertaking on any district, site, building, structure, or object that is included in the National Register . . . the head of any such federal agency shall afford the Advisory Council on Historic Preservation . . . a reasonable opportunity to comment with regard to such undertaking.

Generally, the Coast Guard was responsible for ensuring that Exxon complied with federal law, but the Forest Service was designated lead agency for cultural resources. Other involved federal agencies in addition to those managing lands included the BIA, National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency (EPA). CAC and KANA, the two Native organizations, were involved as interested parties, along with a number of for-profit Native village corporations and non-profit Native organizations.

The Section 106 review process was implemented according to regulations in 36 CFR Part 800. This formalized a consultation process which allowed all interested parties opportunity to comment on the effect a federal undertaking might have on an historic property. The steps identified in the 36 CFR Part 800 regulations (inventory, determination of effect, and mitigation) were followed. One procedural modification in the inventory process occurred in 1989 when the Advisory Council declared that all historic properties would be treated as if they were eligible for listing on the National Register of Historic Places.

The process of deciding whether an undertaking will affect an historic property eligible to the National Register (determination of effect) is made jointly by the land-managing agency and the SHPO in consultation with interested parties. If the effect is determined to be adverse, then mitigation is recommended to minimize or avoid the adverse effect. The Section 106 consultation process is handled routinely by the SHPO, with an opportunity to comment by the Advisory Council, and often involves an MOA that identifies specific steps and considerations tailored to particular undertakings.

In 1989, the inventory, determination of effect, and mitigation steps were collapsed into a very narrow time-frame due to the emergency nature of the undertaking. The consultation process was conducted expeditiously to allow shoreline treatment to proceed quickly. The MOA, usually signed and in place prior to the undertaking, was developed in draft form after treatment was initiated and was signed in May 1990.

In 1990, the Section 106 review process was handled through implementation of the CTAG process. All state and federal agencies, Native organizations, and other interested parties were provided the opportunity to review existing site documentation, to determine the effect of proposed treatment on known cultural resources, and to comment on proposed constraints to specific shoreline treatment plans on a case-by-case basis. The SHPO formally signed-off on all work orders only after consensus had been achieved during CTAG meetings.

Permit Structure

Exxon Company, USA created and funded the Cultural Resource Program to protect cultural resources as shoreline segments and subdivisions were being treated in 1989 and 1990. The program facilitated Exxon's compliance with state and federal law during shoreline treatment. The permits which were issued to the program provided access to public lands to conduct archaeological surveys, site update tasks, and site inspection and monitoring tasks (Table 1).

Four of the National Park Service permits relate to archaeological activity within the boundaries of Katmai National Park and Preserve and Kenai Fjords National Park. The fifth permit (ARPA Permit 90-KENAI FJORDS-ARO-001) relates specifically to archaeological work at SEL-188. One of the two special use permits issued by the Fish and Wildlife Service (Permit 47921) covers archaeological investigations in the Kodiak, Becharof, and Alaska Peninsula National Wildlife refuges. The second Special Use Permit (50866) covers work only in the Alaska Maritime National Wildlife Refuge. The special use permits issued by the State of Alaska and the Forest Service cover archaeological work on all lands within the project area managed by these agencies.

State of Alaska Permits

The State of Alaska issued two permits in 1990 which apply to the Exxon Cultural Resource Program. DNR Land Use Permit SCR 90-005 was issued to Exxon Company, USA for the overall 1990 shoreline treatment program, and Archaeology Permit 90-2 covered archaeological investigations on state owned or managed lands.

DNR Land Use Permit

The DNR Land Use Permit (SCR-005) was originally issued to Exxon Company, USA on April 4, 1989. An extension was made on October 31, 1989 which validated the permit until December 31, 1990. Permit SCV-005 encompassed all shoreline cleanup operations and the activities of the 1989/1990 winter program on state-owned tide and submerged lands. Among the 17 stipulations appended as Attachment A to the permit, special stipulations nine and 10 refer directly to the Exxon Cultural Resource Program:

9: All site specific shoreline cleanup work plans shall incorporate the timely recommendations of the State Historic Preservation Officer.

10: If, in connection with any of the operations authorized under this permit, EXXON, its officers, agents, employees, contractors, subcontractors or their personnel encounter any previously undiscovered paleontological, archaeological or historical sites or artifacts, field operations shall be suspended on that portion of the project area, and the Director of EXXON's Cultural Resource Program shall be immediately notified and the State Historic Preservation Officer notified within 24 hours.

These stipulations, along with stipulation seven which requires Exxon to comply with all applicable federal, state and local laws and regulations affecting shoreline cleanup operations, tie this permit to the 10 archaeological permits held by the Exxon Cultural Resource Program in 1990.

DNR Field Archaeology Permit

The purpose of the State of Alaska Field Archaeology Permit (90-2) is to:

> . . . preserve information integrity of cultural resources that may be impacted by the EXXON

Table 1 1990 Exxon Cultural Resource Program Permits

	Start Date	Expiration Date
State of Alaska Field Archaeology Permit 90-2	4-12-90	04-12-91
USDA-FS Special Use Permit 4118.01 (Amend. 1)	6-12-89	06-30-91
USDI-NPS ARPA Permit 89-KATMAI-ARO-003	6-18-90	06-04-91
USDI-NPS Special Use Permit ARO-KATM-9500-012	4-15-90	09-30-90
USDI-NPS ARPA Permit 89-KENAI FJORDS-ARO-001	6-15-90	06-04-91
USDI-NPS Special Use Permit ARO-9845-9500-008	6-08-89	06-04-91
USDI-NPS ARPA Permit 90-KENAI FJORDS-ARO-001	7-30-90	06-04-91
USDI-FWS ARPA Permit R7(MAR)90-1	3-29-90	12-31-90
USDI-FWS Special Use Permit 47921 (Kodiak)	5-10-90	12-31-90
USDI-FWS Special Use Permit 50866 (Alaska Maritime)	6-01-90	12-31-90

VALDEZ oil spill cleanup. Reconnaissance survey and limited testing to be done on intertidal lands and state-owned uplands.

Although not stated on the 1990 permit, intensive survey was specified in the 1990 Work Plan, reviewed by CTAG, and conducted as part of the shoreline protection program. Additional 1989 permit stipulations were assumed to apply in 1990. One stipulation which specified January 15 as the submission date for the final report was altered to April 1 in both 1989 and 1990. The remaining stipulations concerned the applicability of the Secretary of the Interior's Standards and Guidelines to the final report, qualifications for project supervisors and field personnel, and the transmittal of project data to the Museum at the University of Alaska Fairbanks. The provisions pertaining to cultural resources in the DNR Land Use Permit (SCV-004, and SCV-005) were included by reference and were adhered to in both 1989 and 1990. An agreement is being negotiated with the University of Alaska Fairbanks (UAF) Museum for long-term curation of all artifacts, objects, samples, and pertinent documentation. A separate agreement with the UAF Archives (Rasmuson Library) for storage of all original program documentation has been approved and signed.

USDA Forest Service Permit

The Forest Service issued Special Use Permit (4118.01) on June 12, 1989 to minimize disturbance to cultural resources located on Chugach National Forest lands during the 1989 shoreline treatment program. Amendment 1 to the 1989 permit was added on April 4, 1990. The amendment extended the permit until June 30, 1991, and included the following archaeological stipulations:

1: A draft final report is to be submitted no later than April 1 of the year following fieldwork. This report will be reviewed within 30 days and a final report is to be submitted no later than June 30 of the same year.

2: Subsurface test units shall not exceed one square meter nor be less than 50 cm square and, if cultural material is encountered, all four walls are to be drawn and photographed.

3: Artifacts recovered from Forest Service lands are to be cleaned and catalogued using the Forest Service system; if recovered from ANCSA 14(h)(1) selected lands, they are to be held in trust; and an artifact inventory is to be appended to the report.

4: Human remains, if intentionally buried, are to be documented by scale drawings and B/W photographs and left in place with all associated cultural material.

The report review and production schedule outlined in the USDAFS permit was adopted for the project. All permitting agencies agreed that the production of one interim and one final report would satisfy the reporting requirements on all permits issued to Exxon's Cultural Resource Program. The sole exception was the SEL-188 report which described archaeological protection and oil spill treatment in a subdivision within Kenai Fjords National Park (Betts *et al.* 1991).

National Park Service Permits

The Cultural Resource Program applied to NPS for two ARPA and two special use permits for 1990 project activities within national parks. ARPA permits were issued by the Alaska Regional Office for Katmai National Park and Preserve (89-KATMAI-ARO-003) and for Kenai Fjords National Park and Preserve (89KENAI FJORDS-ARO-001). The Alaska Regional office issued a third unsolicited ARPA permit for treatment monitoring activities at SEL-188 in Kenai Fjords National Park. Special use permits for archaeological investigations within their respective parks were issued by each of the park superintendents: ARO-KATM-9500-012 for Katmai National Park and Preserve, and ARO-9845-9500-008 for Kenai Fjords National Park and Preserve.

Katmai National Park and Preserve

The ARPA permit issued in 1990 for Katmai National Park and Preserve (89-KATMAI-ARO-003) was a renewal of the 1989 permit issued on June 8, 1989. The original permit was extended to June 4, 1991 and covers "archaeological survey, monitoring, and limited mitigative treatment in response to oil cleanup and oil spill related activities" within the park. The permit extension contains several new stipulations not covered in the original permit. The new stipulations include increased scope and quality of site and artifact documentation procedures; treatment of burials and cemeteries; increased consultation and discussion with appropriate Native groups; and preparation of a brief, popular brochure on the program designed to inform Native groups about the nature of shoreline investigations.

The Special Use Permit (ARO-KATM-9500-012) issued by the superintendent of the Katmai National Park and Preserve for the period April 15 to September 30, 1990 is essentially the same as the 1989 Special Use Permit issued for Katmai. Both permits covered archaeological investigations required in Aniakchak National Monument and Preserve. The purpose of this permit is to determine " . . . potential adverse effects of cleanup activities on archaeological sites . . . " and includes " . . . subsurface testing (shovel probes) of archaeological sites . . . "

Kenai Fjords National Park and Preserve

The ARPA permit issued for Kenai Fjords National Park and Preserve (89-KENAI FJORDS-ARO-001) in 1990 renewed the 1989 permit issued on May 30, 1989. The permit was extended to June 4, 1991 and covers "archaeological mitigative treatment/monitoring in response to oil cleanup and oil spill related activities" within the park. This permit extension contains several new stipulations which require increased scope and quality of site and artifact documentation. Other new stipulations which require specific treatment of burials and cemeteries and increased consultation with Native parties refer specifically to the concerns of Chugach Alaska Corporation and associated village corporations. The preparation of a popular brochure, required under the Katmai ARPA permit, is not required in the ARPA permit for Kenai Fjords National Park and Preserve.

The Special Use Permit (ARO-9845-9500-008) issued by the Kenai Fjords National Park and Preserve superintendent is an extension of the special use permit issued in 1989. This permit was extended to June 4, 1991 to coincide with the expiration date of the ARPA permit for the park. The permit allowed:

> . . . subsurface shovel probe testing of suspected archaeological sites for the presence of artifacts or other evidence of historic human habitation. Testing to be done to determine if sites may be adversely impacted by cleanup activities related to the Exxon Valdez oil spill.

The permit applied to the investigation of Kenai Fjords National Park and Preserve shorelines.

A third ARPA permit (90-KENAI FJORDS-ARO-001) was issued by the Alaska Regional Office for the period between July 30, 1990 and June 4, 1991 for anticipated treatment monitoring at SEL-188 in Kenai Fjords National Park and Preserve. This permit authorizes "archaeological mitigative/monitoring in response to oil cleanup and oil spill related activities" at "(a beach) within Kenai Fjords National Park." This unsolicited permit did not directly apply to Exxon Cultural Resource Program activities since program endeavors were restricted to the intertidal zone. A full report has been prepared on the site protection and treatment activities at SEL-188 (Betts *et al.* 1991).

Archaeological investigations in Katmai National Park and Preserve and Kenai Fjords National Park and Preserve in 1990 have been briefly summarized in the Investigator's Annual Report to each park as required.

US Fish and Wildlife Service Permits

The USFWS issued one ARPA and two special use permits to the Exxon Cultural Resource Program for archaeological investigations associated with the 1990 shoreline treatment program. The ARPA permit (R7[MAR]90-1) was effective from

March 29 to December 31, 1990, and was issued by the Regional Office for:

> ... survey, and limited testing/limited collection on lands managed by the USFWS as parts of the Alaska Maritime, Alaska Peninsula, Becharof, and Kodiak National Wildlife Refuges which have been, or may become affected by treatment activities related to the EXXON VALDEZ oil spill.

The 1990 ARPA permit was essentially identical to the one issued in 1989 for similar work. Both permits specified that the archaeological work was "limited to survey investigations, limited surface collection and testing for site evaluative purposes only. Extensive testing and/or emergency excavation may not be undertaken under this permit."

In 1989, one special use permit was issued for archaeological investigations in the four refuges within the project area. Two special use permits were issued in 1990: one permit (47921) for work in the Alaska Peninsula, Becharof, and Kodiak refuges and a second one (50866) for work in the Alaska Maritime National Wildlife Refuge. The two 1990 special use permits are identical except that the offshore islands are not included in the permit for the Alaska Peninsula, Becharof, and Kodiak National Wildlife refuges. Both permits state that their purpose is to allow archaeological resource surveys on USFWS lands, and the Alaska Maritime permit refers to the 1990 USFWS ARPA permit.

This compliance report fulfills the reporting requirements of the program's nine solicited permits.

The Cultural Technical Advisory Group (CTAG)

CTAG was perhaps the most important administrative development of the 1990 program. This review process was initially proposed by Dr. Robert Shaw, Deputy SHPO, in a meeting on March 23, 1990 as a forum for consultation with landowners and interested parties as required under the terms of Section 106 of the National Historic Preservation Act and subsequent regulations. CTAG provided a vehicle whereby Exxon's specific treatment plans and the proposed archaeological constraints were reviewed and discussed by agency archaeologists and other interested parties.

It was initially proposed that the group be composed of representatives from the Coast Guard, Forest Service, State Historic Preservation Office, and Exxon. Participation was extended to Chugach Alaska Corporation, Kodiak Area Native Association, National Park Service, Fish and Wildlife Service, and the Bureau of Indian Affairs. Essentially all landowning agencies and Native organizations with cultural resource protection interests in the project area were represented. Exxon was represented by both Exxon management and one of the co-directors of the Cultural Resource Program. CTAG met for two to three hours almost daily throughout April and May and at least weekly from June to mid-July, 1990.

The 1990 shoreline treatment program was reviewed by both TAG and CTAG. TAG was responsible for determining the type of treatment employed in each subdivision, and CTAG was responsible for determining the appropriate archaeological constraints. The two groups functioned independently.

CTAG Data Review and Constraint Approval

CTAG was formed to review specific archaeological constraints recommended by Exxon to protect known cultural resources within each of the 1,035 subdivisions considered for treatment in 1990. Only the 587 subdivisions slated for treatment were formally reviewed by CTAG. Constraints for all 1,035 subdivisions were signed-off by the SHPO prior to being forwarded to the FOSC for review and signature.

The archaeological constraint formulation process began when the multi-agency Spring Shoreline Assessment Teams (SSAT) gathered oiling data on Prince William Sound and the Gulf of Alaska shorelines in March, 1990. Project area shorelines which had been divided into discrete units (segments) in

1989 were further divided into subdivisions in 1990. Oiling and biological data, maps, and agency comments including the specific methods, techniques, and manpower required to treat oiled subdivisions were faxed daily to the SCAT offices in Anchorage where they were compiled into packets and reviewed by the Exxon Technical Group comprised of engineers, geologists, biologists, and archaeologists.

The Cultural Resource Program co-director reviewed each subdivision packet, evaluated the recommended treatment in light of the cultural resource data from the subdivision, and then recommended an archaeological constraint to CTAG. All known cultural resource data, including information gathered during the 1989 program, were considered during the review process. The type and intensity of treatment and the corresponding recommended archaeological constraint were presented to TAG and CTAG simultaneously.

CTAG reviewed each segment data packet containing 1990 SSAT data and 1989 archaeological data. The packets' data summary sheets listed the following segment information crucial to making a constraint determination: length; landowner; AHRS site(s) number, type, and aspect (intertidal or upland zone); features; 1989 SCAT archaeologist; and time spent investigating the segment in 1989. Treatment information including 1990 treatment plans and intensity, 1989 treatment history, and 1989 constraint information were also included. These data had been abstracted and entered into the cultural resource data base. Administrative fields which tracked paper flow between CTAG, SHPO, and Exxon and between the Anchorage office and the field archaeologists were also included.

Batches of packets ranging in number from several to 25 or more were distributed to CTAG representatives 48 hours before formal review. Each agency or Native organization representative that received the packets signed a transmittal list that accompanied each packet. The packets were generally distributed at the end of one CTAG meeting and scheduled for review at the CTAG meeting 48 hours later. Separate addenda and anadromous fish stream packets were also compiled and distributed for review. These smaller packets were often reviewed by the agencies and Native organizations in a 24-hour period rather than the usual 48 hours.

CTAG met daily for most of the review period and evaluated the subdivision packet that had been distributed two days earlier and any addenda and anadromous fish stream packets that normally were distributed at the previous meeting. Each subdivision, addendum, and anadromous fish stream packet was individually reviewed at the CTAG meeting, co-chaired by the Exxon Cultural Resource Program co-director and an Exxon management representative.

As each package was reviewed, the Exxon Cultural Resource Program co-director summarized the cultural resource aspects of the subdivision including the past activity in the subdivision, the intensity of planned 1990 treatment, and the proposed archaeological constraint. Agency and Native organization representatives either accepted, questioned, or rejected the proposed archaeological constraint.

If the representatives accepted the proposed constraint, CTAG moved on to the next packet. If the constraint was questioned, usually in the form of a request for more information or clarification, the issue was discussed. All concerns raised throughout the process were handled in this manner to the satisfaction of all representatives. If a proposed constraint was rejected by CTAG, a new constraint was established through discussion and the change was made on appropriate forms.

Any changes to the constraints proposed by Exxon were recorded on the packet contents cover sheet. At the end of the packet review, the packet content sheet was circulated among all representatives for signature. The SHPO representative initialed all constraint entries while the various upland land manager representatives initialed constraints pertinent to their land holdings. The CTAG-approved constraint was entered on the shoreline evaluation form of the work plan, signed by members of the TAG, and then reviewed, signed, and dated by the SHPO before being sent to the

FOSC for final approval (Figure 16). The work plan was then sent to the FOSC for final approval after a 48-hour review by the upland land manager. The work plan was returned to Exxon for implementation after the FOSC signature effectively made the work plan a work order.

Exxon supervisors and state and Coast Guard monitors used work orders to direct the type, intensity, and location of oil spill treatment. The work orders also included bold-print archaeological and biological constraints. Exxon Cultural Resource Program staff met with Exxon treatment supervisors prior to and during the initial phase of the shoreline treatment program to ensure adherence to archaeological constraints. They reviewed the types of constraints that would appear on work orders, explained the rationale behind the specific constraints, and identified field procedures. The Cultural Resource Program office staff and field archaeologists worked closely with Exxon treatment crew supervisors throughout the summer of 1990 and ensured compliance with the cultural resource constraints approved by CTAG.

Archaeological Constraints

Five archaeological constraints were used in Exxon's 1990 shoreline treatment program: Deferred, Holding, Standard, Inspection, and Monitor (Table 2). The standardized archaeological constraints developed for the 1990 program were designed to simplify the review process, transfer some aspects of the decision-making process to the field archaeologist, and provide clear direction to Exxon treatment crew supervisors and monitors in the field when planning to treat a particular subdivision. The constraints and their role and implementation in the site protection program are described below.

Deferred Constraint

A **Deferred Constraint** was applied to all subdivisions where no treatment was planned in 1990. Although CTAG did not formally review these subdivisions, the SHPO signed a deferred constraint which indicated that if treatment was planned in the future, the cultural resource status of the subdivision would need evaluation by CTAG prior to any treatment. Deferred constraints intentionally made no reference to the presence or absence of cultural resources in the subdivision. If this constraint was printed on a subdivision work order, the Exxon field supervisor was not authorized to proceed with any treatment in the subdivision.

Holding Constraint

A **Holding Constraint** was applied to all subdivisions in which archaeological survey was required prior to determining the constraint for the subdivision. This constraint temporarily applied in 106 subdivisions in which CTAG was lacking sufficient data to determine the effect of proposed 1990 treatment. These subdivisions were temporarily off limits for treatment until the appropriate constraint could be determined. The SHPO decided whether or not data were adequate based on the degree of confidence which Exxon and the CTAG representatives had in the extant data, the sensitivity of known cultural resources, and the type and intensity of 1990 planned treatment in the subdivision. Intensive archaeological surveys were initiated in these 106 subdivisions to collect the archaeological data necessary for making determinations of effect.

Survey results were communicated to the Exxon office in Anchorage, usually within three days of SHPO's decision that survey was necessary. The Cultural Resource Program co-director reviewed the survey results and recommended either a **Standard, Inspection, or Monitor Constraint**. The survey results and the recommended constraint were reviewed by CTAG prior to the application of a formal constraint.

Standard Constraint

A **Standard Constraint** applied to subdivisions in which it was determined that planned treatment would not adversely impact cultural resources. The Exxon supervisor could treat any subdivisions having this constraint without consulting an Exxon archaeologist. This constraint generally applied to subdivisions which had been surveyed either at the reconnaissance level in 1989 or at the intensive level in 1990. Standard constraints contained the caveat that any previously undiscovered cultural resources should be reported to Exxon's Cultural Resource Program by the Exxon supervisor. Procedures for dealing with any previously unknown cultural resources detected during shoreline treatment were written into the constraint.

Consultation and Inspection Constraint

The **Consultation and Inspection Constraint** required the Exxon archaeologist to discuss the subdivision's cultural sensitivity with the Exxon field supervisor and agency monitors prior to treatment. This constraint was written on work orders in subdivisions where unconstrained treatment might adversely impact known cultural resources such as intertidal lithic scatters and visible sites adjacent to treatment areas.

If an Exxon archaeologist determined after consultation and inspection that cultural resources would likely be impacted by the planned treatment, the constraint could be upgraded to a monitor constraint. In this case, the field archaeologist would remain with the treatment crew as an on-site monitor. Conversely, the archaeologist could release the subdivision for treatment after an on-site inspection if it was determined that cultural resources would not be adversely impacted by the planned treatment. The inspection constraint also applied to scientific sampling and assessment activities, and archaeologists conducted inspections related to these activities. A summary of Exxon Cultural Resource Program consultation and inspection activities is presented in Appendices C and D.

The scope of work was an integral part of the consultation and inspection constraint and outlined the archaeologist's specific field tasks. It was written by the Exxon Cultural Resource Program co-director, agreed upon at CTAG, and printed on the inspection recording form which the archaeologist was required to complete. The following scope of work directed the field archaeologist to conduct a number of important tasks:

Consult with Exxon supervisor concerning uplands access restriction; inspect beach face of SEW-440 and direct treatment around cultural materials; if time permits, investigate and document midden site.

Most scopes of work required the archaeologist to determine the actual treatment intensity and to gauge potential impact to known cultural resources in the subdivision. Inspection intensity was determined after the archaeologist had become familiar with the location and nature of cultural resources, and after discussing the planned treatment with the Exxon supervisor.

In many cases, an oil geologist, Alaska Department of Environmental Conservation (ADEC) monitor, Coast Guard monitor, and a land manager representative were present during these discussions. The consultation process enabled the Exxon archaeologist to address site sensitivity and protection issues in the presence of agency monitors and other representatives present in the area of planned treatment.

CTAG recognized that professional judgement would be required in the field if Exxon archaeologists were to effectively protect cultural resources during treatment. Consequently, archaeologists were given the flexibility to either increase or decrease the level or intensity of inspection performed at any one location. For example, if the treatment area and the site were geographically separate, a verbal consultation with the treatment supervisor was sufficient to fulfill the requirements of the constraint. Consultation with the Exxon supervisor, in this case, would emphasize the importance of the cultural resources present and the need to adhere to and enforce Exxon's strict "no uplands access" policy.

While this approach worked well to protect cultural resources located in the uplands, it was not appropriate for sites located adjacent to or within the treatment area - particularly intertidal sites. Under these conditions, the field archaeologist would inspect the treatment area with the Exxon supervisor and assist in directing the treatment activity away from culturally sensitive areas.

SHORELINE EVALUATION

SEGMENT ST/ BA-04 SUBDIVISION A (1 OF 1) DATE 3/31/90

SEGMENT ENVIRONMENTAL SENSITIVITIES AND TIME CONSTRAINTS:

Possible active Bald Eagle nest (5T) - 3/1 to 6/1; Purse seine hook off (1K) - 7/20 to 9/30.

SUBDIVISION ECOLOGICAL CONSTRAINTS: No specific subdivision constraints although should treatment be required, restrict substrate disturbance to a minimum.

ARCHAEOLOGICAL CONSTRAINTS: If treatment is planned, a cultural resource evaluation is required prior to shoreline treatment.

SHPO SIGNATURE: Charles E. Holmes DATE: April 6, 1990

OILING CATEGORIZATION:

Wide 0 m: Medium 0 m: Narrow 0 m: V.Light 228m: No Oil 2076m

Subsurface Oil Observed: Yes ____ No X Maximum Depth ____

RECOMMENDATIONS:

X No Treatment Recommended

____ Treatment Recommended

____ Manual Pickup

____ Bioremediation

____ Tarmat: ____ Breakup

____ Removal

____ Snare/Absorbent Booms

____ Oil Snares (pom poms)

____ Absorbents (pads, rolls, etc)

____ Spot Washing: ____ Wands

____ Beach Cleaner

____ Other (see comments)

COMMENTS: No treatment recommended on BA-4 (A) due to only very light, sporadic oiling being observed. Please review Field Shoreline Comment Sheet.

TAG COMMENTS: ____

TAG APPROVAL DATE: 4-6-90

ADEC JOHN BAUER [signature]

EXXON ANDY TEAL [signature]

NOAA Burl Wescott [signature]

USCG G.A. REITER G.A. Reiter

FOSC: [signature] DATE: 4-19-90

Figure 16 **Completed 1990 Shoreline Evaluation Form**

Table 2 1990 Exxon Cultural Resource Program Archaeological Constraints

Deferred	If treatment is planned, *a cultural resource evaluation is required prior to shoreline treatment.*
Holding	Cultural resource survey in progress. *Shoreline treatment cannot proceed* until field data have been assessed and a formal archaeological constraint entered on the shoreline evaluation form.
Standard	If cultural resources are uncovered during shoreline treatment, stop work in the vicinity, mark the location of the find and *contact Exxon's Cultural Resource Program immediately.*
Inspection	Consultation and inspection with an *Exxon archaeologist is required prior to treatment.* Specific on-site monitoring requirements will be determined at that time.
Monitor	*An Exxon archaeological monitor is required on-site during shoreline treatment.*

The "consultation" aspect of the constraint enabled field archaeologists to exercise professional judgement regarding future treatment events in the subdivision after the initial on-site inspection. If future treatment would not adversely impact cultural resources, the field archaeologist could invoke the "consultation" aspect of the constraint. Consultation required the Exxon field archaeologist and Exxon supervisor to communicate either by phone or in person to ensure that the supervisor was aware of the reason for the constraint, and to confirm that the treatment planned for the subdivision would not impact any cultural resources.

The flexibility built into the consultation and inspection constraint allowed it to be effective and enabled the productive use of field personnel and resources. Close cooperation between Exxon supervisors and field archaeologists ensured that cultural resource constraints were adhered to, almost without exception, throughout four and a half months of shoreline treatment.

Inspection Constraint Revisions

Subdivision treatment plans occasionally were revised throughout the summer. As a result, archaeological constraints were reviewed and occasionally revised depending on the magnitude of the revision to the work plan. As treatment activity intensified, the level of inspection also tended to intensify. Archaeological constraints were upgraded if cultural resources were discovered in the intertidal zone or if treatment method changed from manual to mechanical, as in the case of storm berm relocations. Constraints also were downgraded but only after the field investigation indicated the higher constraint was unwarranted.

For example, two locations recorded as archaeological sites during reconnaissance-level surveys in 1989 were determined to be non-cultural after closer examination in 1990. Both segments' constraints were downgraded as a result. CTAG occasionally assigned an inspection constraint on the assumption that site potential was high in a subdivision. The constraint was downgraded after the initial inspection failed to identify cultural resources in the subdivision.

Storm berm relocations were a major focus of archaeological inspections. Storm berm relocation is a treatment technique that involves mechanized excavation and redeposition of oiled storm berm gravels from the upper to the mid or lower intertidal zones. CTAG determined that all storm berm relocation areas had to be inspected by an Exxon field archaeologist prior to treatment due to the intrusive nature of the activity. In a region where dynamic geotectonic processes are the rule rather than the exception, any major subsurface disturbance warranted investigation. When original subdivision treatment plans were amended during the summer to include storm berm relocation, the archaeological constraints for those subdivisions were upgraded to inspection constraints. The consultation and inspection constraint provided the necessary flexibility for CTAG to make initial non-field constraint determinations and for the field archaeologists to make adjustments on the basis of their field evaluations.

Other Inspection Activities

Treatment-related sediment and biological sampling locations selected by various Exxon groups also were reviewed and inspected by Exxon field archaeologists (Appendix D). The CTAG-approved constraints for the shoreline treatment program were followed when sampling was conducted in subdivisions scheduled for treatment. If the sampling location occurred in subdivisions not scheduled for treatment, and, therefore, never reviewed by CTAG, inspection by an Exxon archaeologist was required prior to sampling. These activities occasionally occurred in areas that were not subject to SCAT survey in 1989, and an inspection constraint was imposed. Inspection of these locations was consistent with the directive written into the deferred constraint, and with the intent of the CTAG review process.

On-site Monitoring Constraint

The **On-site Monitoring Constraint** provided the highest degree of protection for cultural resources present in a subdivision by requiring the physical presence of an archaeologist on site during treatment. The monitoring constraint was applied to work orders which called for treatment in subdivisions containing highly visible and/or sensitive cultural resources such as rockshelter burials in or immediately adjacent to treatment subdivisions and artifact concentrations located in the intertidal zone. The monitoring constraint stated that treatment could not proceed without an Exxon archaeologist present. CTAG determined that 31 subdivisions required an Exxon archaeological monitor to be present during treatment. On-site monitoring also was conducted in several other subdivisions as treatment plans were modified during the summer. Monitoring of biological sampling locations was conducted in subdivisions where an archaeological monitor was required by CTAG. A summary of monitoring activities is presented in Appendices E and F.

Each on-site monitoring scope of work was very specific and allowed for little interpretation on the part of the field archaeologist. For example, the following scope of work was written for planned treatment in a subdivision containing a sensitive archaeological site:

> *Assure that no unauthorized access to site takes place. Do not alert crews to site's location. Any approach to the site should be made overland. Document condition of the site.*

Except for two incidents which occurred early in the field season (see Chapter 5), Exxon archaeological monitors were on site during the treatment of all subdivisions with on-site monitoring constraints.

Monitoring Constraint Revisions

Subdivision constraints were occasionally upgraded to on-site monitoring constraints after initial field inspection assessments were completed by Exxon archaeologists. Constraint upgrading occurred in situations where archaeological sensitivity was greater than was indicated by the documentation available at the time of CTAG review, usually the result of a field investigation by Exxon archaeologists. Field investigations sometimes revealed new and extremely sensitive resources, such as burials or rock art sites which were unknown at the time CTAG reviewed the subdivision. When this occurred, the subdivision's archaeological constraint was upgraded to an on-site monitoring constraint to fully protect the newly discovered cultural resource.

In one instance, an intertidal artifact scatter site, initially reported to be outside the treatment subdivision boundary, was encountered just inside the boundary of the subdivision scheduled for treatment. The treatment crew recognized artifacts in the intertidal zone and followed the directive written into the standard constraint by immediately stopping work, flagging off the sensitive area, and notifying Exxon's Cultural Resource Program. An Exxon archaeologist joined the treatment crew the following day as an on-site monitor, and treatment proceeded. The subdivision's archaeological constraint was upgraded from a standard constraint to an on-site monitoring constraint, and all future treatment was conducted under an archaeologist's supervision.

Changes to original approved work orders occasionally were requested from the field by an Exxon supervisor after field consultation with the ADEC and Coast Guard monitors and a land manager representative (if present). Such changes were formally requested as work plan addenda and were reviewed by TAG and CTAG.

Other Monitoring Activities

Treatment-related geological and biological sampling locations by various Exxon groups also were reviewed and monitored (Appendix F). CTAG-approved constraints for the shoreline treatment program applied to these activities and were followed. If sampling locations were in subdivisions not scheduled for treatment in 1990 or not surveyed in 1989, and, therefore, never reviewed by CTAG, an archaeological assessment of the location was required prior to sampling. The assessment occasionally resulted in the recommendation of archaeological monitoring of sampling activities which were conducted in archaeologically sensitive areas.

Summary

This chapter presented information pertinent to understanding the administrative structure of the Exxon Cultural Resource Program and the compliance process. The discussion on current land management introduced the principal land managers and owners and the major land holdings they manage within the project area. A detailed discussion of the cumulative results of the 1989 and 1990 Cultural Resource Program activities on these lands is presented in Chapter 6.

The description of the Section 106 process of the National Historic Preservation Act outlined the laws and regulations designed to protect cultural resources and provides the framework within which the permitting system operates. The permitting structure section identified the types of permits held by the program and the stipulations which delineated access to and the conduct of archaeological investigations on state and federal lands.

The constraint formulation and review process developed and implemented in 1990 was the mechanism whereby the Section 106 consultation process was formalized among the permitting and land managing agencies. CTAG was perhaps the most significant administrative development of the 1990 program because it brought together members of agencies and Native organizations with different cultural resource mandates and disparate land holdings. The CTAG process allowed the state and federal agencies and Native organizations to actively participate in decisions which directly affected the protection of cultural resources in their areas during 1990 shoreline treatment. The environmental context, cultural background, and historical significance of these resources are described in the following three chapters.

CHAPTER 3

ENVIRONMENTAL SETTING*

The Gulf of Alaska coast is a dramatic landscape where towering mountains and glacial ice meet the sea (Figure 17). The terrain forms the northeastern boundary of the Pacific Rim, part of the tectonically active margin sometimes referred to as the "Ring of Fire." The forces that produced this breathtaking northern landscape pushed immense mountains into the sky, shaped the land with sea and ice, shook the earth with massive earthquakes, and rent the sky with volcanic explosions.

The dynamic nature of Gulf of Alaska landscapes affected aboriginal societies just as earthquakes, tidal waves, avalanches, and volcanic eruptions affect present residents of the region. Such catastrophes undoubtedly caused periodic human hardships, but local topographic diversity, resource variation, and gradual environmental change probably have had a more profound effect on human adaptations in the region. As active participants in the natural landscape, humans also affected the environment and caused changes in the productivity of plant and animal communities.

This chapter presents an overview of the south-central Alaska coastal environment. It examines specific differences in the distribution and productivity of natural resources which affected the people of the region, where environmental diversity led local groups to a variety of ingenious adaptations to different ecological conditions. Although social, political, and demographic factors affected human adaptations in the area, environmental variation provides a powerful tool for understanding the diversity evident in the archaeological record. In the following sections, we focus on environmental variables that affected the human ecology of the region over the past 7,000 years.

The Physical Environment

The Alutiiq region encompasses Prince William Sound, the south coast of the Kenai Peninsula, the Barren Islands, the entire Kodiak Archipelago, and the Pacific coast of the Alaska Peninsula from north of Cape Douglas to Stepovak Bay, southwest of Chignik (Figures 7-10). This region falls between

*(Richard Reanier summarized the natural resources of the area in Mobley *et al.* 1990:13-48. See also W. Workman 1980b; McCartney 1988. These syntheses provided much of the data reviewed in this chapter.)

[R. Reanier 15:11]

Figure 17 Fourpeaked Glacier, Cape Douglas area, Alaska Peninsula

about 56 and 61 degrees north latitude and about 148 and 155 degrees east longitude and encompasses an irregular area extending roughly 750 km (466 mi) east to west by 500 km (310 mi) north to south. Within this area, well over 10,000 km (6,250 mi) of shorelines exist, including thousands of islands of various sizes.

Climate

The climate of this subarctic maritime region is cool and wet, but relatively mild compared to adjacent interior areas because of the moderating influence of the Pacific Ocean. A nearly continuous barrier of high mountains rises from the Pacific, buffering coastal areas from the continental climatic extremes (both warm and cold) of the interior. Comparatively warm waters flowing northward as the Alaska Current ameliorate the coastal climate where mean annual temperature at sea level is a relatively equable 7^{o} C., about 45^{o} F. (Wilson and Overland 1987). Air temperature fluctuations during the course of the year are relatively mild, though local temperature variations can be significant within the project area (Table 3).

The high latitude of the region results in marked seasonal variation in the amount of daylight, a factor that has important implications for the seasonal productivity of various subsistence pursuits. At Seldovia on the outer Kenai Peninsula coast, there are 18 1/2 hours between sunrise and sunset on the summer solstice (June 22), but only six hours of daylight on the winter solstice (December 23). Obviously, winter days provide far fewer hours to spend in hunting and gathering activities, a feature of higher latitudes that encourages storage of foods collected during long summer days. Long hours of summer sunlight also raise ocean productivity, supporting summer migrations of important food species.

The shoreward movement of relatively warm and moisture-laden air off the North Pacific, which cools and condenses as it rises against the mountains of the continental margin, leads to frequent cloudiness and high precipitation throughout the Gulf of Alaska. Precipitation varies significantly across the project area, however, with annual averages of up to 800 cm in the coastal mountains (Royer 1983) and as little as 60 cm at Larsen Bay on the lee side of the Kodiak Mountains (Table 3). Except in unusual years or in colder areas (i.e., Valdez), most precipitation falls as rain, even during winter.

North Pacific storms are generally southwesterlies, bringing cool temperatures, precipitation, strong winds, and high seas. Such conditions may occur at any time of year, but storm frequency and intensity are greatest during winter months. Consequently, marine travel or subsistence activities are often difficult and risky during late fall, winter, and early spring. This limits the number of days available for marine fishing and sea mammal hunting, particularly along exposed coastlines, and for open ocean subsistence pursuits such as whaling and other sea mammal hunting. In the summer, a high pressure system often covers the northeast Pacific, deflecting storms northward into the Bering Sea (Brower *et al.* 1977). Marine travel, fishing, and hunting are less dangerous during this season of relative calm.

Data on temperature and precipitation patterns in the Gulf of Alaska over the past 20,000 years are limited. Major climatic changes accompanied the transition from glacial to interglacial regimes between 17,000 and 10,000 years ago, but regional climates probably have oscillated relatively mildly for the past 10,000 years. Heusser's (1960, 1985) climatic reconstructions for Alaska's south coast suggest that the region followed the broader patterns of climatic change documented for much of

Table 3 **Local Variation in Gulf of Alaska Temperature and Precipitation (from Mobley *et al.* 1990; Wise and Searby 1977)**

	TEMPERATURE (°C)			PRECIPITATION (cm)	
	Mean Annual	Mean Maximum	Mean Minimum	Annual	Annual Snowfall
Valdez	2.2	6.4	-2.1	158.4	621.0
Cordova	3.3	7.6	-1.0	226.3	331.7
Whittier	3.7	7.0	0.4	445.2	670.1
Cape Hinchinbrook	5.4	7.5	3.2	239.6	240.5
Latouche	5.3	8.3	2.3	459.6	355.1
Seward	4.2	7.7	0.7	160.9	214.9
Homer	2.4	5.6	-0.8	73.0	257.8
Kodiak	4.8	7.4	2.2	144.0	241.3
Larsen Bay	4.4	8.4	0.3	58.5	55.9
Sitkanak	4.6	6.9	2.2	128.3	69.9

North America. Heusser proposed three general environmental periods: a cooler and wetter Early Postglacial extending from ca. 9,000 to 7,000 years ago; a warmer than modern Hypsithermal interval between about 7,000 and 4,000 years ago; and a Late Postglacial period spanning the past 4,000 years, when cool and moist conditions returned, and climate periodically may have been more severe than today.

These climatic changes were associated with shifts in vegetation and glaciation, but it is unclear what effect such changes had on animal populations, particularly marine species. Due to moderating oceanic influences and the economic importance of marine fauna throughout Gulf of Alaska prehistory, it seems likely that Holocene climatic changes (since 10,000 B.P.) had relatively minor effects on human populations. An important exception is the climatically-induced Neoglacial expansion of glaciers during late Holocene times (since 5,000 B.P.), which probably displaced local animal and plant populations, along with human settlements (W. Workman 1980b:58).

Tectonics and Regional Geology

The study area lies on a tectonically active "collision coast" where two of the earth's major crustal plates converge: the oceanic Pacific Plate and the continental North American Plate. Along this dynamic margin, the denser Pacific Plate plunges northward beneath Alaska's continental landmass creating intense tectonic activity with crustal deformation, mountain building, earthquakes, volcanic eruptions, and the accretion of oceanic crust onto the continental margin. The mountainous character of much of the Gulf of Alaska coast makes land travel difficult, limits the amount and extent of habitable lowland landforms, and increases the diversity of terrestrial landscapes.

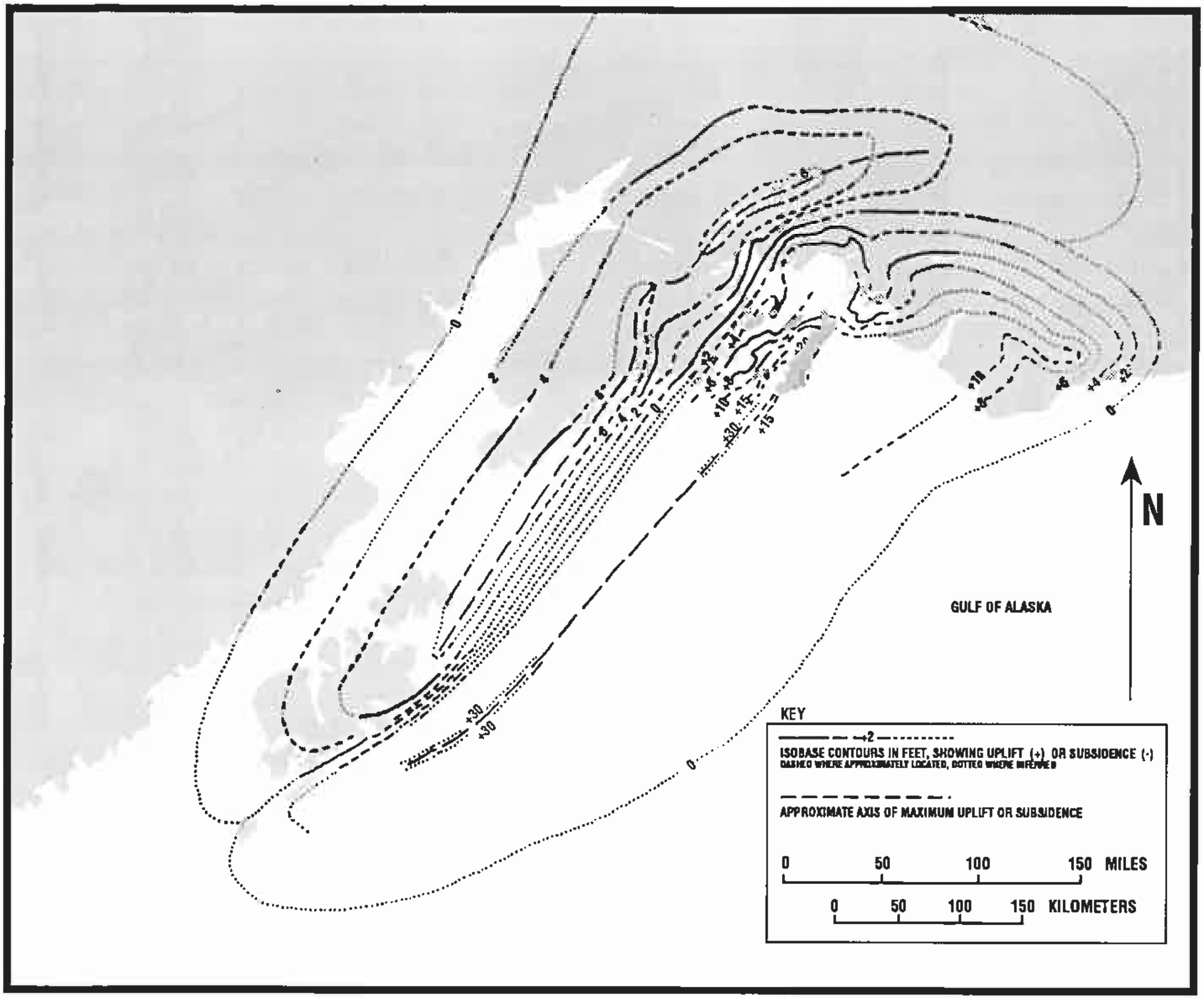
Tectonic History

The tectonic history of the southcentral Alaskan coast is complex. As early as 1794, Vancouver reported evidence for subsidence in Prince William Sound:

> The shores are in general low, and as has been already observed, very swampy in many places, on which the sea appears to be making more rapid encroachments than I ever before saw or heard of. Many trees have been cut down since these regions had been first visited by Europeans; this was evident by the visible effects of the axe and saw; which we concluded had been produced whilst Messrs. Portlock and Dixon were here, seven years before our arrival; as the stumps of the trees were still remaining on the earth where they had originally grown, but were even now many feet below the high water mark, even of neap tides. A low projecting point of land behind which we rode, had not long since afforded support to some of the largest pine trees in the neighbourhood, but it was now overflowed by every tide; and excepting two of the trees, which still put forth a few leaves, the whole were reduced to naked, dead white stumps of trees, with their roots still fast in the ground, and were also found in no very advanced state of decay nearly as low down as the low water of spring tides [Vancouver 1801:335-336].

In 1933, de Laguna (1956:3-4, Plate 4) also found dead trees standing in the intertidal zone (see also Grant and Higgins 1910; Dachnowski-Stokes 1941; Moffit 1954) and clear evidence for subsidence at a number of Prince William Sound archaeological sites. During our 1989 and 1990 cultural resource surveys, drowned trees were noted in intertidal zones of the Kenai Peninsula and Kodiak areas as well, marking forest communities killed by subsidence (see Mobley *et al.* 1990:Fig. 9).

Early historic accounts and geological data suggest that much of Prince William Sound and adjacent areas have been subsiding for hundreds or thousands of years. Birket-Smith (1953:179) and de Laguna (1956:3) attributed an apparent lack of early village sites in Prince William Sound to the submergence and erosion of older sites. Thus, subsidence may have removed a whole class of sites from the archaeological record in parts of Prince William Sound (see Chapters 6 and 7) and the southern coast of the Kenai Peninsula. On Kodiak and the Alaska Peninsula, however, coastal sites date back at least 6,000 to 7,000 years (G. Clark 1977; Jordan 1991)



[from Plafker 1969:Figure 3]

Figure 18 Tectonic uplift and subsidence in southcentral Alaska due to the 1964 earthquake

suggesting that subsidence has not been extensive in this area. On the northeast coast of Kodiak, several early (Ocean Bay) archaeological sites recently have been found on raised terraces that mark emerged shorelines dating to the early or middle Holocene (R. Knecht, pers. comm. 1991).

In 1964, much of Prince William Sound was uplifted dramatically by a massive earthquake. Plafker and his colleagues (1965, 1967; Plafker and Kachadoorian 1966; Plafker and Rubin 1967, 1978; and others) conducted detailed studies of vertical displacements caused by the 1964 earthquake. Generally speaking, uplift occurred east of a line that runs southwest from Prince William Sound to Kodiak Island and beyond into the Gulf of Alaska (Figure 18). Subsidence occurred west of the same line. Maximum uplift of 11.5 m (37.8 ft) was recorded on Montague Island and maximum subsidence of 2.5 m (8.1 ft) in northwest Prince William Sound. The zone of uplift encompasses nearly all of Prince William Sound, parts of the Kenai Peninsula, and a narrow band along the east coast of the

Kodiak Archipelago. The zone of subsidence includes most of the Kodiak Archipelago and the Kenai Peninsula. The Alaska Peninsula largely was unaffected by submergence or uplift associated with the 1964 earthquake.

While eustatic and isostatic changes in sea level generally affect shorelines and faunal communities relatively gradually, at least in human terms, massive tectonic movements like the 1964 earthquake have the potential to alter both the coastline and the availability and productivity of critical resources. The 1964 earthquake uplifted more than 2,500 km (1,563 mi) of the Prince William Sound coast, exposing and killing intertidal organisms (Hanna 1971; Eyerdam 1971). For several years at least, this dramatically reduced the productivity of shellfish populations, an important seasonal resource. Uplift from the 1964 earthquake halved the size of one Prince William Sound sea lion rookery, while sea lion use increased five-fold at another (Johannsen and Johannsen 1975). Uplift caused downcutting of many streams (Kirkby and Kirkby 1969) and may have affected the productivity of some salmon streams for a time. Rapid tectonic subsidence dramatically changed coastal morphology in some areas and altered local erosion and deposition cycles. For example, river mouths and low lakes were transformed into estuarine tidal inlets or lagoons, and bars and spits appeared in what was once open water (Chaney 1987). More comprehensive data on the complex tectonic history of the Gulf of Alaska are necessary before the specific impacts of tectonic movements on archaeological sites and natural resources can be assessed.

Regional Geology

The project area contains parts of three physiographic provinces in Wahrhaftig's (1965) broader Pacific Mountain System: the Pacific Border Ranges Province on the east, the Alaska-Aleutian Province on the west, and the Coastal Trough Province which separates the two (Figure 19). The Pacific Border Ranges include the Kenai-Chugach Mountains of Prince William Sound and the Kenai Peninsula, and the Kodiak Mountains of the Kodiak Archipelago. The Aleutian Range of the Alaska-Aleutian Province forms the backbone of the Alaska Peninsula and divides the Gulf of Alaska from Bristol Bay to the north. The Coastal Trough Province, marked locally by the Cook Inlet-Susitna Lowlands, divides the two mountainous provinces.

Prince William Sound is surrounded on all sides except the south by the massive and heavily glaciated peaks of the Kenai-Chugach Mountains, rising to elevations of up to 4,000 m (13,120 ft). Though considerably lower, the islands of Prince William Sound are extensions of the same mountains. To the southwest, the Kenai Mountains rise equally abruptly from Gulf of Alaska waters to reach altitudes of 1,000 to 2,000 m (3,280-6,560 ft). The Kodiak Mountains of Kodiak, Afognak, and the Trinity islands are a structural and topographic extension of the Kenai-Chugach Mountains, but never rise above elevations of 1,300 m (4,265 ft). Thus, from northeast to southwest, the Kenai-Chugach Mountains gradually decline in elevation. The Aleutian Range also trends from northeast to southwest along the Alaska Peninsula from Kamishak Bay in the north to Pavlov Bay opposite the Shumagin Islands. The range generally rises to elevations of 1,000 m (3,280 ft), with a number of volcanic peaks that reach heights of 2,500 m (8,200 ft).

Three major geological terranes trend from northeast to southwest across the project area (Figure 20). The Prince William terrane to the east and the Peninsular terrane to the west sandwich the Chugach terrane. The Kenai-Chugach Mountains are composed of rocks of the Chugach and Prince William terranes. The Prince William Sound coast is formed primarily of rocks of the Orca Group, including deformed marine sandstones, siltstones, and argillites, interbedded with pillow basalts from submarine volcanic flows (Plafker *et al.* 1982). In places, these were metamorphosed by intrusive granitic rocks 10-15 million years ago (Plafker *et al.* 1985). Much of south and west Prince William Sound is composed of Orca sedimentary rocks, with significant amounts of Orca volcanics and granitics.

Most of the Kenai Peninsula's south coast consists of rocks of the Chugach terrane, dominated by marine flysch sediments deposited along continental margins. The major rock types of the Chugach terrane include sandstones, mudstones, siltstones, slates, argillites, and oceanic basalts (Plafker 1987). Also present is a melange facies, a chaotic mix of deformed rocks welded together at the plate margin (Plafker *et al.* 1982). Like parts of Prince William Sound, some Chugach terrane rocks were metamorphosed by granitic intrusions during the Eocene. Remnants of these granitic rocks are evident in the rocks of the Harris Peninsula and the Pye and Chiswell islands.

The bedrock of the Kodiak Archipelago is made up of three terranes accreted to Alaska during plate convergence (Moore *et al.* 1983). Sandstones and shales of the Kodiak Formation make up most of Kodiak Island (Nilsen and Moore 1979), though intrusive granitics form the mountainous backbone of the island. Volcanic and granitic rocks of the Peninsular terrane are exposed along the west coast (Sample and Moore 1987), along with the flysch and melange facies of the Chugach terrane, and deep sea sedimentary rocks, gabbros, and ultramafic rocks of the Uyak Complex (Raymond 1980). Pillow basalts, shales, argillites, and mudstones of the Ghost Rocks Formation are found along the east coast of the Kodiak Archipelago. Also exposed on the east coast and the Trinity Islands, the Sitkalidak Formation

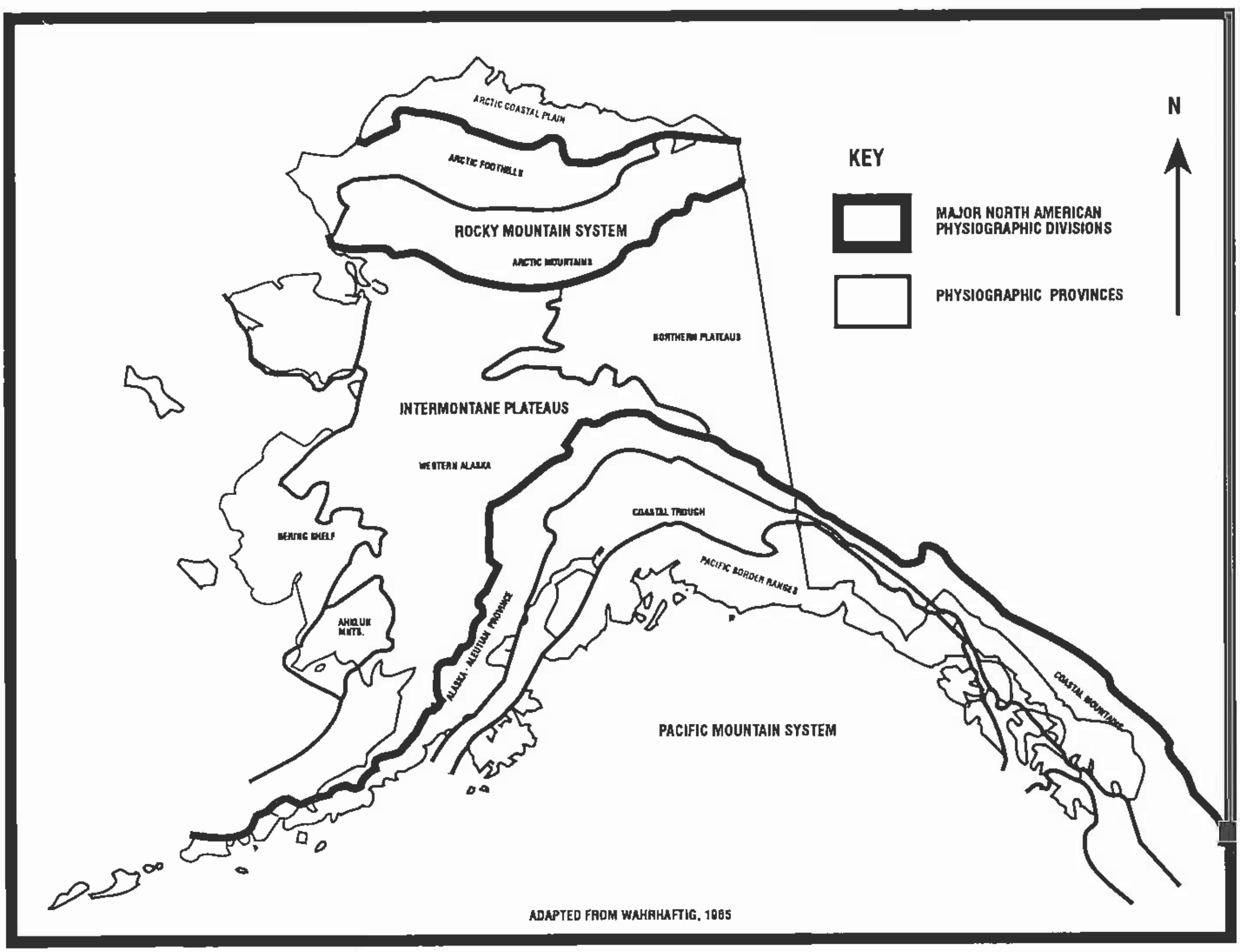


Figure 19 Physiographic regions of Alaska

contains sandstones, shales, and conglomerates of Eocene and Oligocene age (Sample and Fisher 1986). Quaternary tephra and glaciomarine sediments cap much of the Kodiak Archipelago (Nilsen and Moore 1979).

The Aleutian Range of the Alaska Peninsula is formed primarily from sedimentary and plutonic rocks, capped by Quaternary and Tertiary volcanics (Beikman 1980). Along the Pacific coast, the Kaguyak Formation contains siltstones and graywacke sandstones derived from an ancient submarine fan (Detterman and Miller 1985). Opposite Kodiak Island, Tertiary volcanic rocks form much of the Alaska Peninsula coast. The prominent Tertiary to Quaternary volcanos of the peninsula are composed mostly of dacitic and andesitic lava flows, breccias, and tuffs. Within the project area, tephra deposits from Mt. Katmai's 1912 eruption cover much of the Pacific coast of the Alaska Peninsula.

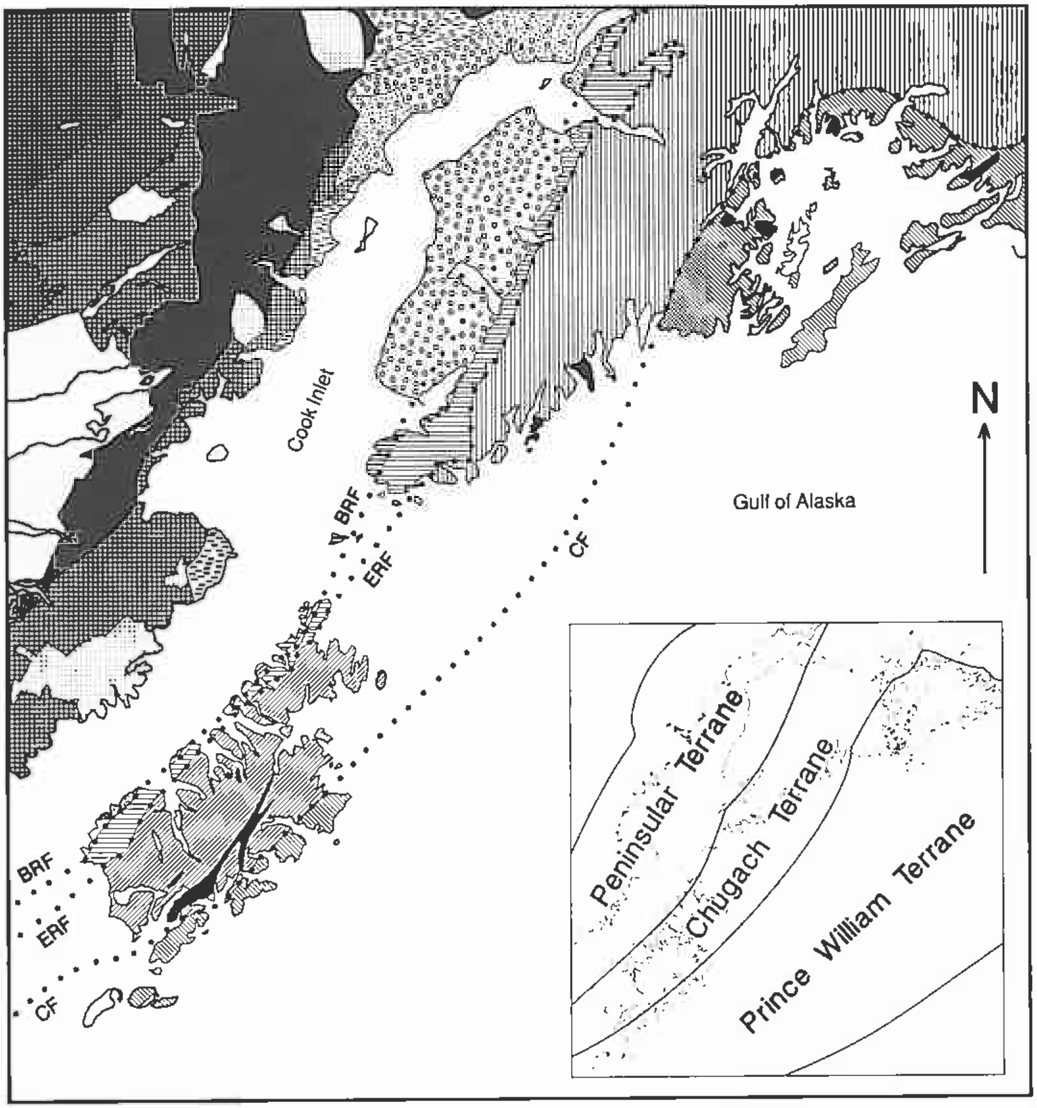
Variability in the lithology of the project area results in local and regional differences in the availability of various mineral resources. These differences led to intergroup variation in the intensity of the use of some minerals and to trade between areas. The patterns of mineral distributions and trade remain poorly understood (R. Jordan, pers. comm., 1989), but some preliminary observations can be made.

Slate, for instance, one of the most important rock types used in tool-making for the past 5,000 years, is found throughout most of the region. High-quality slates reportedly have a more localized distribution, however, weathering primarily from Chugach terrane rocks of northwest Prince William Sound, the outer Kenai Peninsula, and the east shore of the Kodiak Archipelago (de Laguna 1956:5; R. Knecht, pers. comm. 1991). Argillites have a similar distribution, though they also are found in other rock groups of Prince William Sound, the Kenai Peninsula, and Kodiak.

The metamorphosed basalts, gabbros, and diorites of Prince William Sound's Evans, Elrington, Glacier, and Knight islands reportedly provide a source of greenstone used for making splitting and planing adzes (de Laguna 1956:5) and greenstone is also available on Kodiak (Jordan and Knecht 1988:228). Pebbles and small cobbles of a red chert are found along the west coast of Kodiak where rocks of the Uyak Complex outcrop. Artifacts made from this chert are common in Ocean Bay sites on Kodiak (D. Clark 1979), though the material is often intractable (Jordan and Knecht 1988:228). Similar Uyak Complex rocks are exposed near the tip of the Kenai Peninsula and may also contain nodules of this chert (Mobley *et al.* 1990:23). Fine-grained basalts and a variety of cherts are available along the eastern Alaska Peninsula coast, though other important mineral sources (slates, greenstones, etc.) are rare or absent. Not coincidentally, most archaeological sites on the Pacific coast of the Alaska Peninsula contain a relatively large percentage of chipped stone tools, even during times when slate dominates assemblages elsewhere in the region. Steffian (1991a) believes sources of high quality Alaska Peninsula coal (jet) were used by some Late Kachemak groups on Kodiak Island to make labrets and other artifacts. Finally, de Laguna (1956:5) reports five locations where native copper was available in Prince William Sound (see also Mobley *et al.* 1990:181-182), material that probably was traded widely within the project area. The more heavily mineralized rocks of Prince William Sound and the Kenai Peninsula also led to more intensive mining activity during the historic period (see Chapter 4).

Vulcanism and Tephra Deposits

Intense volcanic activity in the Gulf of Alaska has produced numerous tephra or ash fall deposits in the study area (e.g., Riehle 1985; Riehle *et al.* 1990; 1987; Miller and Smith 1987). The most intensive volcanic activity has occurred on the Alaska Peninsula, where at least 17 volcanos known or suspected to have erupted in the last 10,000 years are found between Cape Douglas and the Chignik area (Selkregg 1974:Figure 82). While no active volcanos are present on Kodiak Island, the Kenai Peninsula, or in Prince William Sound, these areas are within range of airborne ash falls. The Kodiak Archipelago



Key

- Quaternary or Tertiary volcanic rocks.
- Tertiary granite and granodiorite.
- Tertiary basalts. Includes Lower Tertiary basalts of the Orca Group (PWS)
- Jurassic diorites.
- Quaternary alluvial, glacial, and beach deposits.
- Upper Tertiary continental deposits. Sandstone, siltstone, claystone. Includes upper part of the Kenai Group
- Middle and Lower Tertiary continental deposits. Sandstone, siltstone, shale, claystone.
- Lower Tertiary interbedded sedimentary, volcaniclastic, and volcanic rocks. Includes Orca Group (PWS) and Ghost Rocks Formation (Kodiak).
- Upper Cretaceous graded beds of sandstone and shale of the Kodiak Formation.
- Cretaceous shelf deposits, sandstone, siltstone, shale and limestone.
- Cretaceous and Upper Jurassic flysch of the Chugach Terrane. Graywacke, slate, argillite, and interbedded basalts.
- Lower Cretaceous and Upper Jurassic(?) melange of the Chugach Terrane. Greenstone, limestone, chert, granodiorite, greenschist. Includes Uyak Formation (Kodiak).
- Cretaceous and Jurassic argillite, shale, graywacke, quartz, conglomerate, lava, and tuff.
- Jurassic sandstone, siltsone, shale, conglomerate, and graywacke. Includes Talkeetna, Kiagagulik, and Shelikof formations, and the Tuxedni Group.
- Upper Triassic limestone, tuff, conglomerate, and breccias.

BRF = Border Ranges Fault ERF = Eagle River Fault
CF = Contact Fault

Figure 20 Geology of the Western Gulf of Alaska *[after Beikman 1980]* has been affected by numerous eruptions of Alaska Peninsula volcanos. Seven active volcanos are located along the west shore of Cook Inlet opposite the Kenai Peninsula, and four more are situated in the mountains north of Prince William Sound. At least 15 of these have erupted ash or lava historically, with as many as 34 eruptions as of 1974 (Selkregg 1974:63), and several more in the intervening years.

The regularity of volcanic eruptions in southcentral Alaska, the large number of tephra deposits, and historical data all suggest that vulcanism has had a significant effect on human populations since initial settlement of the region. Both devastating eruptions and relatively minor ash falls have occurred. One of the best documented ash falls was the 1912 eruption of Mt. Katmai, which ejected ca. 20 km^3 of volcanic debris (Hildreth *et al.* 1984). Most of the ash was blown to the southeast, where it blanketed the eastern Alaska Peninsula and Kodiak Island (Wilcox 1959). Thickness of the ash deposits declines rapidly south and east of the vent (Figure 21), where rock and ash accumulations were up to 250 m (820 ft) thick (Hildreth 1983). As much as 50 cm (20 in) of ash was deposited in the Uganik Bay area on Kodiak, though in the southern and northern parts of the archipelago little tephra accumulated. Only traces of ash were recorded along the south coast of the Kenai Peninsula. Where heavy Katmai ash accumulated, it may have decimated the flora and fauna, clogging streams and intertidal zones, killing land plants and animals (Griggs 1922), and leading to the abandonment of Katmai and other Alaska Peninsula villages which were never re-occupied.

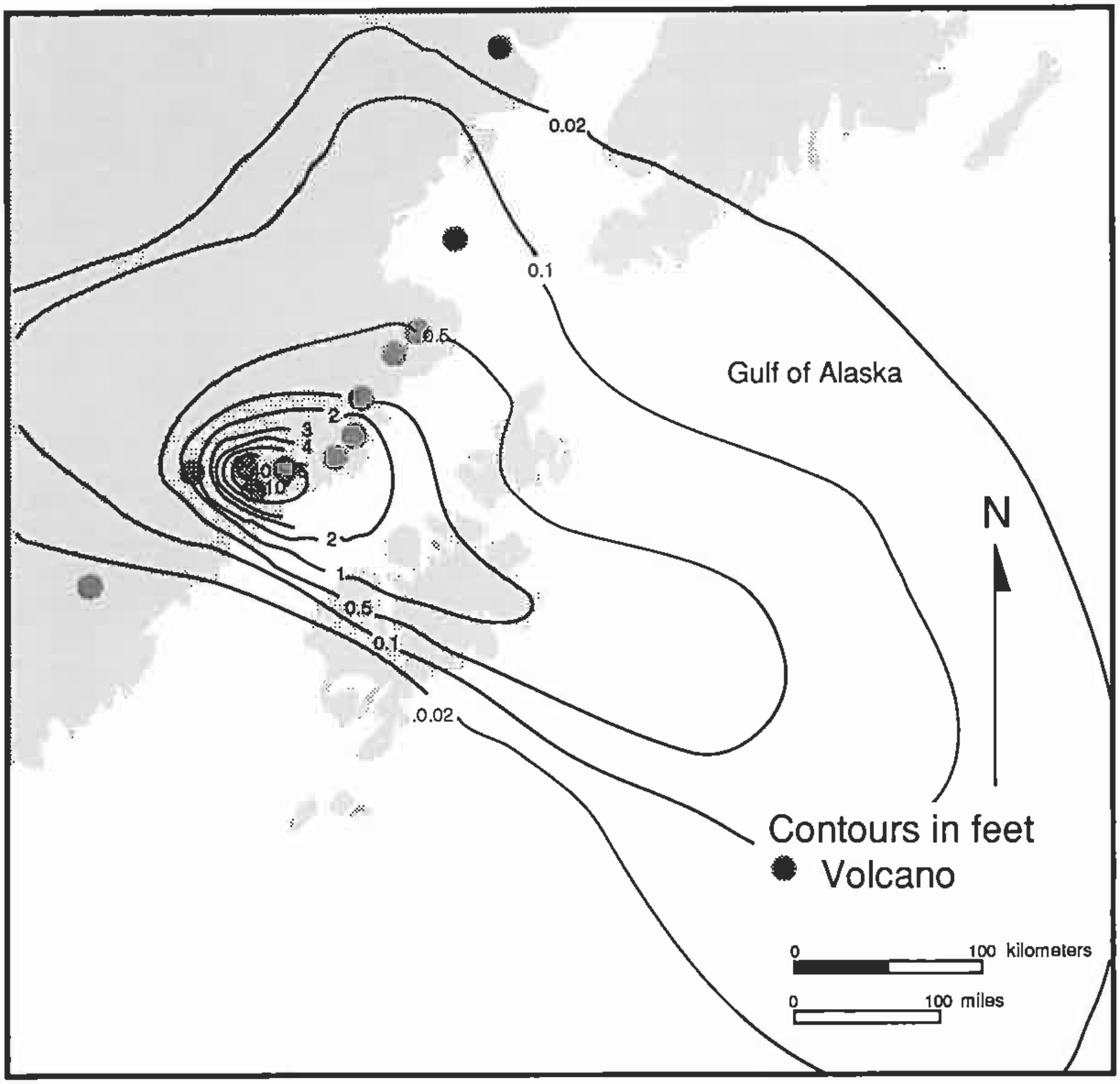
Not all volcanic eruptions have the devastating effects of the massive 1912 eruption of Mt. Katmai, though many older tephra layers in pollen cores are associated with significant changes in vegetation that appear to be related to vulcanism (Mobley *et al.* 1990:46). Dumond (1979:389) identified 10 or more separate ash falls at Brooks River on the Alaska Peninsula, but concluded they had little effect on the broad course of cultural development. Ash falls may well have had short-term effects on critical resources (salmon, intertidal shellfish, and others), however, and may have caused periods of resource stress among hunter-gatherer groups.

Ash layers can be important stratigraphic markers and sensitive dating tools because tephra sources can be identified chemically and associated organic materials can be radiocarbon dated (Figure 22). Unfortunately, the sources and ages of many ash deposits in the project area have yet to be determined (Ager and Simms 1984; Nelson and Jordan 1988). Three tephra layers recently were identified at SEL-188 on the Kenai Peninsula, for instance (Schaaf and Johnson 1990; Betts *et al.* 1991), and eight other samples were collected from archaeological and non-cultural sites of the project area (see Chapter 6).

Soils

Due to commonalities in topography, climate, and precipitation, the soils of the Gulf of Alaska coast are similar in many respects. Much of the landscape is dominated by steep slopes with little or no soil development. Due to the geological dynamism of the region, virtually no soils have been forming for more than about 15,000 years. According to Ferrians (1965), no permafrost exists near sea level along the coast. Due to the high rainfall typical of the region, saturated soils or subsoils are relatively widespread. Along with the high relief typical of the area, saturation limits the number of dry landforms suitable for human occupation. The wet and anaerobic condition of some Gulf of Alaska archaeological soils preserves wooden artifacts and structural remains that normally deteriorate in sites of any antiquity.

Local differences in the glacial, tectonic, volcanic, and vegetational histories result in significant variation in the soils of the western and eastern portions of the project area (see Mobley *et al.* 1990:29). Most soils of Prince William Sound and the Kenai Peninsula's south coast are formed on bedrock or in sediments deposited on glacial moraines and outwash fans or on raised beach deposits. Many soils in these areas have been forming since deglaciation without significant interruption, though subsi-



[from Wilcox 1959: Figure 62]

Figure 21 Distribution of volcanic ash from the 1912 eruption of Mt. Katmai and Novarupta

dence and erosion have interrupted soil formation on many coastal landforms. Because most lowland areas of Prince William Sound and the southern Kenai Peninsula are covered with coniferous forests, their soils tend to be relatively acidic. Such soil acidity normally provides a poor preservational matrix for shell and bone in archaeological sites, unless neutralized by alkaline rocks or the deposition of large amounts of shell by coastal hunter-gatherers.

Soils of Prince William Sound and the Kenai Peninsula's south coast are dominated by three basic types. One is the relatively well-developed and well-drained spodosols, horizonated soils where iron, aluminum, and carbon have been leached from the upper profile and deposited in the lower. A second common soil type is organic-rich peats (histosols) which form on poorly drained landforms (Rieger *et al.* 1979). In still other areas (i.e., some valley bottoms), deglaciation occurred relatively recently (see below) or older soils have been destroyed or buried by more recent glacial advances. Some of these younger soil associations are dominated by poorly developed and essentially unhorizonated wet soils (entisols).

Due to the proximity of highly active Alaska Peninsula volcanos, many soils on Kodiak and the Alaska Peninsula form in volcanic ash. The frequent deposition of volcanic ash in these areas results in many relatively young and poorly developed soils (inceptisols) which lack diagnostic soil horizons. Even in the forested parts of Afognak Island, the environments most similar to Prince William Sound and the Kenai Peninsula, spodosols generally have not had time to develop (Rieger *et al.* 1979).

Glacial History

Only 15,000 years ago, nearly the entire project area was blanketed by vast accumulations of glacial ice. Large icefields still cap the mountains of Prince William Sound, the Kenai Peninsula, and the Alaska Peninsula, and the geologic record reveals a history of repeated glacial episodes since mid-Tertiary time (see Péwé 1975; Hopkins *et al.* 1982; Hamilton and Thorson 1983). The seaward extent of glaciation in the Gulf of Alaska during the late Pleistocene, an issue critical to debates about the potential for an early maritime migration into the New World, is unresolved. Some geologists believe the ice margin was near the present coast (Coulter *et al.* 1965), others place it near the outer edge of the continental shelf (Hamilton and Thorson 1983), and still others have proposed intermediate positions (Pewe 1975; Prest 1984). For the western Gulf, Péwé (1975) and Karlstrom (1964) believe grounded ice reached the outer continental shelf, but Hollin and Schilling (1981) argue that the thickness of such ice is incompatible with the presence of ice-free areas on Kodiak Island and Cook Inlet.

(A. Crowell 5:33)

Figure 22 Site deposit (KOD-414) with multiple ash layers (Units 2, 3, 5, 8)

Compared to more intensively studied areas, the glacial history of the study area is poorly understood. Like other parts of Alaska and the world, however, the available data suggest that much of the Gulf of Alaska experienced alternating cycles of low amplitude glacial advance and retreat during the Holocene, beginning about 7,000 years ago (Calkin 1988; Grove 1988). During the height of the Neoglacial (after 5000 B.P.), as many as five to 10 cycles of advance and retreat may have occurred (Grove 1988). The latest phase of general glacial advance worldwide, the Little Ice Age, began around A.D. 1200 and ended in the late 1800s. In heavily glaciated areas like Prince William Sound and the southern Kenai Peninsula, middle and late Holocene glacial advances may have destroyed archaeological sites or caused their burial beneath glacial outwash or moraine sediments.

Variation in the glacial history of different areas of the Gulf of Alaska contributes to the broader environmental variability inherent within coastal landscapes. Glacial history is related to changes in flora and fauna and contributes to local variation in sea level history, onshore and offshore topography, soil genesis, human settlement, and archaeological site preservation. The following sections summarize the past and present distribution of glacial ice within the four parts of the project area, and examine some implications of these patterns for understanding variability in the archaeological record.

Today, Prince William Sound is the most heavily glaciated part of the Alutiiq region, surrounded by massive montane ice fields on three sides. The islands are almost entirely unglaciated, but at least 16 valley glaciers reach tidewater along the mainland coast. At the height of the last glacial epoch, Prince William Sound was covered by huge accumulations of ice originating in the Kenai and Chugach Mountains. Limited parts of Montague Island may have remained ice-free, however (Tarr and Martin 1914), and some of the highest island peaks also may have remained unglaciated (Mobley *et al.* 1990). According to Sirkin and Tuthill (1987), parts of eastern Prince William Sound began to deglaciate before 14,000 years ago, and some fjord interiors cleared by the end of the Pleistocene (Heusser 1983; Williams and Coulter 1981). Little is known about the timing of Holocene glacial advances in Prince William Sound, but many existing glaciers appear to have reached recent maxima between A.D. 1870 and 1900, after which they have retreated (Tarr and Martin 1914; Field 1975). According to Field (1975:455), no landlocked glaciers in the Chugach Mountains have advanced in recent decades, though several tidewater glaciers (e.g., Columbia, Harvard, and Meares glaciers) in northwest Prince William Sound have advanced since 1900 (Post 1975; Calkin 1988).

The Kenai Peninsula is also relatively heavily glaciated, with numerous large valley glaciers present in coastal drainages. At least 10 glaciers reach salt water. These emanate primarily from two large ice fields, the Sargent Ice Field (which also feeds valley glaciers of Prince William Sound) on the east, and the Harding Ice Field located in the mountains of the central and western peninsula. During the last glacial epoch, these ice fields appear to have coalesced as a single ice cap covering the seaward side of the Kenai Peninsula, sending large glaciers into Kachemak Bay (Hamilton and Thorson 1983) and down fjords such as Nuka Bay (Von Huene 1966). According to Rymer and Sims (1982), the mountains of the central Kenai Peninsula began to deglaciate about 14,500 years ago. Like Prince William Sound, most Kenai Peninsula glaciers reached recent maxima between A.D. 1850 and 1900 (Field 1975) and have retreated since the turn of the century. South of the Harding Ice Field, Hamilton and Rice (1989) have reconstructed glacial fluctuations in coastal bays, showing that glaciers have retreated as much as 15 km (9.3 mi) in Northwestern Fjord and freeing up many kilometers of recently deglaciated shoreline (Figure 23). There is some evidence that various tidewater glaciers along the Kenai Peninsula's south coast have advanced and retreated independent of one another.

The highest peaks on Kodiak Island contain only small remnants of once more extensive glaciers, although much of the area appears to have been glaciated at the height of the last glacial epoch.

Unlike Prince William Sound, the Kenai Peninsula, and the Alaska Peninsula, geological data suggest that a sizable ice-free glacial refugium existed on southern Kodiak Island during the last two glaciations (Karlstrom and Ball 1969). Outside of this glacial refugium, southwest Kodiak and the Trinity Islands appear to have been deglaciated by about 14,000 years ago (Mobley *et al.* 1990:45).

At the height of the last glacial epoch, ice caps centered on the mountains of the Alaska Peninsula appear to have spread northward and southward over the continental shelf, forming a nearly continuous ice cover over the peninsula (Weber 1985). According to Detterman (1986), the lowlands of the Alaska Peninsula were deglaciated by at least 10,600 years ago, opening coastal landforms for potential human settlement. Unfortunately, little is known about the glacial history of the Alaska Peninsula during the Holocene. Within the bounds of the project area, the Alaska Peninsula's coastal plain is largely unglaciated today. Three large ice fields persist at higher elevations, however, and feed valley glaciers that approach the coast. The Fourpeaked Mountain Ice Field, located west and south of Cape Douglas, includes Fourpeaked Glacier (Figure 17) which extends nearly to sea level. The Hook Glacier Field feeds the large Hook Glacier which comes within five kilometers (0.63 mi) of the coast in the valley behind Hallo Bay. Finally, the Icy Peak/Mount Kialagvik Field southwest of Wide Bay feeds several valley glaciers.

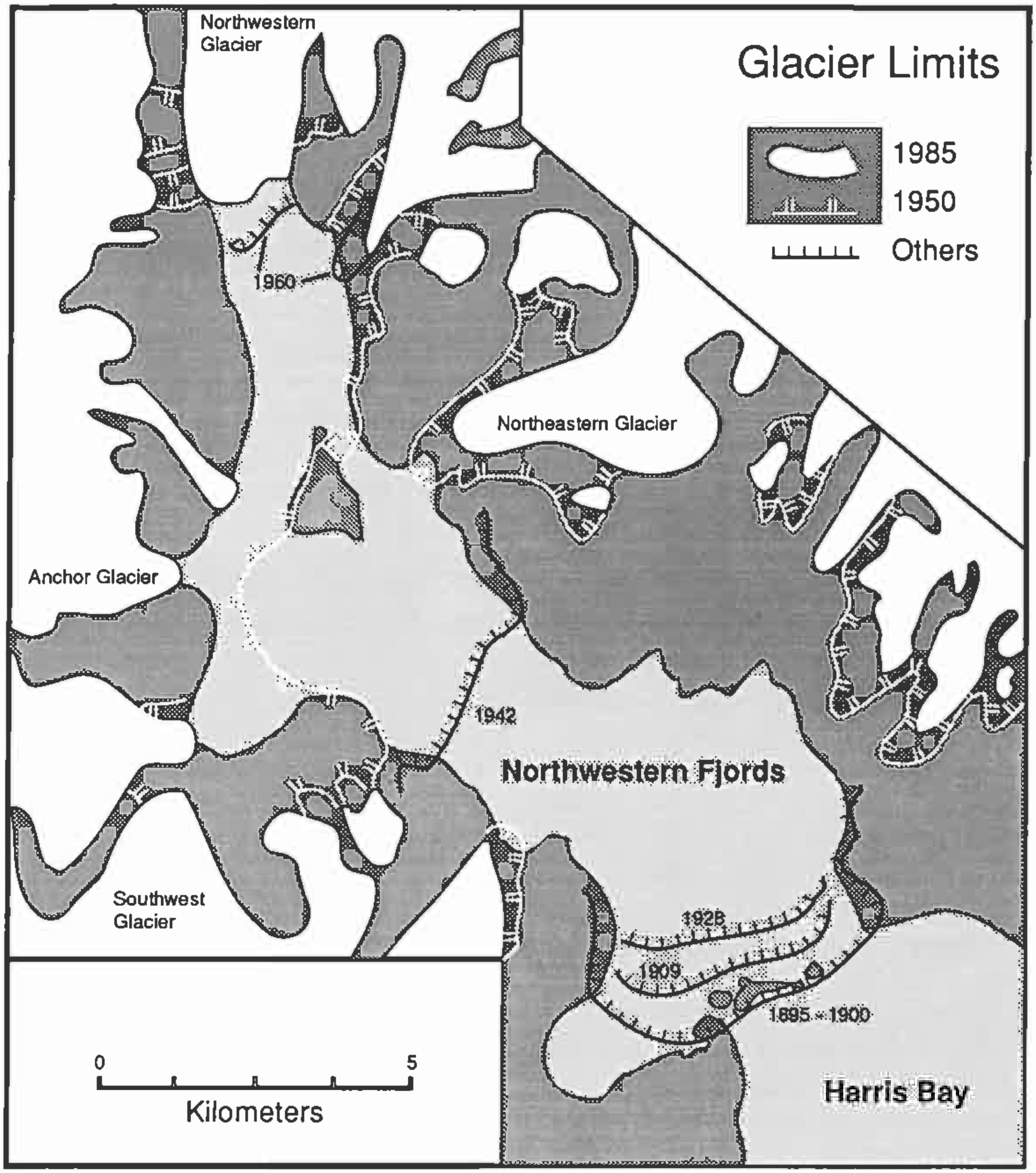
Gulf of Alaska Coasts

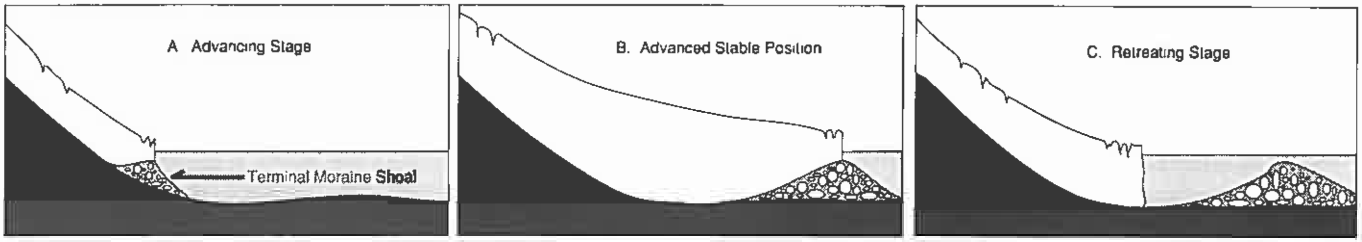
Much of the Gulf of Alaska coast is highly convoluted, deeply indented by glacial fjords or other embayments, and dotted with many crenulated islands. This contorted coastline increases the productivity of intertidal and subtidal communities by increasing the total length and area of such habitats available for human exploitation. This is counteracted to some extent by the steep bathymetry of the region (W. Workman 1980b), but convoluted coasts generally offer a greater diversity of marine resources and amplify local habitat variability based on wave exposure, substrate types, bathymetry, and other factors. Although exact figures are not available, the length of coastline per land area is probably highest in the Kodiak, Prince William Sound, and Kenai Peninsula areas where numerous islands and deep embayments punctuate the coast. In contrast, most of the Alaska Peninsula coast from Kamishak Bay to Stepovak Bay is considerably less convoluted, providing less extensive intertidal and nearshore habitats.

The productivity of Gulf of Alaska coastlines also is influenced by relatively high tidal ranges. Wide tidal swings pose logistical opportunities and problems for marine subsistence and travel, and maritime people kept careful track of daily tidal changes. Gulf of Alaska tides are semi-diurnal, with two unequal highs and lows each day. Daily tidal ranges vary considerably across the project area. A 1990 tide book records maximum tidal ranges of ca. 4.25 m (14 ft) for the Kodiak and Alaska Peninsula areas, 5.9 m (19.3 ft) for the Prince William Sound area, and 8.4 m (27.6 ft) for the Kenai Peninsula area. These tidal fluctuations vary locally, particularly inside of bays where tidal ranges tend to decrease. Nonetheless, regional variation in tidal amplitude has important implications for the potential productivity of intertidal habitats for hunter-gatherers. In areas of the Kenai Peninsula where tidal range is twice that of most areas on Kodiak and the Alaska Peninsula, for example, the amount of exposed intertidal habitat at low tide also would be twice as large (all other variables being equal) and potentially twice as productive.

Wave heights also have practical implications for maritime societies, both for foraging along wave-swept shorelines and for travel, fishing, or hunting by boat. Maximum wave heights reach seven to nine meters (23-30 ft) in open Gulf of Alaska waters (Wilson and Overland 1987), and the highest one-third of all waves (significant wave height) average between three and four meters (10-13 ft) from October to March. These figures decline from June to August, however, when mean significant wave heights are between one and two meters (3.3-6.8 ft). Along some exposed coasts of the project area, wave energy is so high (at least seasonally) that intertidal zones are almost barren of shellfish and other edible organisms, and shoreline access is extremely difficult.

In addition to high waves that batter exposed coastlines during much of the year, periodic tsunamis occur along Gulf of Alaska shores. Tsunamis triggered by distant earthquakes can cross the Pacific Ocean at speeds of up to 900 km (560 mi) per hour. The energy of tsunamis entering coastal waters is focused by shallowing bathymetry, and in





[from Hamilton and Rice 1989:Figures 7,9]

Figure 23 Northwestern Fjord glacier limits and tidewater glacier movements

some areas by narrowing embayments, where they can reach heights of 20 m (66 ft) or more (Wilson and Torum 1968). Other destructive waves can be generated locally by landslides and avalanches, particularly in bays or fjords (Figure 24). An earthquake-triggered landslide caused a wave that destroyed the town of Valdez during the 1964 earthquake (Coulter and Migliaccio 1966).

Shoreline Classifications

As previously noted, shoreline substrates, bathymetry, and wave exposure all have implications for the diversity and productivity of nearshore marine life available to humans. Hayes and Ruby (1979; Hayes 1986) have classified and mapped shoreline types for 4,300 km (2,666 mi) of the Kodiak Archipelago coast and 2,100 km (1,302 mi) of Kenai Peninsula and Prince William Sound coasts. Although the entire south coast of the Kenai Peninsula was classified, Prince William Sound shorelines analyzed were limited to Montague, Latouche, Green, Elrington, Evans, and Bainbridge islands. Despite the lack of classified shorelines for the Alaska Peninsula and much of Prince William Sound, this extensive sample is instructive.

Hayes and Ruby divided the shorelines of the region into 10 types (Figure 25), including straight (vertical) rocky headlands, wave-cut rock platforms, pure gravel beaches, mixed sand and gravel beaches, sheltered rocky headlands, and protected tide flats and salt marshes. These (and other) categories reflect a variety of geological and oceanographic factors, including exposure and wave energy, substrate type, sediment availability, wave refraction, currents, etc. Generally, vertical or very steep shorelines and bathymetry reduce the available area and productivity of intertidal and subtidal habitats. Exposed beaches of pure sand and pure gravel (or cobbles) also tend to support limited intertidal life, especially edible shellfish that are relatively economical to collect. In contrast, most shorelines with wave-cut rock platforms, sheltered rocky headlands, mixed sand and gravel, broad tidal flats, and salt marshes tend to be relatively productive for human foragers.

Steep rocky coastlines are the most abundant (28.3%) shoreline class in the Kenai Peninsula and Prince William Sound areas, while they comprise only 8.8% of the Kodiak coast (Hayes and Ruby 1979; Hayes 1986). On Kodiak, over 75% of the classified shorelines are more sheltered and productive varieties (Types 2, 5, 6, 8, 9, and 10), while the Kenai Peninsula and Prince William Sound sample contains less than 52% of these types. These figures suggest that intertidal and nearshore productivity may be higher in the Kodiak area than along the southern Kenai and Prince William Sound coasts. This could be balanced, however, by the higher tidal ranges of the Kenai and Prince William Sound areas.

Post-Glacial Sea Level History

Sea levels fluctuate both globally and locally due to a number of factors. Global sea levels are controlled by two primary eustatic processes: relatively short-term changes in the amount of water locked up in glacial ice and longer term changes in the volume of the ocean basins themselves. For a discussion of the human prehistory of the region, only the former is of concern. At the height of the last glaciation (ca. 18,000 to 25,000 years ago), world sea levels were lowered by as much as 120 m (394 ft) (Fairbanks 1989), exposing vast areas of the world's continental shelves and linking land masses such as Asia and North America. As the massive continental ice sheets melted at the end of the Pleistocene, world sea levels rose relatively rapidly between about 17,000 and 7,000 years ago (Inman 1983). This marine transgression flooded vast expanses of the earth's continental shelves, divided land masses formerly connected by land, dramatically altered the position and conformation of the world's shorelines, and had major effects on human societies, especially those occupying coastal areas. Because of the generally steep marine topography of the Gulf of Alaska coast, the effects of such changes probably have been less dramatic than in many parts of the world.

Regional and local factors also affect sea level history, leading to variation in the local expression of eustatic sea level changes. In the Gulf of Alaska, the history of sea level and shoreline shifts is complex, depending on local variation in tectonic and isostatic relationships and the steepness of coastal and submarine landforms. As ice is removed from the land, for example, the continental crust below it adjusts to the weight reduction, a shift that can cause the land to rebound relative to the sea. At the same time, adding the weight of 100 m (328 ft) of sea water to the continental shelves causes the underlying crust to sink, lowering sea level relative to the land. Vertical tectonic movements also affect relative sea levels on local and regional scales.

The complex interaction of eustatic sea level changes, isostatic adjustments, and vertical tectonic movements can lead to quite different sea level histories for local areas within a region. As noted by Reanier (Mobley *et al.* 1990:17):

> Simultaneously during deglaciation, eustatic sea level is rising, isostatically depressed land is being uplifted, and vertical tectonic movements, either emergence or subsidence, may also be occurring, all at different and probably variable rates.

The effects of sea level change on the land-sea interface also vary depending on the steepness of submarine and subaerial topography. In areas of very steep topography (i.e., some rocky headlands and outer fjords), even a large vertical sea level rise of 100 m or more may not cause a significant horizontal shift in the coast. In areas of gentler topography (like many bay or fjord heads and some low-lying islands), a 100 m sea level rise may shift the shoreline many kilometers, causing much more significant environmental changes.

[M. Eldridge 8:21]

Figure 24 Avalanche chute, Knight Island, Prince William Sound

The Biological Environment

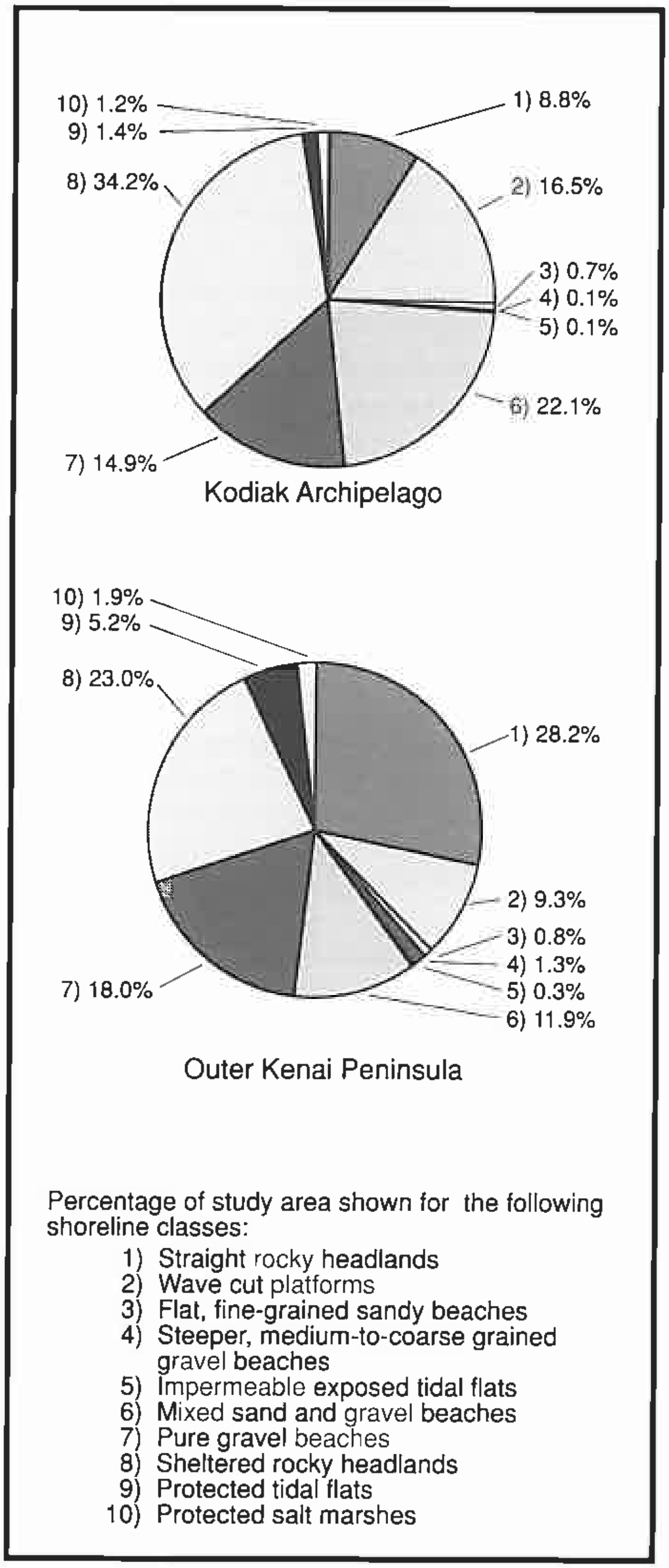
William Workman (1980b:54-55) has characterized the northern Gulf of Alaska coast as an area of "ecological uniformity." Compared to the very different coasts of Bristol Bay, the Aleutian Islands, and the Yakutat area, the Alutiiq region is relatively uniform ecologically. There is considerable biological diversity within the Alutiiq region, however, despite the common presence of many sea mammal, marine bird, fish, and shellfish species. From a cultural ecological perspective, the apparent environmental uniformity masks a great deal of diversity, especially in the distribution and abundance of various plants and animals within the region.

Plant Communities and Resources

Modern plant communities vary significantly along Gulf of Alaska coastlines. Variation in elevation, slope, aspect, bedrock, soils, temperature, exposure, and precipitation all contribute to the diversity of plant communities and influence the distribution and abundance of animal populations. Such factors ultimately determine the nature of the resources available to human groups and influence the subsistence choices people make. Although evidence suggests that Gulf of Alaska plant communities have changed over the past 10,000 years, there is evidence for continuity in some areas for the last 5,000 years, and for greater similarity in vegetation communities across the project area prior to 3,000 years ago.

Today, coniferous forests dominate the lowland vegetation of Prince William Sound, much of the Kenai Peninsula, and the northern parts of the Kodiak Archipelago (Figure 26). In contrast, the coastal lowlands of southern Kodiak and the Alaska Peninsula are largely unforested, dominated by tundra and low shrub cover (Figure 27). There is less regional variation in aquatic plant communities, although marine plant associations vary locally depending on wave energy, substrate, and other variables.

Pollen records from the Gulf of Alaska coast suggest that several types of tundra communities covered much of the unglaciated landscape between about 10,000 and 3,000 years ago (Heusser 1983, 1985). The densely forested modern character of much of the project area is a fairly recent development. High-shrub tundra, probably similar to the vegetation found today on western Kodiak Island and the Alaska Peninsula, formed a mosaic with tall herbs and grasses growing around thickets of alder and willow. Prince William Sound appears to have been largely unforested until about 3,000 years ago (Ager 1983; Heusser 1985) and conifers may have invaded the northern part of Kodiak as recently as 1,000 years ago. Spruce forest continues to spread southward on Kodiak, possibly stimulated by the deposition of Katmai ash (R. Jordan, pers. comm. 1990). Thus, prior to about 3,000 years ago, vegetation communities of the project area may have been more similar than today. Pollen data from unforested areas (i.e., southern and western Kodiak) suggest that essentially modern vegetation types



[after Hayes and Ruby 1979; Hayes 1986]

Figure 25 Shoreline classes, Kodiak Archipelago and outer Kenai Peninsula

existed for the past 4,500 to 5,000 years (Nelson and Jordan 1988).

Peat sections from the Shumagin Islands and the Alaska Peninsula record a major change about 10,000 years ago from vegetation dominated by grass, *Artemesia*, and willow, to associations of birch, *Empetrum*, and grass (Heusser 1983). Birch pollen becomes more prominent between 9500 and 8000 B.P., while an increase in alder pollen after 7000 B.P. may record the migration of alder to the outer Alaska Peninsula (Heusser 1985). On Kodiak, a more or less continuous pollen record exists for the past 9,000 years. A core on eastern Kodiak records a sedge-fern-umbel community before about 8,500 B.P., followed by vegetation dominated by alder and birch until about 5,000 years ago (Heusser 1985). Birch-alder-heath associations probably have dominated the landscape since then, with spruce-alder-sphagnum vegetation becoming more important in the last 1,000 years.

Today, lowland plant communities of Prince William Sound are dominated by a dense rainforest comprised primarily of Sitka spruce, mountain hemlock, and western hemlock trees. In describing the rainforest of Prince William Sound, Birket-Smith (1953:16) emphasized the difficulty of travel by land:

> The forest is nearly impenetrable. The mountains rise with steep slopes, and everywhere the road is barred with great rocks and trees upset by the wind, while in other places the feet sink deep into moss and swamps, where the evil-smelling skunk cabbage (*Lysichiton camtschatense*) grows in abundance.

Spruce and hemlock grow to heights of nearly 30 m (100 ft) in favorable locations, with diameters of up to a meter (Fernow 1902; Heusser 1983). Yellow cedar is present but much less common than in areas to the east. Along the shores of the sound, narrow bands of alder, willow, and black cottonwood trees often are present (Birket-Smith 1953:16). The rainforest understory contains relatively few varieties of shrubs and herbs (Cooper 1942; Heusser 1960), but edible blueberries (*Vaccinium ovalifolium*), salmonberries (*Rubus spectabilis*), cloudberries (*R. chamaemorus*), and elderberries (*Sambucus racemosa*) are common in areas. Muskegs dominated by sedges, sphagnum mosses, and stunted conifers occur on poorly drained landforms throughout Prince William Sound. These contain many shallow ponds where the water table lies at or just below the surface, even in the relatively dry summer. Varieties of heath are common in muskeg habitats and some produce small berry crops. Alpine tundra is distributed widely at higher elevations, varying from lush meadows to barren fellfields. Along protected shores, tall conifers often grow right to the high water mark. On more exposed coasts, salt water spray or occasional storm surf forms a beach fringe community where rye grass and a variety of herbs grow. In places, the beach fringe contains edible wild strawberries (*Fragaria chiloensis*).

As might be expected, the eastern side of the southern Kenai Peninsula contains vegetation communities similar to those of Prince William Sound. Plant associations become increasingly different to the west, however, as the precipitous coast and steepening climatic gradients mark the northernmost range of many plants (Cooper 1942; Viereck and Little 1972). Kenai Peninsula treelines generally are lower than in Prince William Sound, trees are smaller, and the steep terrain limits the extent of muskegs. From Port Bainbridge to Resurrection Bay, wide bays and broad alluvial valleys support a spruce-hemlock rain forest similar to Prince William Sound, except that yellow cedar is absent (Viereck and Little 1975). From Resurrection Bay to Gore Point, the rugged coast and many fjords limit lowland vegetation to a relatively narrow band. Mountain hemlock is rare west of Resurrection Bay. Further west, the precipitous coast supports only scattered pockets of lowland forest, separated by sparsely vegetated mountain walls and fjords. West of Gore Point, large forest stands again cover wide valleys connecting the outer coast and Kachemak Bay. The understory is dense shrubs, but diversity is low because many forest shrubs (e.g., *Vaccinium spp.*) do not grow west of Resurrection Bay (Viereck and Little 1975).

The Kodiak Archipelago is transitional between coastal conifer forest and tundra. The northern part of the archipelago contains dense Sitka spruce forest underlain by blueberry, devil's club, and other shrubs. Alder is abundant above treeline, black cottonwood is common along rivers in the forested zone and along the southwest coast of Kodiak Island (Viereck and Little 1972), and several types of willow grow on western Kodiak Island (Mobley *et al.* 1990). Balsam poplar trees grow on northwest Kodiak Island and stunted black poplars are found as far south as Olga Bay (Fowells 1965). The rest of the archipelago is virtually treeless, with tundra communities similar to the Alaska Peninsula. Wet and moist tundra occupy valley bottoms, while a mosaic of high-shrub and tall-herb tundra grows on the lower slopes of the island. Higher elevations support alpine tundra.

Plant communities of the Alaska Peninsula coast from Cape Douglas to Chignik are dominated by tundra associations. Well-drained lowland landforms are covered by a mosaic of tall-herb tundra and high-shrub communities. The former typically contain ferns, grasses, and small herbs, while the latter are dominated by Sitka alder and willows (Hultén 1968; Heusser 1983). Moist tundra is found in areas of intermediate drainage and contains a diverse assemblage of herbs and dwarf shrubs (Heusser 1983). Poorly drained landforms normally contain less diverse wet tundra dominated by sedges. Alpine tundra dominates the landscape above 300 m (ca. 1,000 ft), though altitudinal variation exists due to slope, aspect, and wind regime (Heusser 1983). In wind-swept settings like Cape

[R. Reanier 9:26]

Figure 26 Coniferous forest, Eleanor Island, Prince William Sound

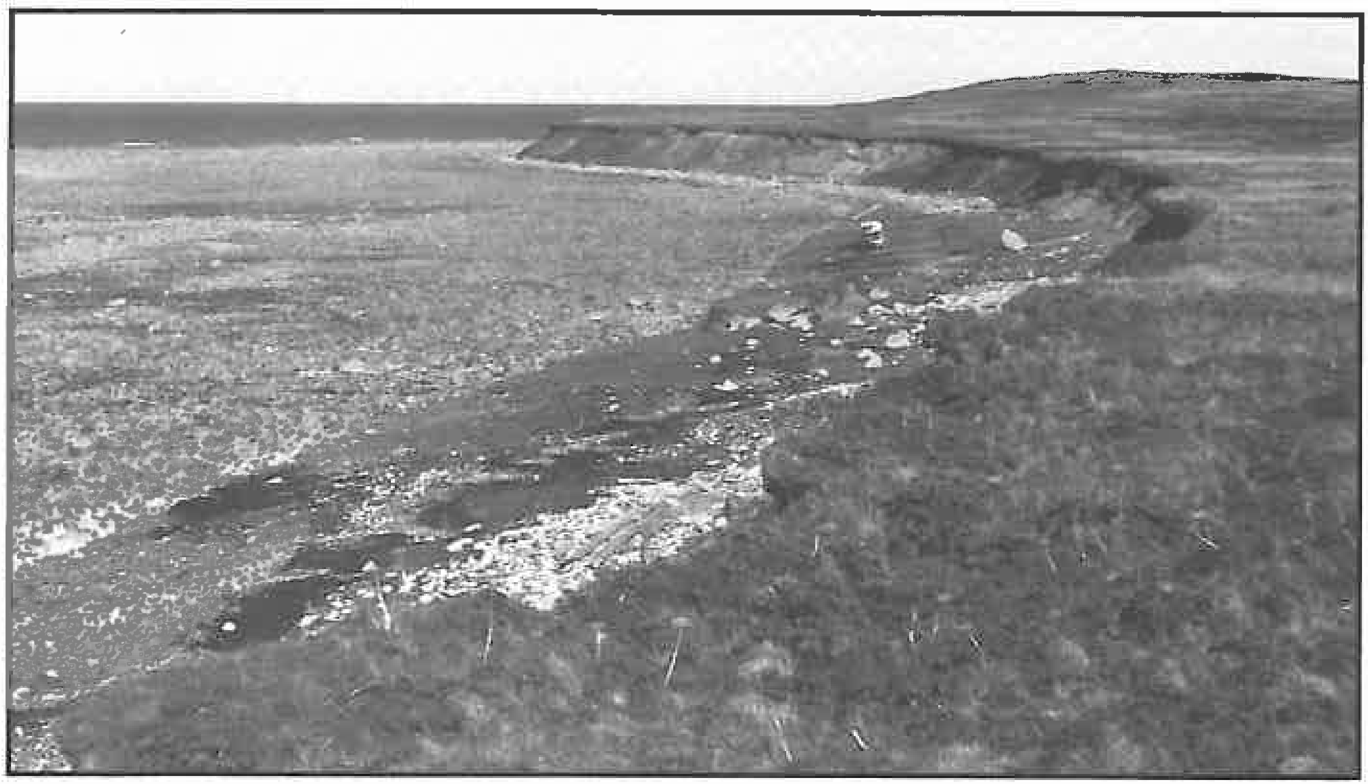
Douglas, "alpine" tundra occurs at sea level. Stunted groves of Sitka spruce occur in sheltered sites along the coast, Kenai birch and mountain hemlock grow on the Alaska Peninsula (Viereck and Little 1972), but western hemlock and black cottonwood do not extend that far west (Viereck and Little 1975).

Despite a fairly diverse flora, relatively few important plant foods are present along the Gulf of Alaska coast, and it appears that plant foods were relatively minor contributors to the Alutiiq diet. Several varieties of berries available in forest, tundra, muskeg, and beach fringe habitats have been mentioned. Other edible plant foods common in all or part of the project area include the young leaves and rhizomes of the fiddlehead fern (*Athyrium filix-femina*), the stalks of wild celery or cow parsnip (*Heracleum lanatum*), young leaves of nettles (*Urtica dioeca*), the cambium layer of spruce, hemlock, and cedar trees, and several species of seaweed (*Fucus*, *Alaria*, etc.). Birket-Smith (1953:42) mentions the crab apple, bulbs of the Kamchatka lily or Indian rice (*Fritillaria camtschatencis*), the roots and leaves of sorrel (*Rumex occidentalis*) and lupine (*Lupinus nootkatensis*), and a variety of other berries among those plant foods collected by the Chugach. Although nutritional data are not available for most of these plants, such foods typically are relatively poor sources of calories and proteins, but often provide essential carbohydrates, vitamins, and minerals.

Animal Resources: Diversity and Productivity

Terrestrial Mammals

Land mammals are distributed unevenly across the project area, as are other classes of fauna (Table 4). Detailed range maps have been published for many species (ADFG 1973, 1978), but these should be extrapolated back in time cautiously. The differ-



[R. Knecht 1:18]

Figure 27 Tundra vegetation, Low Cape, Kodiak Island

ential and fluctuating distribution, diversity, and productivity of land mammals in various parts of the region undoubtedly has influenced human subsistence and settlement strategies for thousands of years.

Thirty-one land mammals are indigenous to the coastal areas of Prince William Sound. These include brown bear, black bear, mountain goat, wolf, porcupine, wolverine, lynx, fox, river otter, marmot, marten, weasel, mink, ground squirrel, and muskrat, all exploited by the Chugach for meat, fur, or other subsistence materials (Birket-Smith 1953:16; Chapter 4). In Prince William Sound, brown bears are limited to Montague, Hinchinbrook, and Hawkins islands, and mainland shores east of Columbia Glacier. Black bears are found on all mainland shores, and on Latouche, Knight, Evans, Bainbridge, Chenega, and Culross islands. Mountain goats inhabit alpine environments along the mainland coast. Although absent from most of the sound, moose are found occasionally near the heads of Port Valdez and Port Nellie Juan. Sitka black-tailed deer now inhabit portions of Prince William Sound, but they were introduced historically and were not available to prehistoric populations.

The Kenai Peninsula contains 34 species of indigenous land mammals - the most diverse terrestrial fauna in the project area (Table 4). An array of species similar to those in Prince William Sound is present, with the addition of Dall sheep and caribou, and an increased abundance of moose. On the Kenai Peninsula coast, brown bears generally are not found west of the Aialik Peninsula. Black bears are concentrated along streams at the heads of bays and fjords. Mountain goats are found in rugged upland areas all along the coast.

The deep and rough waters of Shelikof Strait have isolated the Kodiak Archipelago from the Alaskan mainland since the last glaciation. Biological isolation is responsible for the relatively impoverished terrestrial fauna of the Kodiak area. Aside from humans, indigenous species are limited to the brown bear, red fox, ermine, river otter, northern vole, ground squirrel, and brown bat (Table 4), although 13 land mammals have been introduced to the area historically (Rausch 1969). Even these few land mammals are distributed unevenly across Kodiak. While as many as 3,000 brown bears may live in the Kodiak area (ADFG 1973), none are found on the Trinity Islands and they are relatively scarce beyond the boundaries of the shrub tundra on western Kodiak Island (W. Clark 1958). Kodiak brown bears congregate along stream courses and at the heads of bays during salmon runs from mid-June through October. They generally den on north-facing upland slopes from November to April. Ground squirrels also have a restricted distribution on Kodiak Island (Rausch 1953), and Osgood (1976) suggested that they were introduced from the Semidi Islands by Native peoples.

Land mammals are much more diverse on the Alaska Peninsula in comparison to Kodiak Island. Caribou and moose, both of which were important prey for some Alutiiq groups, are among the 30 species indigenous to the area. Caribou are found all along the Pacific coast of the peninsula, but their principal aggregations are to the north along the shores of Bristol Bay. The Alaska Peninsula caribou herd follows a fairly predictable pattern of seasonal migration, moving southwestward in the spring for calving in the Port Heiden-Port Moller area. In the fall, they return to winter grounds near Naknek River (Hemming 1971). Moose are most common in the interior, but they also are found along the Pacific coast, especially at the heads of bays. Brown bears range all along the Shelikof Strait coast, where they congregate along salmon streams during summer and fall. Wolves live on the Alaska Peninsula but are not abundant on the south coast.

Sea Mammals

Sea mammals were particularly important to the Alutiiq since coastal habitats of the Gulf of Alaska provided few fat or carbohydrate-rich plant foods that could serve as dietary staples. Protein sources are abundant, but the energy (calories) needed to survive in a cold subarctic environment requires efficient sources of fat or carbohydrates (Speth and Spielman 1983). Because of the dual protein and caloric needs of the human metabolism (Osborn

Table 4 Land Mammals of the Kodiak, Alaska Peninsula, and Prince William Sound Areas

Common Name/Taxon	Kenai	AK Pen	Kodiak	PWS
Masked shrew (*Sorex cinereus*)	X	X		X
Dusky shrew (*S. obscurus*)	X	X		X
Arctic shrew (*S. arcticus*)		X		
Northern water shrew (*S. palustris*)	X			X
Pygmy shrew (*Microsorex hoyi*)	X			
Little brown bat (*Myotus lucifugus*)	X	X	X	X
Tundra hare (*Lepus othrus*)		X		
Snowshoe hare (*L. americanus*)	X	X	I	X
Red squirrel (*Tamiasciurus hudsonicus*	X	X	I	X
Hoary marmot (*Marmota caligata*)	X	X		X
Arctic ground squirrel (*Citellus parryi*)		X	I?	
Northern flying squirrel (*Glaucomys sabrinus*)	X			X
Beaver (*Castor canadensis*)	X	X	I	X
Greenland collared lemming (*Dicrostonyx groenlandicus*)		X		
Northern bog lemming (*Synaptomys borealis*)	X	X	X	
Brown lemming (*Lemmus trimucronatus*)		X		
Tundra redback vole (*Cleithrionomys rutilus*)	X	X		X
Muskrat (*Ondatra zibethicus*)	X	X	I	X
Tundra vole (*Microtus oeconomus*)	X	X	X	X
Alaska vole (*M. miurus*)	X			X
Meadow vole (*M. pennsylvanicus*)	X			X
Longtail vole (*M. longicaudus*)				X
Meadow jumping mouse (*Zapus hudsonius*)	X	X		X
Porcupine (*Erethizon dorsatum*)	X	X		X
Gray wolf (*Canis lupus*)	X	X		X
Coyote (*C. latrans*)	X			X
Red fox (*Vulpes vulpes*)	X	X	X	X
Alaskan brown bear (*Ursos arctos*)	X	X	X	X
Black bear (*U. americanus*)	X			X
Shorttail weasel (*Mustela erminea*)	X	X	X	X
Least weasel (*M. rixosa*)	X	X		X
Mink (*M. vison*)	X	X		X
Marten (*Martes americana*)	X	X		X
Wolverine (*Gulo luscus*)	X	X		X
Land otter (*Lutra canadensis*)	X	X	X	X
Lynx (*Lynx canadensis*)	X	X		X
Moose (*Alces alces*)	X	X		
Sitka black-tailed deer (*Odocoileus hemionus*)			I	I
Roosevelt elk (*Cervus canadensis*)			I	
Caribou (*Rangifer tarandus*)	X	X	I	
Mountain goat (*Oreamnos americanus*)	X		I	X
Dall sheep (*Ovis dalli*)	X			

X=Present I=Introduced

(from ADFG 1973, 1978; Burt and Grossenheider 1976; Rausch 1969)

1977; Yesner 1981; Erlandson 1988a), sea mammals are an ideal source of nutrition. Rendered into oils, sea mammal fat also was used as a source of heat and light and as a medium to preserve perishable foods. Sea mammals provided skins for clothes, boats, and other products (see Chapter 4; Laughlin 1980:Table 4.3).

At least 20 species of sea mammals are found in Gulf of Alaska waters, including baleen and toothed whales, porpoises, dolphins, seals, sea lions, and sea otters. Virtually all are relatively large animals (Table 5) and some (i.e., sea lions) aggregate seasonally at haulouts or rookeries. Because of these and other attributes, several varieties of sea mammals were critical to Alutiiq subsistence both historically and before European contact.

Cetaceans

According to Fiscus *et al.* (1976; see also Mate 1980; Leatherwood *et al.* 1982; and Rice and Wolman 1983), seven species of migratory baleen whales are present in Gulf of Alaska waters during summer: blues, fins, seis, humpbacks, grays, rights, and minkes. Except for gray whales, which pass along the coast in large numbers on their way to Bering Sea feeding grounds, baleen whales stay in the Gulf of Alaska to feed on krill, fish, copepods, and other pelagic foods. Rice and Wolman (1983:Table 1) estimate North Pacific whale populations prior to

[Exxon Media Relations]

Figure 28 Humpback whale, Prince William Sound

Table 5 Marine Mammals of the Northwest Gulf of Alaska

	Western Gulf	PWS
Baleen Whales		
Blue (*Balaenoptera musculus*)	R	-
Gray (*Eschrichtius robustus*)	C	R
Fin (*Balaenoptera physalus*)	A	C
Sei (*Balaenoptera borealis*)	A	R
Minke (*Balaenoptera acutorostrata*)	A	C
Humpback (*Megaptera novaeangliae*)	C	A
Right (*Balaena glacialis*)	R	-
Toothed Cetaceans		
Whitesided dolphin (*Lagenorhynchus obliquidens*)	R	-
Killer whale (*Orcinus orca*)	C	A
Harbor porpoise (*Phocoena phocoena*)	A	A
Dall porpoise (*Phocoenoides dalli*)	A	A
Sperm whale (*Physeter catodon*)	A	-
Beluga (*Delphinapteris leucas*)	R	-
Beaked whale (*Mesoplodon stejnegeri*)	R	-
Goosebeak whale (*Ziphius cavirostis*)	R	-
Baird beaked whale (*Berardius bairdi*)	R	-
Mustelids		
Sea otter (*Enhydra lutris*)	A	A
Pinnipeds		
Steller sea lion (*Eumetopias jubatus*)	A	A
Northern fur seal (*Callorhinus ursinus*)	R	R
Harbor seal (*Phoca vitulina*)	C	A

R = rare C = common A = abundant

(from ADFG 1973; AEIDC 1974:Table 43; Brueggeman *et al.* 1989; Consiglieri *et al.* 1989; Hall 1979; Johannsen and Johannsen 1975; Science Applications 1980).

commercial hunting at 5,000 blues, 15,000 humpbacks, 15,000 grays, 42,000 seis, and 44,000 fins. No estimates are available for minke and right whales. Historical sources suggest that Alutiiq hunting of large baleen whales focused on humpback, fin, and minke whales. Whether actively hunted or scavenged off the beach, the large whale populations of the Alutiiq region represent a resource of potentially phenomenal productivity (see Chapter 4).

Twice a year, as many as 20,000 gray whales migrate between Baja California waters and the Bering and Beaufort seas. Most of these swim by the southeast coast of Kodiak Island, along the coast of the Alaska Peninsula, and through Unimak Pass (Leatherwood *et al.* 1982). A similar migration is undertaken annually by as many as 1,000 humpback whales which winter off Hawaii and Baja California, but humpback whales also enter Prince William Sound (Figure 28). Humpback whale populations were decimated by commercial overhunting and the size of their migration was much larger prehistorically.

Minke whales frequent nearshore waters, often feeding in bays and estuaries. Most migrate south in winter, but some individuals stay in Gulf of Alaska waters (Leatherwood *et al.* 1982). Minke whales are common in Prince William Sound during the summer (Hall 1979). Large fin whales are fairly common in outer Prince William Sound in the summer, but generally range further offshore, as do blue, sei, and right whales (Leatherwood *et al.* 1982).

Toothed cetaceans in Gulf of Alaska waters include harbor porpoises, Dall porpoises, whitesided dolphins, killer whales, beluga whales, and sperm whales (Science Applications Inc. 1980). Harbor porpoises are the most common cetacean in the area, feeding year round in shallow bays and estuaries (Leatherwood *et al.* 1982). According to Hall (1979), Dall porpoises are the most abundant cetacean in Prince William Sound, but they are common in shallow coastal waters throughout the region (Mate 1980). Though less common than the two porpoises, whitesided dolphins may be seen in summer in groups of several hundred and their remains have been found in Kodiak Island archaeological sites (Heizer 1956). Of the three larger species of toothed whales, it appears only the beluga was hunted regularly (Birket-Smith 1953), though carcasses of the others probably were consumed when washed ashore. Belugas are relatively small and frequent nearshore waters of bays and estuaries, but they are rare outside of Cook Inlet (Mobley *et al.* 1990:32). Killer whales are much more common in Gulf of Alaska waters, especially in the protected fjords and passages of Prince William Sound and Kodiak (Hall 1979). Sperm whales enter the Gulf of Alaska during summer, but they usually remain well offshore in deep waters (Leatherwood *et al.* 1982). While apparently not hunted prehistorically, sperm whales were taken commercially during the historic era.

Pinnipeds

Both eared and earless seals inhabit the northern Gulf of Alaska. Harbor seals are the most abundant and commonly observed pinniped in the coastal waters of southern Alaska. Harbor seals are year-round residents in nearshore waters, where they feed on fish and shellfish. They haul out frequently on rocks, sand bars, floating ice, or landfast ice shelves at the heads of bays (Figure 29). They are sometimes found in concentrations of hundreds or even thousands of animals, and adults weigh up to 115 kg (255 lb). The largest concentrations of harbor seals haul out on land for pupping in May and June, then again for molting from July to September.

Data on the abundance of harbor seals in different parts of the project area are unavailable, primarily because current survey techniques are inadequate for estimating populations (ADFG 1985b:4), but distribution data are available. According to the Alaska Department of Fish and Game (1973):

> The Alaska Peninsula has high densities of harbor seals near Puale Bay, in Wide and Kukak Bays, and in the Shakun Islets and Cape Douglas areas. Tugidak Island is the most important harbor seal haulout area in the Kodiak Archipelago, but others occur in Ocean Bay and Alitak Bay, in Perenosa and Seal Bays on Afognak Island, and on Ban and Shuyak Islands. On the Kenai Peninsula, concentrations occur at fjord heads, especially in Nuka Bay and Day Harbor. Harbor seals are common throughout Prince William Sound, with concentrations in College and Harriman Fjords, on Peak, Eleanor, Seal, and Perry Islands, and elsewhere.

Approximately 1.5 million northern fur seals migrate through Gulf of Alaska waters twice a year as they travel to and from rookeries on the Pribilof Islands. Although they range throughout the project area, most of this huge migration passes the outer islands of Prince William Sound, the southern Kenai Peninsula coast, and the east side of the Kodiak Archipelago. The northward phase of the migration begins in March and peaks in May and June. Some fur seals may winter in the gulf, though they generally are scarce from August to October. Unlike harbor seals and sea lions, northern fur seals rarely come ashore in the project area, spending their time feeding offshore. According to Burt and Grossenheider (1976:84), adult males weigh up to 270 kg (600 lb) and females up to 60 kg (135 lb).

Steller (or northern) sea lions, like harbor seals, are year-round residents that haul out to breed and bear their young. Haulout locations shift during the year, with populations concentrated at a relatively small number of rookeries from May to October. During fall and winter, sea lions disperse to more numerous but smaller haulouts (Calkins and Pitcher 1983). Scheffer (1972) estimated the 1960 population of Steller sea lions in the northwest Gulf of Alaska at between 40,000 and 50,000. Male sea lions weigh up to 900 kg (2,000 lb) when fully grown (Burt and Grossenheider 1976:82), while adult females may reach 270 kg (600 lb).

The largest modern sea lion concentrations (over 10,000 animals per haulout) occur off the east coast of Afognak Island and on the Barren Islands. Other large rookeries and haulouts (between 1,000 and 10,000 sea lions) are present on islets off the Alaska Peninsula coast at Puale Bay, the Semidi Islands, and Chirikof Island; off the east coast of Kodiak at Twoheaded Island, Sitkalidak Island and Ugak Bay; off the east coast of Afognak Island and the north coast of Shuyak Island; the Barren Islands; the Pye Islands and Chiswell Islands on the outer Kenai Peninsula coast; and in Prince William Sound off Cape Hinchinbrook and on Middleton Island (see cover photo).

Sea Otter

Sea otters are year-round residents of protected nearshore waters with submerged reefs and kelp

[Ron Riehs photo]

Figure 29 Harbor seals hauled out on ice floes in Icy Bay, Prince William Sound

beds, where they eat fish and shellfish. Sea otters swim, eat, and sleep on the surface of the water and only occasionally haul out on rocks. While solitary otters are common in areas of sparse population, pods typically contain between 10 and 30 individuals in densely populated areas, with maximum aggregations of over 400 animals (Kenyon 1969). Prior to European contact, sea otters were distributed all along the Gulf of Alaska coast. One hundred years of the commercial fur trade nearly drove them to extinction, and their modern distribution and abundance are not representative of the prehistoric period. Today, they are found throughout the project area though their abundance varies. Along the Alaska Peninsula, sea otters are plentiful near the capes south of Wide Bay and in the Shakun Islets south of Cape Douglas (ADFG 1973). As Reanier noted (Mobley *et al.* 1990:34), dense sea otter populations significantly affect the structure and productivity of nearshore and intertidal communities by depleting sea urchins and other kelp-grazing species, indirectly enhancing the growth of kelp beds which provide habitat for fish and sea mammals (Estes *et al.* 1978; Duggins *et al.* 1989).

Around Kodiak, sea otters are especially abundant on the north and west shores of Afognak Island and on the Trinity Islands. They are less abundant on the outer coast of the Kenai Peninsula (Schneider 1976), but there are major concentrations around the islands of southern and eastern Prince William Sound (ADFG 1973). Based on Kenyon's (1969:138) census and estimate that modern sea otter populations are only about 20% of prehistoric levels, the Kodiak area may have supported about 6,000 sea otters and Prince William Sound about 5,000.

Birds

Isleib and Kessel (1973:Table 1) list more than 180 species of birds that inhabit the northern Gulf of Alaska, including a variety of sea birds, shore birds, and land birds. Many of these probably were not exploited regularly by humans, but archaeological studies have identified the remains of over 40 species of birds in sites on Kodiak (Friedman 1934, 1935; Amorosi 1987) and the Alaska Peninsula (Grayson 1977). Data on the relative abundance and habitat preferences of Gulf of Alaska birds have been summarized in Mobley *et al.* (1990:Table 7). The size and distribution of modern sea bird colonies have been altered by historic introductions of foxes, rats, and cats (Jones and Boyd 1979). Pre-contact colonies were more numerous, but the location of modern colonies probably has remained stable over time, and their relative size may be roughly representative of prehistoric times (T. DeGange, pers. comm., 1991).

Many birds occupy the region seasonally. Where found in nesting colonies or other seasonal concentrations, sea birds and waterfowl were important sources of meat, eggs, and non-food materials (see Chapter 4).

Major sea bird aggregations are found in breeding and nesting colonies throughout the Gulf of Alaska, where DeGange and Sanger (1987) estimate that over 9,000,000 seabirds (of 26 species) nest at over 800 locations. The most abundant sea birds found in colonies are petrels, fulmars, puffins, murres, gulls, cormorants, and auklets. In the project area, Sowles *et al.* (1978) mapped 389 sea bird colonies, with an estimated population of about 1,500,000. Just to the southwest, however, the Semidi Islands contain nine huge colonies with over 1,500,000 birds (Sowles *et al.* 1978:Map 31). Several sea bird colonies in the project area contain over 100,000 birds, including several on the Semidi Islands and one on the Barren Islands. Large colonies such as these were important seasonal resource locations for hunter-gatherers.

Sea bird colonies are not evenly distributed, and the abundance of seabirds varies seasonally (Mobley *et al.* 1990:40). The Kodiak area has the most colonies (238), with an estimated population of over 378,000 birds. Just to the north, the Barren Islands contain seven more colonies, with over 650,000 birds. These two island groups combined contain more than two-thirds of the nesting sea birds in the project area. Seabird colonies are less abundant on the Alaska Peninsula (n=62), though populated by almost 310,000 birds (Sowles *et al.* 1978). There are 62 known sea bird colonies on the

Kenai Peninsula's outer coast, with an estimated population of about 116,000 birds (Figure 30). Several large colonies dominate the Kenai Peninsula population; more than half (61,000) of the seabirds are found in large colonies on the Chiswell Islands. Another 32,000 birds are concentrated in two large island colonies off the tip of the Resurrection Peninsula. Western Prince William Sound has relatively few sea bird colonies (51), with a population estimated at less than 56,000 birds. Once again, most of the population is concentrated at a few colonies, including 17,000 birds at a colony on Montague Island's southwest coast (Sowles *et al.* 1978).

Of 42 gulf shorebird species, few winter and only 15 breed there. Of the breeders, semipalmated plovers, black oystercatchers, spotted sandpipers, least sandpipers, and red-necked phalaropes are most abundant (Isleib and Kessel 1973). In contrast, 39 of 52 species of waterfowl winter along the coast, including 28 that breed there. Five types of loon occur in the gulf, but only the common loon, red-throated loon, and Pacific loon nest there. Trumpeter and tundra swans are common, with most tundra swans nesting on the Alaska Peninsula and Kodiak. Of five species of geese, only Canada geese and white-fronted geese breed in the region. Of 35 duck species, 22 breed along gulf coasts (DeGange and Sanger 1987). Of the migrant ducks, northern pintails are most common, though goldeneyes, buffleheads, and mergansers arrive first in the spring. According to DeGange and Sanger (1987), Prince William Sound provides winter habitat for up to 50,000 ducks, where mallards, harlequins, Barrow's goldeneyes, and common mergansers breed in forested areas. Numerous sea ducks summer there as well. Of the wintering ducks, oldsquaws and black scoters are more numerous in the Kodiak area, where mallards and goldeneyes are less numerous than elsewhere in the western gulf.

Spring migrations bring many land birds to the Gulf of Alaska (see Isleib and Kessel 1973). Among the larger species, bald eagles nest throughout the region in May and June, migrating out of the area from August to November. Willow, rock, and white-tailed ptarmigan live in the region, but the latter are relatively rare and absent from the Alaska Peninsula and Kodiak areas (ADFG 1978). Spruce grouse are found only on the Prince William Sound mainland and on the Kenai Peninsula (Isleib and Kessel 1973; ADFG 1978).

Marine Fish

Gulf of Alaska waters support at least 287 species of fish (OSCEAP 1987). Many of these fish are most accessible from late spring to early fall, when they are found in relatively shallow nearshore habitats or aggregated in rivers and lakes of the area. In much of the region, the most important seasonally abundant fish were salmon, although halibut, her-

[Ron Riehs photo]

Figure 30 Gull colony on the Aialik Peninsula, outer Kenai coast

ring, cod, and rockfish may have been equally or even more important locally.

Salmon and Other Anadromous Fish

Economically, the most important fish in local waters are salmon, with five species (pink, chum, sockeye, coho, and chinook) annually spawning in stream, river, lake, and intertidal habitats of the region. Runs of steelhead trout, Dolly Varden char, and sea-run cutthroat trout also occur, but their economic importance is limited. Local variations in the productivity, seasonal availability, and predictability of anadromous fish runs have major implications for human subsistence and settlement. Salmon generally spawn from late spring to late fall (May to November). After migrating to the sea as juveniles, surviving adults return to the spawning grounds where they hatched. Because of this predictability and aggregation, sizable salmon runs provide a bountiful and reliable food supply. In general, larger drainages support a wider range of anadromous fish, larger numbers of fish, and have fish available for a longer period of time (Schalk 1977).

A comparison of historic and prehistoric salmon distributions and populations is impossible because of the damage to individual runs caused by historic commercial fishing practices. Early 20th century commercial fish traps in the project area, as well as the illegal practice of seining fish at river mouths ("creek robbing"), destroyed whole runs of fish. Also, the artificial enhancement of anadromous species, especially pink salmon, has changed modern species composition in the region. Pink salmon from hatcheries constitute the majority of the modern commercial salmon harvest in Prince William Sound, for instance.

Salmon were (and are) most important economically in the Kodiak area, especially on western Kodiak where relatively large lake and river systems (i.e., the Karluk, Ayakulik, and Upper Station rivers) support massive annual runs that include many or all of the available species. In the Karluk River alone, over 3,000,000 salmon were harvested commercially in 1889 (Bean 1891:20) and annual runs of over 10,000,000 fish from all five species may have occurred prehistorically (Jordan and Knecht 1988:29). Rivers entering Uyak, Uganik, and Afognak bays also support important pink and chum salmon runs, and these species are found in many smaller streams. Pink salmon spawn in at least 240 streams in the Kodiak area from mid-July to mid-August, as well as in intertidal areas. Pinks account for about 80% of the annual commercial salmon catch (Strauch *et al.* 1980), and fisheries enhancement programs have augmented natural runs.

Sockeye salmon are second in importance on Kodiak, spawning near lakes where the fry remain for at least a year. The Karluk, Red, and Frazer River systems on southwest Kodiak Island are the primary spawning areas for sockeye. Chum salmon also have important runs on Kodiak, spawning in many of the same places as pink salmon. Coho and chinook salmon have limited spawning populations in the Kodiak Archipelago.

Prince William Sound anadromous fish runs are dominated by pink and chum salmon, with pink the more numerous (Tamm 1980). Chums return to the sound in mid-July, where the run overlaps with pink salmon returning in August (Rogers 1987). Anadromous fish runs, again mostly of pink and chum salmon, are relatively small along the Pacific shores of the Kenai and Alaska peninsulas (Tamm 1980; USFWS 1985; OCSEAP 1987).

Other Fish

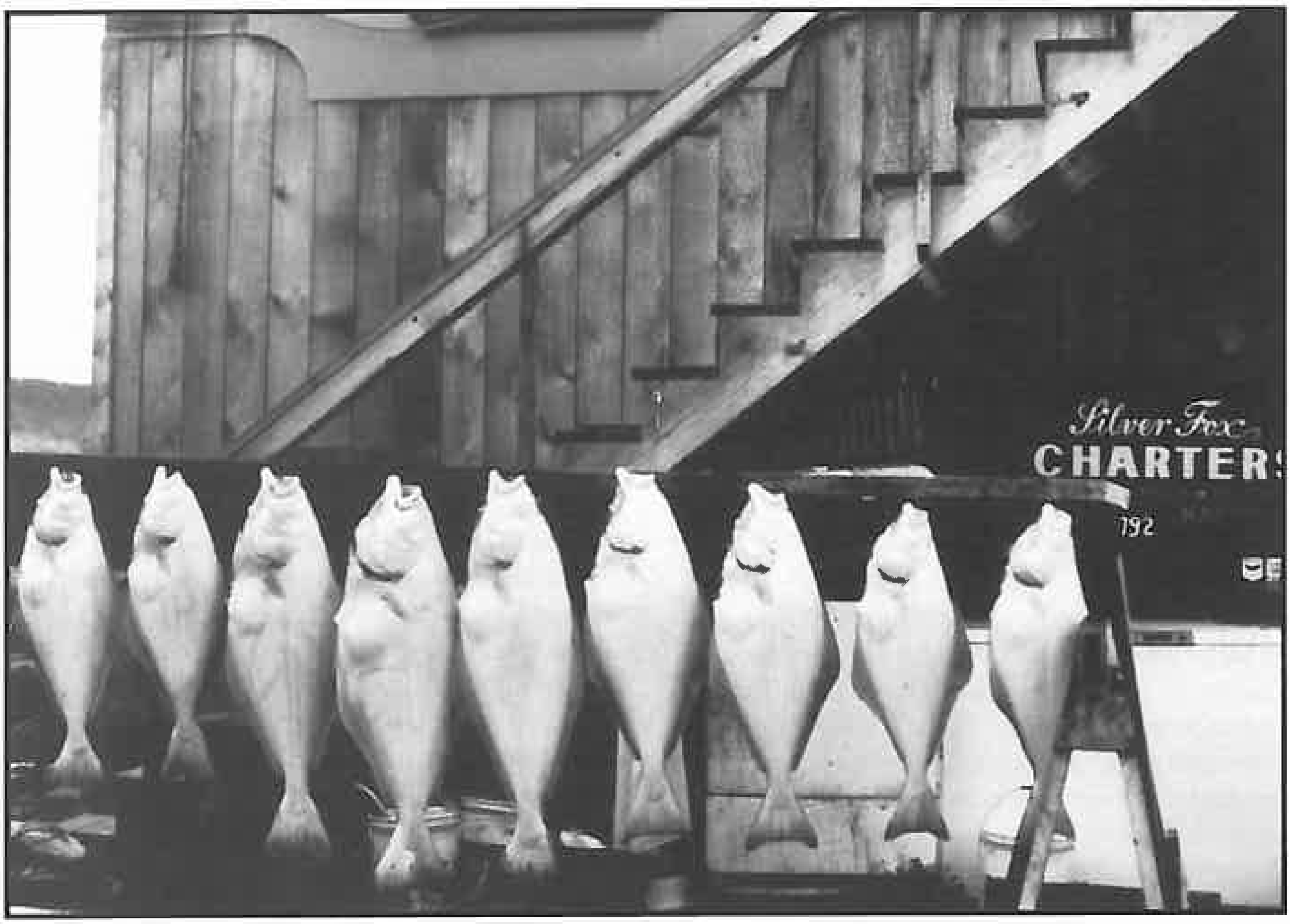
Over 100 species of fish are known in Kodiak waters (Rogers *et al.* 1987) and at least 72 species in Prince William Sound (Rosenthal 1983). Studies suggest that the diversity of marine fish populations peaks near the mouths of bays. The sheltered shallows of such bays also provide important nursery habitat for a number of species. Diversity and productivity generally are greatest in rocky kelp bed habitats, where rockfish and greenling are common. In more sheltered eelgrass habitats, tomcod, greenling, flounder, and rockfish are common, though less abundant than in productive kelp beds.

Ethnographic and archaeological data suggest that a variety of other marine fish were caught by

Alutiiq peoples. Pacific halibut can weigh more than 120 kg (400 lb), for example, and feed in shallow coastal waters during spring and fall (OCSEAP 1987). Most halibut spawn and winter further offshore at depths of 300 to 1,000 m (ca. 1,000 to 3,300 ft). Halibut tend to aggregate in specific locations, where their abundance and large size make them an attractive target for fishermen (Figure 31). Halibut flesh is rich in protein, but low fat content limits its caloric yield.

Large schools of herring swim in shallow coastal Gulf of Alaska waters during fall and winter. They spawn by the billions during the spring, depositing their eggs in nearshore waters, including the intertidal zone. Both the timing and specific locations of spawning grounds vary from year to year, but herring generally spawn in Prince William Sound from early March to early June and in Kodiak from May to mid-June. During the summer months, most herring school offshore for feeding (Tamm 1980:159). Both herring meat and eggs are rich sources of nutrients, and the fat-rich flesh can be rendered into an energy-rich oil.

Cod are found in shallow nearshore waters during the spring, arriving in "great shoals" according to Davydov (1977:232). Many varieties of rockfish can be found in nearshore waters. Like halibut, both cod and rockfish are good sources of lean meat, providing abundant protein but relatively little fat.



[USDAFS photo]

Figure 31 Halibut caught by sport fishermen in the Gulf of Alaska

Shellfish

As previously noted, the combination of convoluted coastlines and high tidal amplitude provides a relatively high percentage of both linear coastline and intertidal area per unit of land area. Gulf of Alaska intertidal zones are diverse, with the structure of communities depending on substrate, wave energy, water temperature and salinity, and other variables. Shellfish have been portrayed as low quality resources or "starvation foods" (e.g., de Laguna 1956; Osborn 1977; Bailey 1978), but the total biomass generated in intertidal communities can be very high. As a novice clam digger, Erlandson (1988a:104) was able to collect 2.3 kg (ca. five pounds) of shellfish meat per hour, for example, even in heavily exploited clam beds near Sitka in southeast Alaska. Shellfish also were available to virtually all members of society and required little or no technology to collect. For these reasons, the proximity of productive shellfish beds appears to have been an important determinant of village locations in many areas of the Gulf of Alaska.

Prehistoric groups in many parts of the Alutiiq region appear to have regularly exploited shellfish. The importance of shellfish is evident in massive accumulations of the shells of clams, mussels, and other edible shellfish in many coastal middens of the Kodiak Archipelago. While shellfish remains are often the most dominant visual constituent of coastal shell middens, their dietary importance generally is overemphasized relative to less visible midden constituents like fish and mammal bones (Bailey 1978).

Most shellfish collected by Alutiiq groups appear to have come from the intertidal zones of two basic habitats: rocky shorelines and mixed gravel/sand/mudflats. These habitats are found throughout the project area, but their extent and productivity vary within the region. The primary shellfish collected along most rocky shorelines was mussels, including the bay mussel (*Mytilus edulis*) typical of sheltered bay habitats (Figure 32), and the larger California mussel (*M. californianus*) found along wave-swept shorelines of exposed coasts. Both mussels attach to rocks in the middle intertidal zone, sometimes in dense mats that can contain several thousand individuals per square meter (Wessen 1982). In some areas, late spring or summer "red tides" (dinoflagellate blooms) cause mussels (and other filter-feeding shellfish) to concentrate toxins in their flesh. Eating tainted mussels can cause illness or death from paralytic shellfish poisoning (PSP). Nonetheless, the daily availability, aggregation, and ease of collecting often made mussels an important source of fresh meat and complete protein during the rest of the year.

Other shellfish commonly collected in rocky shore habitats include several types of chitons, including the black katy (*Katharina tunicata*) and giant chitons (*Cryptochiton stelleri*) generally found in the low intertidal; sea urchins (*Strongylocentrotus drobachiensis*) also found in lower intertidal habitats; and various types of barnacles (*Balanus spp.*), limpets (*Acmaea spp.*), and dogwinkles (*Thais* or *Nucella spp.*). Barnacles, limpets, dogwinkles, and a variety of small gastropods are found in many shell middens, but they generally were of minor economic importance.

A variety of burrowing shellfish can be found in great abundance in the mixed mud/gravel/sand tideflats common in sheltered bays and other protected habitats. Some of these (i.e., the cockle, *Clinocardium nuttalli*) occasionally can be found at the surface, but most have to be dug from the mudflats with digging sticks or other equipment. Two medium-sized clams appear to be most common in middens of the area, including the smooth Washington clam (*Saxidomus giganteus*) and the smaller littleneck clam (*Protothaca staminea*), both relatively shallow burrowers often found together in the middle intertidal. The large horse clam (*Tresus nuttalli*) can reach lengths of 25 cm (10 in), but its habit of burrowing deep in the mud (Morris 1966:32) makes it difficult to capture and may account for its lesser abundance in many shell middens. Several other clams (*Tellina lutea, Mya truncata, Hiatella arctica*) are found in sheltered mudflats of the project area.

Razor clams (*Siliqua patula*), generally found in the low intertidal zone of wave-swept sandy beaches (Kozloff 1983:260-261), are an important shellfish resource in some areas. They may be more important today than in the past, however, since they are available only at minus tides and are difficult to catch, even with metal shovels (de Laguna 1956:6). De Laguna noted that several razor clam beaches existed in Prince William Sound but found few razor clam shells in the middens she examined. They are abundant in some Cook Inlet middens (e.g., Reger 1987), and may have been exploited intensively in some parts of the project area.

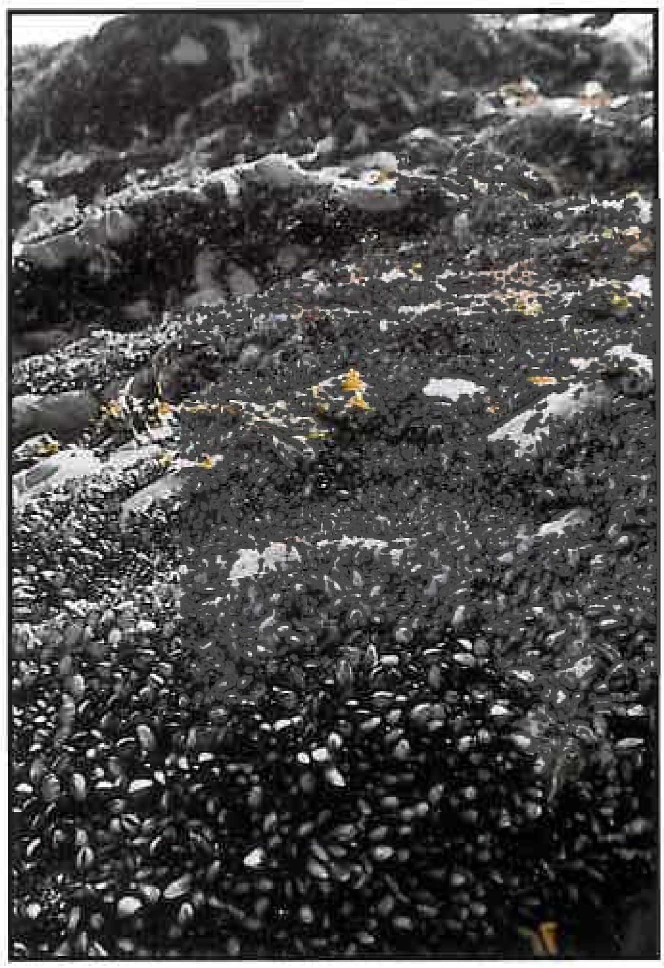
While productive shellfish beds are found along the shores of Prince William Sound, the Kenai Peninsula, the Kodiak area, and the Alaska Peninsula, they are not distributed evenly. As mentioned earlier, unprotected coastlines exposed to very high wave energy are often nearly devoid of edible shellfish. Shoreline surveys along many kilometers of wave-battered coast in the Puale Bay area on the Alaska Peninsula, for example, found almost no productive shellfish beds. In contrast, Jordan and Knecht (1988:228) estimate that between 50% and 100% of the Kodiak coast contains productive shellfish beds.

Other variables that can limit the productivity of intertidal resources include sediment deposition at the mouth of glacial streams and the formation of winter sea ice at the head of some bays. Tidewater glaciers, particularly prevalent in parts of Prince William Sound and the Kenai Peninsula, often produce extensive sediment plumes that prevent productive shellfish beds from becoming established over a wide area. Winter sea ice is not widespread in the Gulf of Alaska but can be found in some sheltered bays and areas of large freshwater outflow such as northwest Prince William Sound (Brower *et al.* 1977). Sea ice also forms in some areas on either side of Shelikof Strait, though only in the most protected lagoons and bay heads (Jordan and Knecht 1988:228).

Environmental Diversity and Continuity in the Alutiiq Region

Although the Alutiiq region has been characterized as ecologically homogenous (W. Workman 1980b), significant variation exists in the physical and biological environments of the area. Spatially, such variation is evident on a number of scales: from differential resource distributions within a single bay, to differences between bay systems within a larger area (i.e., the Alaska Peninsula), to variability in the availability and productivity of resources within discrete geographic areas (e.g., the Kodiak Archipelago vs. Prince William Sound) of the Alutiiq region.

Variation in the distribution and productivity of resources is substantial enough to have significantly affected the types of adaptations that various groups practiced, a subject examined in greater de-



[Exxon Media Relations]

Figure 32 **Dense mat of blue mussels in the Gulf of Alaska**

tail in Chapter 7. At any given point in time, the differential distribution of resources affected life on the coast, particularly when resource distributions are considered together with demographic and social factors. The inter-relationship between resource distributions, environmental conditions, and cultural factors influenced where hunter-gatherers settled, how they moved across the landscape seasonally, what resources they exploited, what types of tools they made and used, and how they interacted with their neighbors.

Temporal changes in the environment also influenced maritime hunter-gatherer adaptations of the region. Temporal variations operate on varying scales. Local or short-term resource fluctuations, for instance, occur in virtually all ecosystems and encourage humans to diversify their subsistence options. Maritime hunter-gatherers were active participants in the coastal ecosystem and affected the productivity of the plant and animal populations they depended on for a living.

Catastrophic environmental changes caused by large earthquakes, tsunamis, or volcanic eruptions occur periodically and are more difficult for human groups to plan for. More gradual environmental changes also affected human adaptations in the region, two prominent examples being late Holocene glacial expansions of Prince William Sound and the Kenai Peninsula, and the gradual spread of spruce and hemlock rainforest from east to west across the region.

On the regional level, along with evidence for spatial and temporal variation in the environments of the project area, there is evidence for substantial continuity through space and time. As Workman (1980b) has pointed out, many of the same types of resources are available throughout the region, and this is particularly true of marine resources. The presence of these common resources (e.g., salmon, sea mammals, shellfish, sea birds), despite differences in their relative productivity, has led to generally similar adaptations among Alutiiq groups.

Evidence for temporal continuity among resources, particularly for the economically important marine resources, is also substantial. On much of Kodiak Island and the Alaska Peninsula, for instance, there appears to have been little dramatic change in the types of plants and animals available for human exploitation for several thousand years. Due to the importance of marine resources among the Alutiiq and their ancestors, temporal variation in resource distributions may have had less dramatic effects than on hunter-gatherers living in other regions.

CHAPTER 4

CULTURAL AND HISTORICAL BACKGROUND

Exxon's 1989 and 1990 archaeological field surveys identified 326 previously unrecorded archaeological sites in the project area. The site types recorded range from villages, camps, forts, rock paintings, and fish traps to mines, cabins, fox farms, canneries, and World War II facilities. How can these varied finds be understood in the context of at least 9,000 years of Gulf of Alaska history and prehistory? What do they add to our knowledge of past patterns of land and resource use, demographic trends, and cultural change?

This chapter builds a foundation for answering such questions by summarizing the cultural and economic history of southcentral Alaska. It describes Alutiiq material culture, maritime subsistence, settlement patterns, and social organization during the late 18th and early 19th centuries. Historical developments are discussed for the Exploration period (A.D. 1741 - 1783), the Maritime Trade period (A.D. 1784 - 1866), and the American Commercial period (A.D. 1867 - present) with an emphasis on cultural interaction and the effects of European contact on Alutiiq societies. Finally, we summarize the archaeology of the Alutiiq region from a combined historical, ecological, and evolutionary perspective.

The ethnographic Alutiiq way of life was linked to that of earlier generations and provides a starting point for interpreting the pre-contact archaeological record. Ethnohistoric data must be used cautiously in interpreting archaeological data, however, because of the biases of many early observers and because culture change was continuous before and after the arrival of Europeans. For years, anthropologists have used ethnographic analogy to reconstruct the past by uncritically applying behavioral models based on post-contact lifeways to the archaeological record. This practice has been common along the northwest coast of North America, despite clear evidence that European contact caused massive and very early economic, social, and political changes in Native societies. By the time the first systematic ethnographies were collected (often not until the early 1900s), Native societies had been altered dramatically by economic, demographic, socio-political, and technological changes. Historic and ethnographic accounts have great utility in understanding the past, especially the changes caused by European contact. Rather than structuring our perceptions of the past, however, archaeological data are best used to test the validity of the ethnographic record as a reflection of the more distant past and to understand changes in Native societies that resulted from European contact.

The Alutiiq of Southcentral Alaska: Ethnohistoric Description

When European explorers like Bering, Cook, and Arteaga first sailed into the Alutiiq region in the 18th century, they encountered a population of at least 9,000 to 10,000 people in about 100 villages spread out along nearly 10,000 km (6,200 mi) of convoluted coastline. Despite the distances involved, ease of maritime travel and trade promoted cultural and linguistic unity among this population. Local differences in dialect and culture were present, but commonalities in economy, art, religion, and social organization predominated. Alutiiq contacts with neighboring peoples were extensive and trade goods, people, and cultural influences from Aleut, Southwest Alaskan Eskimo, Tanaina, and Northwest Coast Indian areas had been entering the region for millenia. Interaction between these groups contributed to the richness and diversity of Alutiiq art, ceremony, and material culture.

Language and Territories

At the time of European contact, Alutiiq peoples occupied an area extending from roughly west of the Copper River Delta to just west of the Chignik and Stepovak Bay areas on the Alaska Peninsula. This area encompassed all of Prince William Sound, the outer coast of the Kenai Peninsula, the Barren Islands, the Kodiak Archipelago, and the Pacific coast of the Alaska Peninsula from Kamishak Bay to Stepovak Bay (Figure 33). The Chugach occupied Prince William Sound and the closely related Unegkurmiut occupied the outer Kenai Peninsula. The most populous Alutiiq territory was on Kodiak, home to the Koniag, who also settled the Alaska Peninsula as far west as Kupreanof Point. The homeland of the Alaska Peninsula Koniag, sometimes referred to as the Peninsular Eskimo (Oswalt 1967a), extended northward to the southern coast of Bristol Bay. The little-known Aglurmiut Eskimo were the Koniag's neighbors on Bristol Bay (Fitzhugh and Crowell 1988:46).

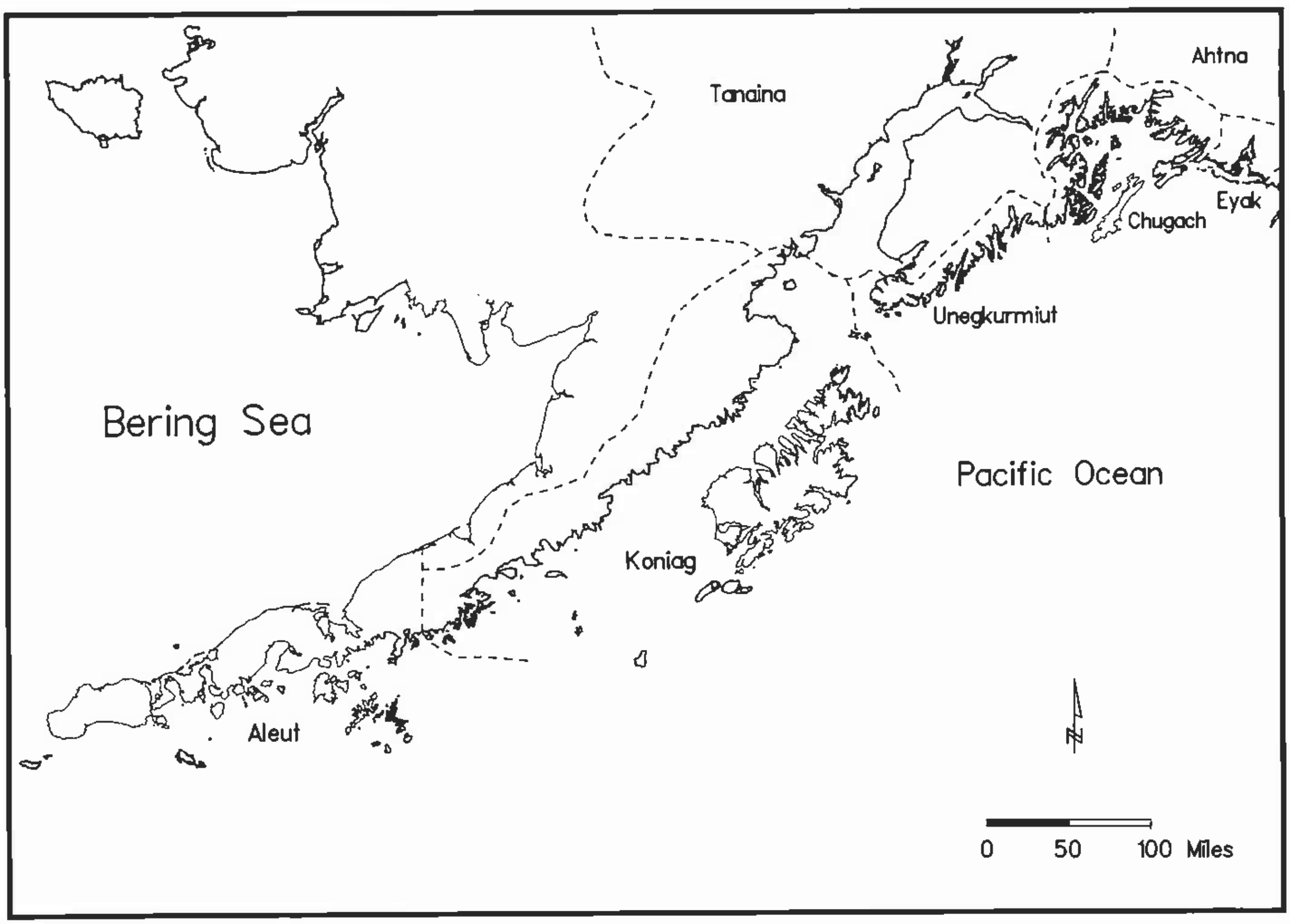
We use the term "Alutiiq" as a cultural designation embracing all these groups, one essentially synonymous with "Pacific Eskimo." Alutiiq is also the term used by linguists for the Yupik language spoken throughout the region (also called Sugpiaq, suk/suk, and Sugcestun). Linguists consider the Koniag and Chugach tongues to be separate dialects of Alutiiq, while speech differences between Kodiak Island and the Alaska Peninsula, and between Prince William Sound and the Kenai Peninsula, are at the sub-dialect level (Woodbury 1984:53). Alutiiq is the term preferred by Koniag and Chugach descendents themselves to refer to their collective culture (Pullar and Knecht 1990:9). More specifically, Alutiiq peoples refer to themselves as members of the Qikertarmiut ("people of Kodiak Island"), Aglegmiut ("people of the Alaska Peninsula"), and Paluwigmiut ("people of Prince William Sound"). The Koniag and Chugach also identified themselves as members of local groups like the Uyaksarmiut, the "people of Uyaksaq" or Uyak Bay (Pullar and Knecht 1990:9-10; see also de Laguna 1956).

Historical Demography

Contact with Europeans began with the earliest Russian, British, and Spanish explorations between 1741 and the late 1770s, and intensified after 1784 when the first permanent Russian settlement was founded on Kodiak Island. These contacts would prove to be disastrous for Alutiiq peoples. Population decline was rapid due to introduced diseases (especially smallpox); forced dispersal of sea otter hunters and their families to Russian American Company outposts in the Kurile Islands, the Aleutians, Sitka, and California; heavy losses among hunters on long distance sea otter hunting expeditions due to storms and enemy attacks; and economic disruption and starvation among home populations because of company labor commitments and the absence of hunters.

Exact losses are impossible to calculate for the early years. Lisianskii's (1814:193) estimate of 8,000 for the original population of Kodiak was a very rough guess. Russian counts of 6,510 Koniags in 1792 and 6,200 in 1796 included villages on both Kodiak and the Alaska Peninsula (Petroff 1884:33). Later figures for Kodiak are 4,000 in 1805 (Lisianskii 1814:193), 3,934 in 1806 and 2,900 in 1825 (Khlebnikov 1979:24), and 1,500 in 1839 (Tikhmenev 1978:200). The first U.S. census in 1880 recorded 1,354 Koniags and 678 Creoles in 16 villages on Kodiak and Afognak islands, and 330 Koniags and 66 Creoles in seven villages on the Alaska Peninsula's Pacific coast (Petroff 1884:28). Tikhmenev estimated that there were originally about 65 villages on Kodiak. It is very likely that the Koniag numbered well over 10,000 individuals at contact, and that populations were declining *at or even before* direct contact because of European diseases spread through Native trade and conflict.

Population estimates for the Chugach range from about 400 to almost 1,000 in the years between 1792 and 1839, with no clear pattern of decline because counts variously included or excluded Creoles and Athapaskan Indians of the Copper River and Kenai Peninsula (Hassen 1978). By 1880, the Chugach



[adapted from McCartney 1988:39]

Figure 33 Ethnic boundaries in Alutiiq region, 19th century

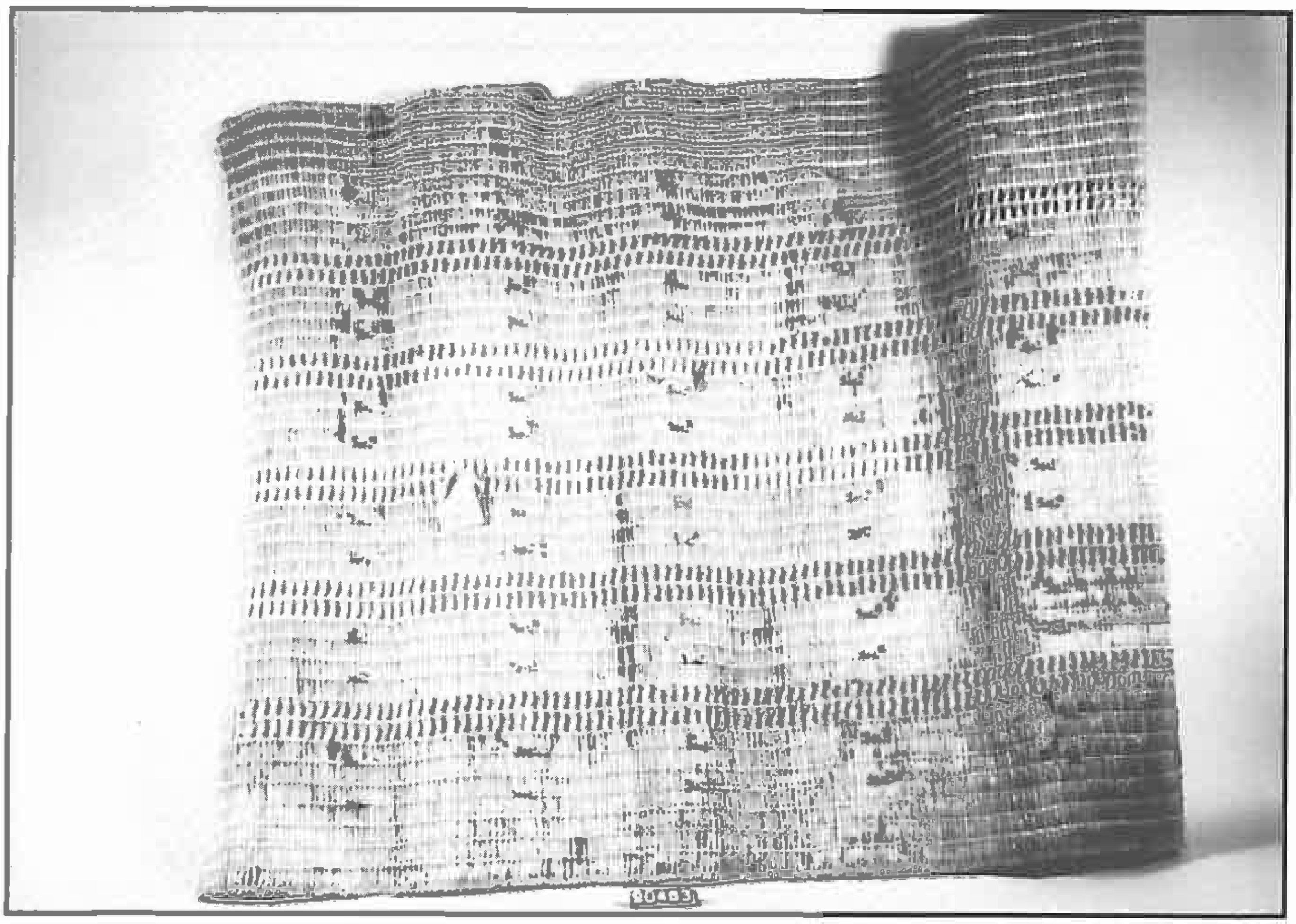
population had dwindled to 267, and the number of winter villages had dropped from eight to four (Petroff 1884:28). Eleven Creoles at Nuchek were also counted. No early census data are listed in Petroff for the Unegkurmiut. In 1880, they numbered only 32, all living at Yalik.

Products of Traditional Life

Our descriptions of Alutiiq material culture are necessarily brief. Illustrations and further information may be found in Birket-Smith (1941, 1953); Ray (1981); D. Clark (1984b); and Fitzhugh and Crowell (1988).

Houses and Domestic Implements

Koniag houses were large semi-subterranean sod-covered dwellings with a central room and several low side-chambers used as family sleeping areas or for steam bathing. According to Lisianskii (1814), they accommodated extended households averaging about 18 people. The main room had a square doorway (lacking the entrance tunnel of more northerly Eskimo houses), a central open hearth below a smoke exit and skylight, and covered sub-floor drainage channels. The central chamber served as a communal dining area, workshop, and storeroom. Chugach plank-walled



[A. Crowell photo]

Figure 34 **Woven sleeping mat - Chugach circa 1880s (Fisher Collection, National Museum of Natural History, #90463)**

houses were rectangular and completely above ground, with round doorways at each end, central hearths, smoke vents, interior sleeping chambers, bath chambers, and drying racks. The design was similar to houses of the neighboring Eyak and to Northwest Coast houses in general. Semi-subterranean houses also were used by the Chugach, and Russian-style log cabins were built after contact.

Domestic containers, furnishings, and utensils included grass and spruce root basketry, woven sleeping mats (Figure 34), bird skin blankets, stone oil lamps, carved and bentwood boxes (Figure 35) and bowls, large pottery cooking or oil-rendering vessels, chipped chert and ground slate knives, beaver tooth knives (Figure 36), and spoons and ladles made of wood, bone, and mountain goat horn. Vessels and utensils were painted and carved with zoomorphic designs, often depicting birds (Figure 37) and sea mammals. Iron knives, imported ceramic plates and teacups, copper kettles, and other trade items were in limited supply under Russian rule, and slowly replaced traditional items during the early contact period. In 1839, an agreement between the Russian American Company and the Hudson's Bay Company made a greater variety and abundance of imported trade goods available.

Hunting and Fishing Equipment

Most hunting equipment was designed for taking sea mammals, and many specialized techniques for seal, sea lion, sea otter, whale, and porpoise hunting are described below. Various types of darts were probably the most commonly used weapons. These had light wooden shafts, fletched proximal ends, and barbed or toggle style bone points (Figure 38). The point was connected to the shaft of the dart with a braided sinew cord and detached upon impact with its target. The weapon shaft (often attached to an inflated bladder) was towed by the wounded animal, impeding its escape. Darts could be thrown with great force, accuracy, and range

[A. Crowell photo]

Figure 35 **Bentwood box - Chugach circa 1880s (Fisher Collection, National Museum of Natural History, #168637)**

[A. Crowell photo]

Figure 36 **Beaver tooth knife - Koniag circa 1880s (Fisher Collection, National Museum of Natural History, #127787)**

with a wooden throwing board, which acted as a mechanical extension of the hunter's arm. Harpoon arrows with barbed bone points, used in sea otter hunting, were shot from kayaks using a sinew-backed bow. They were stored in painted wooden quivers. Other weapons included bird darts with barbed prongs for entangling wings, and heavy hand-thrown harpoons for sea lion, fur seal, and small whale hunting. Land hunting for caribou, mountain goat, bear, and smaller game was done with bows and arrows, snares, traps, and deadfalls. Fishing methods, described in detail later in the chapter, used a variety of hooks, nets, weirs, and traps.

Firearms played a small role in Alutiiq subsistence throughout the Russian period. Like other trade goods, guns, ammunition, and gunpowder were expensive and scarce, and their acquisition by Native people was inhibited by the Russians out of fear of insurrection. Gun shots also frightened away sea otter herds not disturbed by arrow and dart hunting. Furthermore, the carcasses of many sea mammals sank and were lost after being shot with firearms.

Boats

Kayak (Alutiiq *qayaq*; Russian *baidarka*) frames were constructed from dozens of carved wood components, fitted with a cover of processed seal or sea lion skins, and waterproofed with rendered oil. Upturned bows were a distinctive stylistic feature. One, two, and three hatch models were constructed, the latter apparently a post-contact innovation to allow carriage of an extra (often Russian) passenger. Hunting weapons, lines, floats, extra paddles, and other gear were carried on the front deck of the boat. Umiaqs (Alutiiq *angyaq*, Russian *baidar*) were open skin boats requiring half a dozen or more paddlers (Figure 39). The largest could carry 20-30 people or a large amount of cargo. Wooden dugouts also were used by the Chugach.

Clothing

Alutiiq dress emphasized elegance as well as protection from the elements. Light, transparent, and waterproof shirts and full-length kamleikas (hoodless frocks with false sleeves) were sewn from seal, sea lion, and bear intestines. Seams were often ornamented with embroidery and tassels of hair or feathers. Gutskin shirts worn by hunters were fastened to a spray skirt around the cowling of the kayak cockpit, creating a waterproof seal that kept water from entering the boat in heavy seas. Full-length frocks made of sea otter fur or the iridescent necks of cormorants were decorated with dyed hair embroidery, feathers, and puffin beaks. A wide range of headgear was worn for everyday and ceremonial occasions, including Northwest Coast-style basketry hats, caps of painted gutskin, beaded dance headdresses, seal effigy hats, and bent-wood hunting hats (Figure 40). The latter, painted and decorated with ivory carvings, sea lion whiskers, and beads, were worn in the Aleutians as well. Skin boots and mitts were worn with woven grass liners to absorb perspiration and provide insulation (Figures 41, 42). Clothing and personal accessories (beads, earrings, tattoos, labrets, nose pins, face paint) reflected artistic elaboration, religious beliefs, and social complexity. Rich and elaborate or-

[A. Crowell photo]

Figure 37 **Carved bowl with zoomorphic design - Chugach circa 1880s (Fisher Collection, National Museum of Natural History, #168623)**

namentation was a sign of high status in political and ceremonial affairs.

Masks and Ceremonial Art

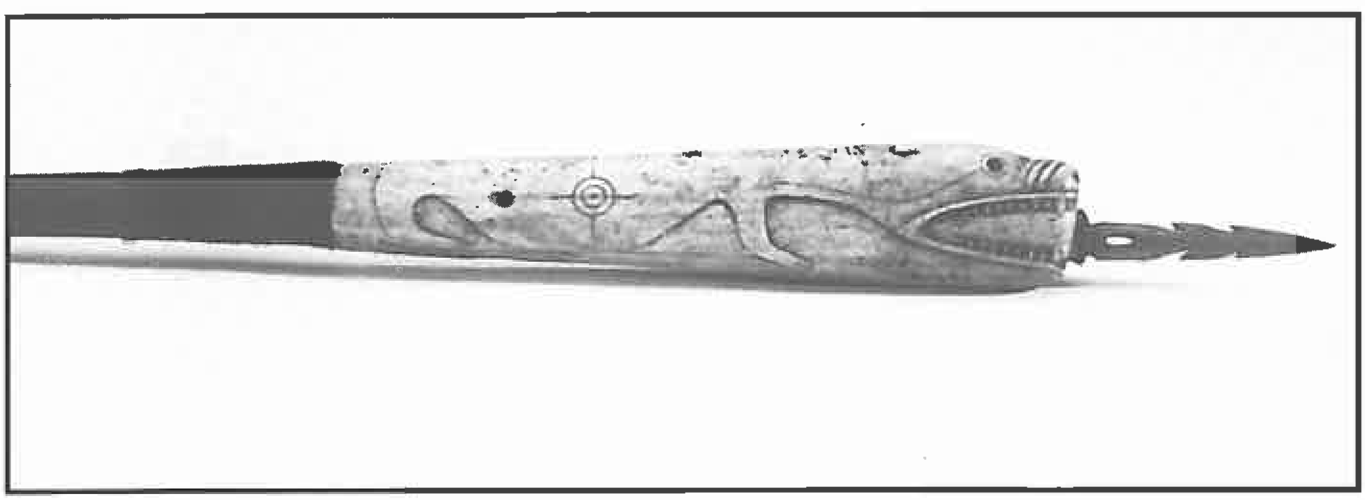
Winter hunting festivals and potlatches were occasions for dancing with masks, rattles, and headdresses. Spirit masks had a complex iconography expressed in the carving of the face, polychrome painted designs, and the embellishment of encircling hoops with feathers, quills, and wooden bangles. Dance headdresses, consisting of skull caps with long tails and dangling eye flaps, were made before contact with shell beads and later with dentalium shells and many colors of glass trade beads. Singing, drums, and hoop rattles hung with masses of puffin beaks provided music for dancers dressed in elaborate clothes, headdresses, and hunting hats. Large and small wooden figurines, miniature masks, dance wands, and bird rattles also were used by dancers and shamans.

Living on the Coast

Traditional Alutiiq subsistence was based on comprehensive knowledge of the habits and habitats of the fish, mammals, birds, plants, and invertebrates of the coastal environment. Many different tools and techniques - adapted to particular circumstances of season, weather, sea conditions, topography, and prey behavior - might be used in the pursuit of a single species of animal. The annual cycle of hunting, fishing, and harvesting activities was linked to seasonal moves between large villages and temporary camps.

Subsistence pursuits and settlement moves followed a seasonal schedule linked to variations in the biological productivity of the sea. Under spring conditions of water column stability, increased sunlight, and high nutrient levels, the Gulf of Alaska undergoes a bloom of phytoplankton growth, followed by a rapid increase in zooplankton and other invertebrate populations. The breeding cycles and migratory patterns of salmon, bottom fish, sea mammals, and birds are synchronized with this seasonal expansion of the food supply, dramatically increasing the amount of food available to human harvesters.

Winter in the Gulf of Alaska restricts maritime hunting activity as migratory species depart, the number of daylight hours decrease, and stormy sea conditions increase the risks of sea travel. Winter and spring sea ice, which provides a variety of



[Courtesy Smithsonian Institution]

Figure 38 **Bone point with carved socket piece - Aglurmiut circa 1880s (Fisher Collection, National Museum of Natural History, #127766 & 127777)**

subsistence opportunities (sealing at breathing holes, ice fishing, etc.) to more northerly maritime groups, is largely absent in the warmer waters of southcentral Alaska. Traditional subsistence activities diminished sharply during winter, a time devoted to feasts, ceremonies, manufacture and maintenance of equipment, and relaxation. Stored supplies of dried fish, meat, sea mammal fat, and plant foods provided winter sustenance, supplemented by the available food reserves of the intertidal zone.

Subsistence and settlement patterns are considered in some detail in this section because of their importance for understanding archaeological site types and their distribution on the coastal landscape. Ethnohistoric, archaeological, and environmental data are combined in discussions of hunting, fishing, collecting of shellfish and plant foods, diet, and seasonality of resource use.

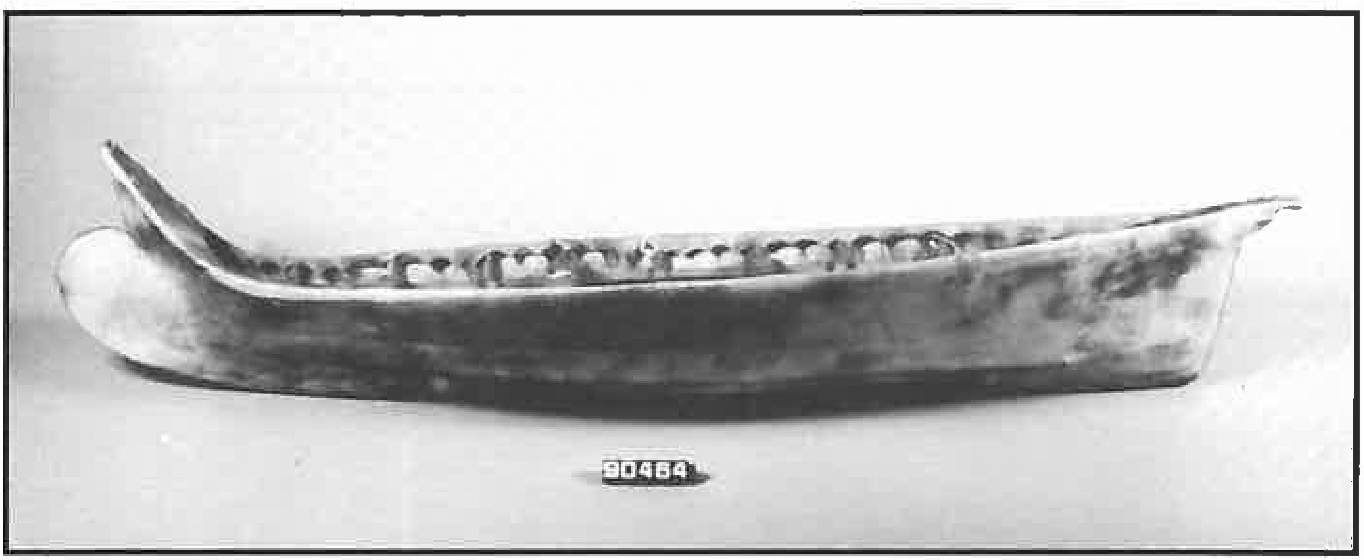
Fishing

Fish, especially salmon, herring, halibut, and cod, were the primary staple of the traditional Alutiiq diet. Eulachon, sculpin, flounder, and tomcod also were relied on. Fish were eaten fresh, dried, smoked, boiled, and fermented. Large quantities of dried fish, "piled high along the walls" according to Holmberg (1985:41), were stored in Alutiiq houses for winter use.

Anadromous Fish (Salmon, Trout, and Char)

All five North Pacific salmon species (along with steelhead trout and char) have annual spawning runs in Gulf of Alaska rivers and lakes (Chapter 3). Variations in the quantity, predictability, and seasonal duration of anadromous fish runs affect human subsistence use. Larger drainages tend to support greater numbers of fish and more species due to more extensive and varied bottom habitat and greater annual stability of water temperatures, which also reduces variation in the timing of runs (Schalk 1977).

Most Koniag and Chugach salmon fishing was done at stone or log and stake weirs built across stream and river channels or entrances (Birket-Smith 1953:41; Davydov 1977:231; Gideon in Black 1977:99; Portlock 1789:253). Numerous V-shaped stone weirs, which may date from the Russian pe-



[A. Crowell photo]

Figure 39 Umiaq model from Karluk - Koniag circa 1880s (Fisher Collection, National Museum of Natural History, #90464)

riod but probably are pre-contact, cross the Karluk River on Kodiak (Bean 1891; Jordan 1983). Intertidal weirs built of stones or wooden stakes on the Kenai Peninsula and Prince William Sound (Lobdell 1976b; Mobley *et al.* 1990; Figure 81) may have been designed to capture pink or chum salmon, which (along with herring and other fish) spawn in intertidal areas. During falling tides, Unegkurmiut beaters in kayaks and on foot trapped salmon behind wooden weirs built across the lower English River. Other weirs were built in pools below waterfalls farther upstream (Stanek 1985). Weir construction may not have required particularly large labor commitments; Chugach salmon weirs were built by "several persons in common," who had exclusive rights to the facility (Birket-Smith 1953:96). Various implements (harpoons, gaffs, leisters, dip nets) and even bare hands were used to capture fish trapped behind weirs. Caught salmon were cleaned, split, and dried on racks for winter storage.

Weir fishing was not completely fail-safe, as Davydov (1977:231) noted on Kodiak in 1802-3:

> But just as a harvest of corn is not always successful, so the catch of fish is not always sufficient. This happens for various reasons: a heavy snowfall, or heavy rains in the springtime which cause the water in the rivers to rise to a great height and the speed of the current carries away the weirs and all the fish go right upstream.

Loss of a weir in a springtime flood was probably less disastrous than it seems, however, since the runs did not peak until late summer and early fall.

[Courtesy Smithsonian Institution]

Figure 40 **Bentwood hunting hat - Alaska Peninsula Koniag circa 1880s (Fisher Collection, National Museum of Natural History, #90444)**

The use of dip nets, or possibly seines, in river fishing is attested by some of the earliest outside observers in the Alutiiq region (Coxe 1780:117; Merck 1980:106), contrary to assertions by Holmberg (1985:46) and others that fish nets were not used until introduced by the Russians. Wooden or woven grass salmon traps were also set in river mouths (Birket-Smith 1953:41).

Pacific Herring

The Chugach harvested herring with leisters, fish rakes, and small nets. Roe deposited on seaweed is collected from the intertidal today, and this was probably a pre-contact practice as well (Stratton and Chisum 1986). According to Birket-Smith (1953), the Chugach fished for herring from June until November, weather permitting. Given the general pattern of offshore feeding by herring during the mid-summer months, the intensity of the fishery was probably low during July and August. Herring fishing may have started earlier than June, given the usual timing of the spawn in Prince William Sound. Modern residents of Chenega also take herring in the winter. No description of traditional Koniag herring fishing is available, though several vertebrae were found in a soil sample from the Late Koniag village of KOD-177 (see Chapter 6).

Pacific Halibut

Halibut are large bottom fish that spend the spring, summer, and fall in relatively shallow coastal waters. They were caught with large V-shaped, barbed wooden hooks similar to traditional Northwest Coast types (Birket-Smith 1941:Figure 22). Halibut are especially abundant around Kodiak Island and were listed by Davydov (1977) as the most important saltwater fish taken by the Koniag (Figure 43). Most halibut fishing was done in the early summer (May - June), prior to the major salmon runs (Billings in Merck 1980:206; Sauer 1802:178; Birket-Smith 1953:39). In addition to hook and line fishing, Merck notes that the Koniag caught halibut near the shore using "darts, which serve them in place of gaffs."

Cod

Cod are found near shore in the spring, arriving in "great shoals" according to Davydov (1977). The Koniag fished them from kayaks using large hooks rigged to a weighted kelp line which suspended the bait just off the sea bottom. Chugach cod fishing was primarily in early summer, although cod were available and caught throughout the year in calm weather. Pinart (1875a:14) describes Koniag ice fishing, probably for cod or tomcod. The enormous fish populations available prior to commercial exploitation provided Alutiiq people with a reliable and accessible resource.

[A. Crowell photo]

Figure 41 **Fishskin boots - Aglurmiut circa 1880s (Fisher Collection, National Museum of Natural History, #90460)**

Sea Mammal Hunting

Dried, roasted, or stone-boiled sea mammal meats were major contributors to the Alutiiq diet. Sea mammal fat and rendered oil were valued as everyday and ceremonial foods, often served with dried fish and other dishes as gustatory and nutritional complements. Fat and oil also were used to preserve fish, bird eggs, berries, seaweed, Kamchatka lily roots, and other foods, allowing these items to be stored for winter consumption.

The non-food values of sea mammals were as critical as their dietary contributions: skins for boat covers, clothing, and hunting floats; intestines for waterproof kamleikas; sinews for thread and cordage; stomachs for food storage containers; and bones and teeth for carving and tool manufacture. Laughlin (1980:Table 4.3) lists 13 major Aleut uses for sea lion products alone.

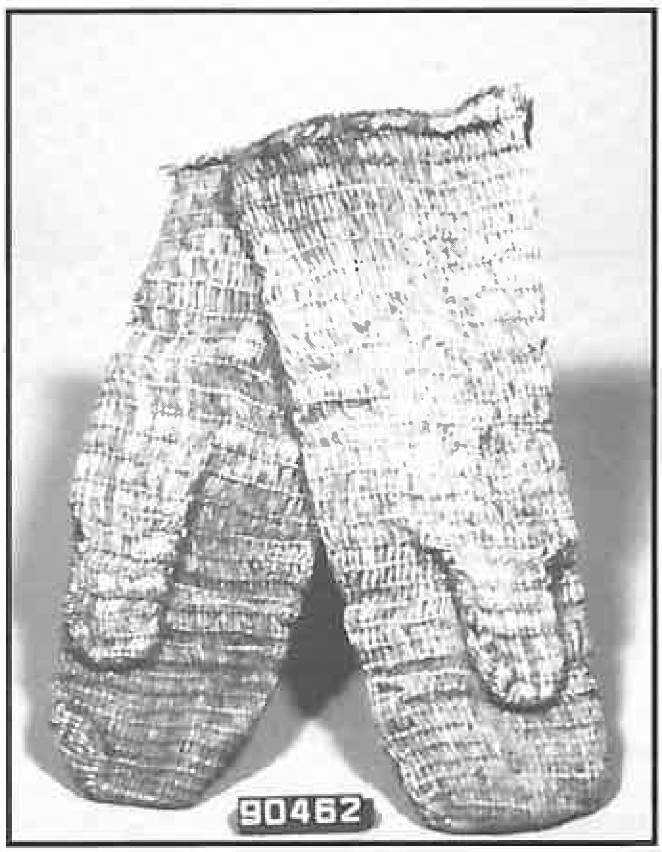
The kayak - fast, silent, long-ranging, seaworthy, and light - was the most important tool of Alutiiq sea mammal hunters. The array of specialized weapons carried on board enabled a hunter to locate, approach, kill, and retrieve wary and highly mobile animals along the shore and on the open sea.

Harbor Seal

A variety of ethnohistoric harbor seal hunting techniques have been described for the Alutiiq (Birket-Smith 1953:24; Gideon in Black 1977:97; Holmberg 1985:51; Lisianskii 1814:205; Davydov 1977:221). Sleeping seals sometimes were stalked (in a kayak, on foot, or by swimming) at haulouts and killed with handcast harpoons, lances, or clubs. Seal hunting harpoons were tipped with a large barbed head or a toggle head with a slate endblade. Sinew seal nets up to 20 m long were suspended with wooden floats and small stone sinkers across the mouths of small bights or coves where seals hauled out. The seals then were panicked into the water or lured into the vicinity of the net with a sealskin decoy. In the latter case, rocks were thrown into the water to frighten seals into the net. Seal netting is recorded for Kodiak, but not for Prince William Sound. Groups of hunters also drove harbor seals inland, where they were killed with clubs.

Decoy hunting of harbor seals also was common. Hunters put stuffed or inflated seal skins on rocks and lured curious animals into harpoon range by imitating seal barks and cries. Alternatively, a hunter wore a wooden helmet carved and decorated to mimic a seal's head, exposing it to view above a rock. Holmberg states that decoy hunting could yield 10 to 12 seals per day. The Chugach occasionally harpooned swimming seals from rocks or through breathing holes on ice-covered lakes and bay heads. Seals on floating ice pans could be harpooned from a kayak concealed behind a screen of floating ice chunks.

Harbor seals could be hunted in virtually all coastal areas, especially where rocks, islets, sand



[A. Crowell photo]

Figure 42 **Woven grass mitt liners - Aglurmiut circa 1880s (Fisher Collection, National Museum of Natural History, #90462)**

[Henry W. Elliot, Smithsonian Institution Neg. #73-10872]

Figure 43 Catching halibut from kayaks

bars, or ice were used as haulouts. These were predictable areas for seal concentrations during breeding and molting periods in early and late summer, respectively. Seals also were hunted opportunistically when encountered during travel. In 1790, Koniag harbor seal hunting was recorded in June and July by Merck (1980:105), but may have begun as early as April (Sauer 1802:178). Low level fall and winter harbor seal hunting to replenish food supplies was undertaken by the Chugach, weather and sea (or ice) conditions permitting (Birket-Smith 1953:5), and the same was probably true for the Koniag.

Northern Fur Seal

According to Birket-Smith's Chugach informants, fur seals were hunted intensively during May around Naked, Smith, and Knight islands, indicating a significant number of the animals entered the sound during the course of their spring migration to the north. Hunters in kayaks pursued and harpooned the animals in open water. At some locations, swimming animals could be speared from rocks.

In 1790, Sauer and Merck noted that Koniag hunters took fur seals off the east coast of Kodiak from February to April, though specific hunting techniques were not recorded, and their comments may have referred to past activity. In 1805, Lisianskii (1814:192) said seals were "formerly numerous." Russian commercial exploitation of fur seals seems not to have occurred on Kodiak or in Prince William Sound (D. Clark 1986). Historic records suggest that Koniag fur sealing declined markedly after

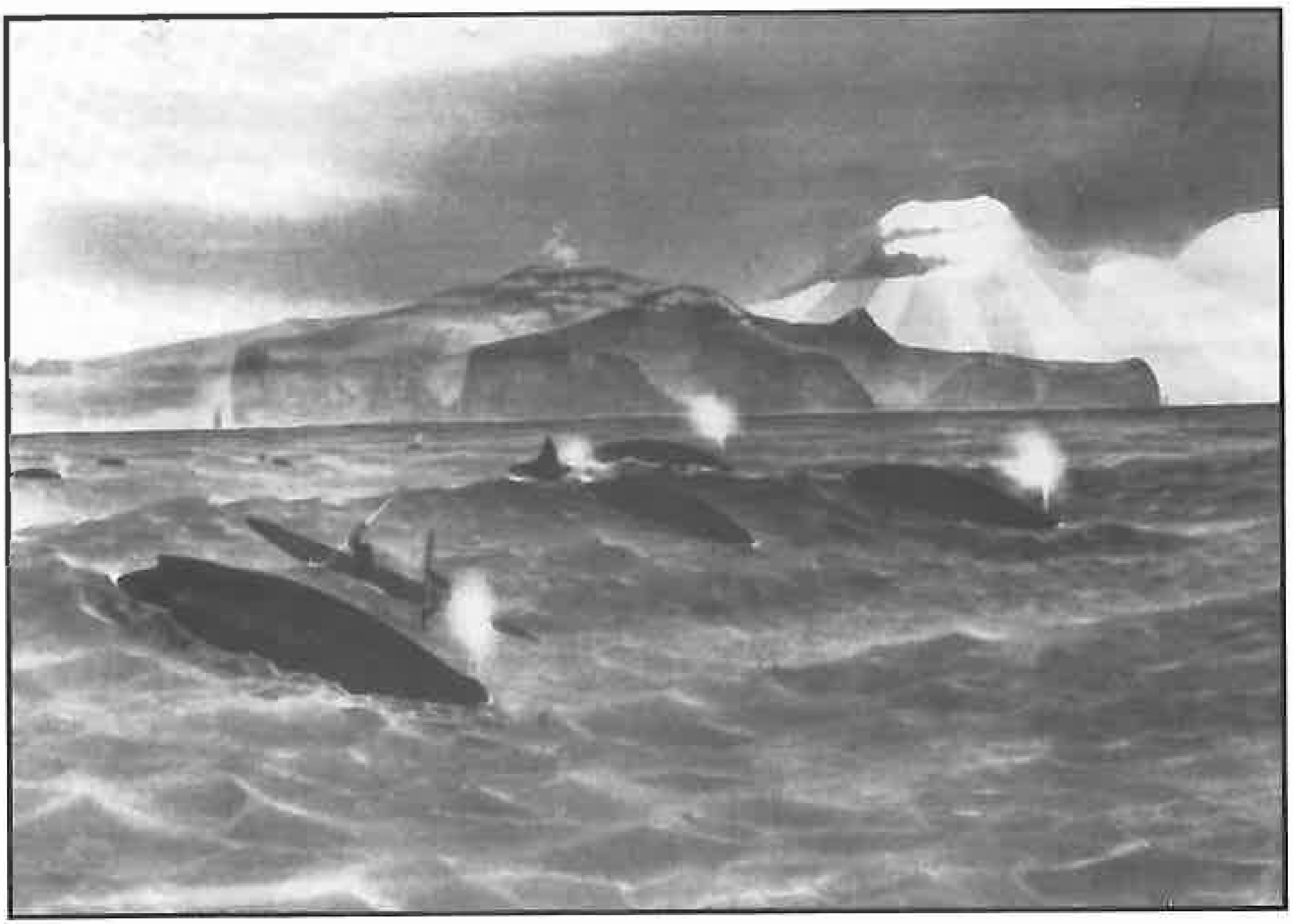
Russian settlement, probably due to enforced hunting focus on sea otters.

Northern (Steller) Sea Lion

Sea lions were hunted offshore from kayaks like fur seals, using large harpoons attached to inflated bladders or sealskin floats. Due to the large size of sea lions, several kayaks might be needed to tow a carcass to shore and hunting was usually done in parties. Sea lions also were attacked with harpoons at their haulouts. Sauer (1802:180) states that poisoned arrows were used to shoot sea lions but provides few details. Presumably, the poison would have been aconite, also used against whales. Davydov (1977:220) reports the use of nets to take sea lions. In 1790, the primary hunting season on Kodiak was April to July (Merck 1980:105; Sauer 1802:178), while autumn hunting was preferred in Prince William Sound, when the animals were fat and tasted best (Birket-Smith 1953:5, 27). Low-level winter hunting took place in both areas.

Sea Otter

At times, sea otters reportedly were clubbed onshore by the Chugach (Birket-Smith 1953:32). More frequently, however, sea otters were hunted on calm days during the summer from two-hatch kayaks. Hunting weapons were light darts (propelled from throwing boards) or harpoon arrows with detachable barbed tips. According to Holmberg



[Henry W. Elliot, Smithsonian Institution Neg. # 84-1816]

Figure 44 Aleuts in kayaks hunting humpback whales off Akutan Island using methods similar to Koniag

(1985:49), sea otter hunting was done by large hunting parties (80 to 100 boats) in 1850, but smaller parties (8-20 boats) were noted by earlier authors (Gideon in Black 1977:97; Lisianskii 1814:203). Boats traveled in a widely spaced line until an otter was encountered, when a circle was formed around the prey and shooting began. The circle was reformed each time the otter reappeared after an escape dive, until it had received multiple wounds and could no longer elude pursuers. Lisianskii said sea otters sometimes were taken easily in this way, while at other times " . . . twenty baidarkas would be employed half a day in taking a single otter" (Lisianskii 1814:203). This labor intensive hunting method probably was a post-contact phenomenon (D. Clark 1984a), developed in response to the highly inflated value of pelts and a dwindling otter population. While intensive sea otter hunting clearly was a historic phenomenon, archaeological evidence suggests that they were hunted prior to the development of the fur trade as well.

Under the Russians, large kayak fleets were dispatched to hunt sea otters each spring (early April) from Nuchek, Kodiak, and Cook Inlet to areas where prime hunting remained. Hunting parties, often much reduced by losses at sea, returned in September (Gideon in Black 1977; Tikhmenev 1978). Birket-Smith (1953:28) also indicates that some sea otter hunting was done during winter in Prince William Sound.

Baleen Whales (Humpback, Fin, and Minke Whales)

Koniag, Chugach, and Aleut whalers hunted baleen whales from kayaks using poisoned darts propelled by throwing boards (Crowell 1991; Black 1987) (Figure 44). Historic references (Veniaminov 1984:358; Merck 1980:73; Holmberg 1985:47) identify humpback, fin, and possibly minke whales as the primary species taken by this method. Alutiiq whale darts were tipped with long slate blades coated with poison derived from the root of the monkshood plant, *Aconitum* (Heizer 1943; Bisset 1976). The effect of the poison was usually fatal, but delayed, so dead whales could not be recovered until found several days later, adrift at sea or washed up on shore. It may have been advantageous to carry out this form of whaling within bays, to minimize the chances that drift whales would be lost on the open ocean.

Humpback, fin, and minke whales probably were hunted because they commonly enter bays and fjords during the summer, where they feed by moving slowly along the surface. Sources indicate that whales were hunted from May through August (Holmberg 1985:48; Davydov 1977:224). Humpbacks and fin whales also expose a critical flipper area for dart penetration during a behavior called "side-feeding" (Gaskin 1982). Other large whales, including migratory grays, usually remain offshore in open water. Historic accounts indicate that hunting focused on the youngest and smallest whales, probably those from 8-12 m long.

Estimates of recovery rates for struck whales range from 10 - 50%. From an economic point of view, the most remarkable aspect of poisoned dart whaling was the minimal investment of resources and manpower required, combined with the huge payoff of meat and blubber provided by even an immature whale. Ritual preparations were lengthy, however, and group efforts were needed to butcher whales and to transport meat and blubber back to villages in umiaqs. Whale meat and fat were esteemed components of the diet, and various by-products (sinews, bone, gut, baleen) also were valued. The status of Alutiiq whalers was high, with a complex of magical beliefs and practices associated with their craft.

Birket-Smith (1953:34) recorded an oral history of Chugach whaling, a type well known from northern Alaska and the southern Northwest Coast, using toggle harpoons, umiaqs, and sealskin floats. Black (1987) discusses similar early contact period accounts from the Aleutians. Only poisoned dart hunting was recorded in 18th and 19th century accounts of the Alutiiq region, however. The practice continued under Russian rule, with two-thirds of each whale collected for Russian American Company stores (Davydov 1977:224).

Toothed Cetaceans

The Koniags hunted harbor and Dall porpoises from kayaks in June and July, using throwing boards and special darts (Davydov 1977:225; Merck 1980:105). Their meat was a delicacy, but porpoises were difficult to hunt because they are fast swimmers and expose themselves only briefly above the water's surface. Birket-Smith discusses Chugach hunting of "small whales" - apparently including belugas and pilot whales - with harpoons and floats. Other species of southern Alaskan toothed whales include sperm and killer whales, which were not hunted.

Land Mammal Hunting

Except for caribou on the Alaska Peninsula and mountain goats around Prince William Sound, ethnohistoric accounts indicate that land mammals were relatively minor contributors to Alutiiq subsistence. Other species hunted for food or furs in all or part of the region included brown and black bear, moose, fox, wolf, river otter, rabbit, ground squirrel, porcupine, mink, marmot, and ermine. The larger species were hunted with bows and spears, while deadfalls and snares were used for both larger game and smaller furbearers. Winter trapping of fox, river otter, and other commercially valuable furbearers intensified under Russian rule.

Caribou

Details on caribou hunting on the Alaska Peninsula are lacking, but both Aleuts and Pacific Coast Koniag hunted them with bows and arrows and traded their skins, parkas, antler, and chest hair (for embroidery) to the Kodiak islanders (Davydov 1977:212; Gideon in Black 1977:98; see also D. Clark 1974c; Heizer 1956:27). Ethnographic and archaeological data suggest a pattern of permanent villages and year-round occupation of the Pacific coast, with seasonal exploitation of the interior, perhaps in the late summer and early fall when caribou hunting could be combined with salmon fishing in the Nushugak and Ugashik River drainages.

Mountain Goat

Mountain goats are relatively common on the Kenai Peninsula and in the Chugach Mountains around Prince William Sound, where they were an important subsistence item for local groups (Birket-Smith 1953:20, 37). Goat horn spoons were made for ceremonial use and trade, and goat hair was prized for blanket weaving in post-contact times. In August and September, parties hunted goats with bows and arrows in the mountains.

Birds

The Alutiiq used many of the Gulf of Alaska's more than 180 species of marine birds, waterfowl, and terrestrial birds for meat, eggs, and non-food products, including skins (for parkas), feathers, down, and beaks. Hunting methods and locales (open water, breeding colonies, etc.) for only a few significant species are listed below, based on data provided by Davydov (1977:226-231), Birket-Smith (1953), and other sources cited previously.

Exploitation of nesting seabirds was a spring and early summer activity; bird eggs were collected from April to mid-June and "young birds" in May and June (Merck 1980:105). Open water kayak hunting for seabirds took place throughout the summer. Migratory ducks and geese were hunted in spring and fall, especially in Prince William Sound where a number of species breed and spend the summer.

Geese and Ducks

On Kodiak, geese reportedly were caught with snares on land, while in Prince William Sound, molting geese were surrounded and driven ashore by hunters in kayaks, then killed with sticks by women and children. Ducks were hunted from kayaks with pronged darts and arrows or caught at sunrise and twilight in nets strung across narrow straits or river mouths. The eggs of nesting ducks and geese also were eaten.

Seabirds and Eagles

The eggs of various gulls were gathered in spring from cliffs, reached by climbing with the aid of poles and ropes. Gull eggs could be eaten fresh until June, or stored in fat. Gulls themselves were captured in nooses placed on the surface of the water and baited with crushed clams, or with baited gorges made of pointed sticks. Guillemots were snared on rookery cliffs or captured in bag nets let down from the top of the cliff. Cormorants were captured in bag nets at night on rookery cliffs, captured in sacks with dead bird decoys, caught by hand, or clubbed while sleeping. Cormorants were eaten and the skins used to make parkas. Puffins were snared or caught by hand at nesting holes on tops of cliffs. The eggs were also eaten and the skins used for making parkas. Puffin beaks were used to make dance rattles. Bald eagles were snared on rocks, using salmon heads as bait.

Shellfish

Ethnographic data on Alutiiq shellfish use are limited. Early Russian accounts (e.g. Lisianskii 1814:210; Holmberg 1985:41) mention shellfish as a year-round dietary component, however, particularly important in spring when winter stores had been exhausted and fishing and hunting were not productive. Summer consumption may have been minimal due to a plethora of other subsistence options and fear of shellfish poisoning caused by "red tides." Archaeological data suggest that a variety of shellfish were collected. Along rocky shores, these included mussels, limpets, sea urchins, barnacles, snails, whelks, chitons, sea slugs, and octopi. Mud and sand flats provided a variety of clams and cockles. The abundance, variety, ease of collection, and protein value of shellfish made them an important subsistence resource in the region. Shellfish collecting had few technological requirements and could be carried out by all members of society. Consequently, proximity to shellfish beds was a factor in selecting settlement locations, particularly winter villages.

Plant Foods

The range of plant foods used by southern Alaskan peoples, the extent of knowledge about their nutritional and medicinal values (cf Kari 1987; Wennekens 1985), and their overall dietary importance have been overlooked in many discussions of Alutiiq subsistence. Birket-Smith, Gideon, and others make it clear that berries (crowberry, mountain cranberry, blueberry, cranberry, salmonberry, cloudberry, strawberry, and others), roots (Kamchatka lily), stems and leaves (wild celery, cow parsnip, sorrel, lupine, nettle), seaweeds, and the inner bark from spruce, cedar, and hemlock trees were intensively harvested. Many plant foods were preserved for winter use by drying or immersion in sea mammal oil or fat. Other plant products, such as spruce roots and grass for basketry and kelp for fishing line, had important non-food uses. Plant gathering and processing were done primarily by women. "Culturally-modified trees" bearing the scars of bark removal are common in forested zones of the study area (Mobley *et al.* 1990:163).

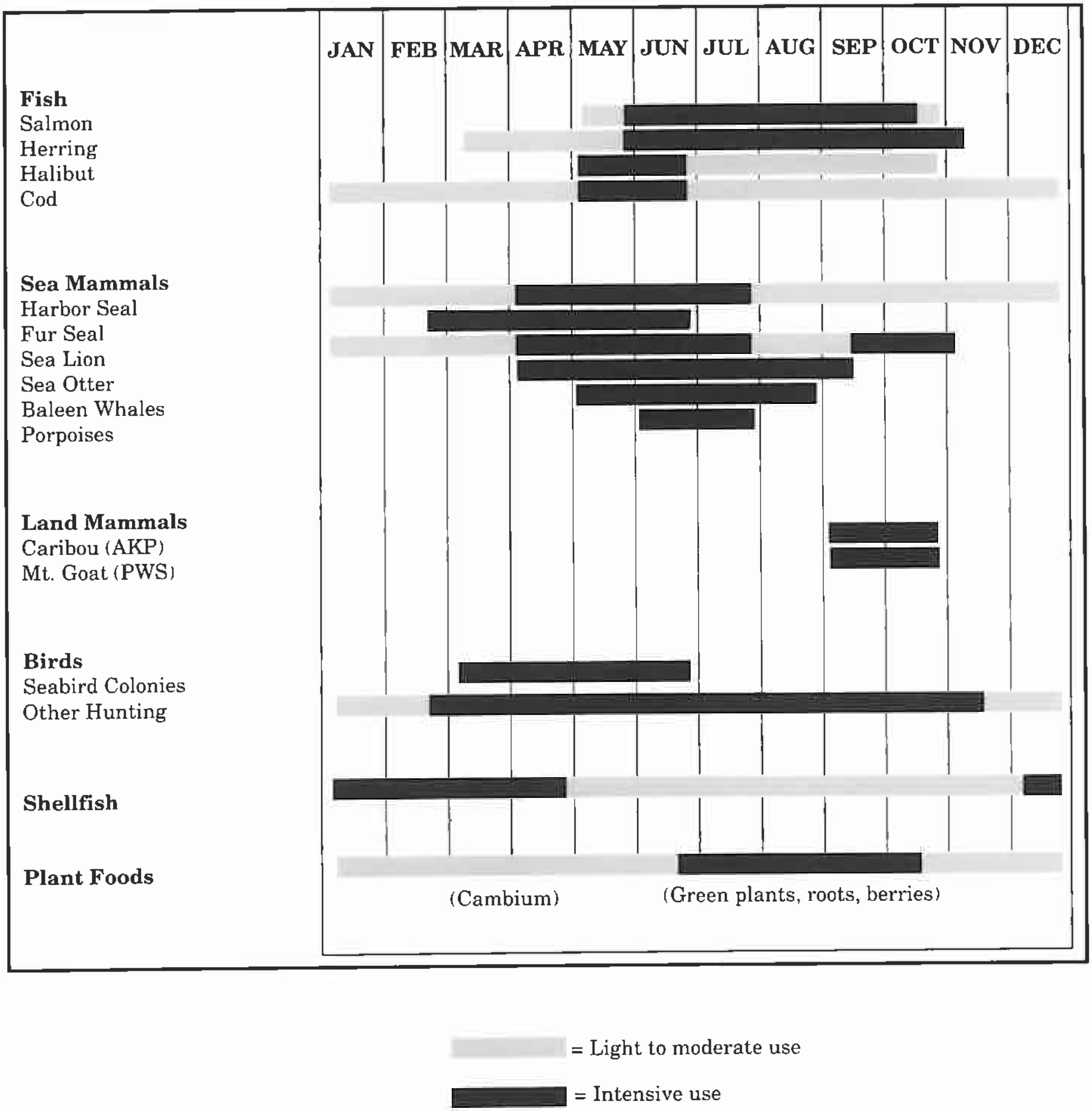
Annual Round

Along with minor variations between the Prince William Sound, Kenai Peninsula, Kodiak, and Alaska Peninsula areas, several generalized phases are evident in the seasonality of post-contact Alutiiq resource use. Along with a summary of the seasonal use of various major food resources compiled from ethnohistoric data (Table 6), the seasonal round of historic Alutiiq populatons can be reconstructed as follows:

Late Winter/ Early Spring (late February - April): The first resources of the new year became available. Activities included fur seal hunting (beginning in February), harbor seal and sea lion hunting (intensifying in April), egg collecting and bird netting at seabird rookeries, hunting of migratory waterfowl, and continued shellfish harvesting from the late fall and early winter. Plant foods were limited to hemlock and spruce cambium. Sea otter expeditions set out in April (under Russian rule).

Late Spring/ Early Summer (May - June): The period of greatest diversity in subsistence activities. Fishing of herring (PWS), halibut, and cod overlapped with early salmon fishing. All sea mammals were hunted, both at sea and at rookeries (sea lions,

Table 6 **Seasonal Alutiiq Resource Use**



harbor seals). Seabirds and waterfowl were taken at sea and at nesting areas, but few eggs were available. Among plant foods, primary emphasis was on tender stalks and leaves. Shellfish use diminished to a low level.

Late Summer/ Early Fall (July - October): Intensive salmon fishing dominates subsistence activity, supplemented by fall herring fishing in Prince William Sound. Sea mammal hunting declines, except for whaling and sea otter hunting (under Russian rule). Local hunting of caribou (Alaska Peninsula) and mountain goat (Prince William Sound) were undertaken, as well as hunting for seabirds and southward migrating waterfowl. Kamchatka lily roots and berries were harvested. Shellfish use remained low.

Late Fall/ Early Winter (November - February): The ceremonial season, with primary reliance on stored food and little hunting or fishing. Some harbor seals, sea lions, and possibly small whales were obtained. Bear hunting and trapping of foxes, river otters, and forest furbearers were conducted. Shellfish were harvested heavily if stored food supplies ran out. Kelp and tree cambium also were used as fallback food supplies.

These seasonal phases represent the outcome of a "subsistence strategy" influenced not only by resource availability, but also by technology (the capabilities of boats, hunting weapons), labor (search, processing, and transport effort), risk management (reliability of a resource vs. its yield), and resource value (nutritional yield, cultural preferences, nonfood values).

In many areas, the total edible biomass of available sea mammals far surpassed salmon at all times of the year, including the peak of salmon runs in September. Sea mammal hunting was curtailed during late summer and early fall, however, in favor of intensive salmon fishing. Comparative search and harvesting costs (time and effort) were a factor in this choice. Time and effort expenditures increase for more mobile prey and decrease for prey that are aggregated or have high overall population densities. The advantages offered by salmon fishing are evident; large numbers of fish could be located with little search time, especially in larger rivers where the timing and location of runs were highly predictable. In reference to Kodiak, Holmberg (1985:46) wrote that "The inhabitants know exactly when every river is visited by a certain type of salmon, so that they seldom miscalculate the time by even a day."

Already confined by river banks or lagoons, salmon were further aggregated behind weirs. Efficient mass harvesting and processing were possible, providing large returns to communal labor. The higher mobility, lower overall density, and more dispersed distributions of sea mammals (especially as pinniped haulouts were abandoned following breeding and molting) made them a less attractive subsistence option than salmon fishing during late summer and early fall. Whaling, which continued into August on parts of Kodiak, was an exception due to its very high potential yields and the high value placed on whale meat and oil. Intensive fall hunting for sea lions occurred only in Prince William Sound, where salmon are less abundant than on Kodiak. Herring fishing and hunting for caribou and mountain goat were other fall alternatives that helped offset lower salmon yields in the Prince William Sound, Kenai Peninsula, and the Alaska Peninsula areas.

The low level of sea mammal exploitation in the winter and early spring can be attributed to the risks and uncertainties for boat travel created by stormy weather. Sea mammal hunting was carried out opportunistically during the cold months, however, along with fishing, bird hunting, fur trapping, and shellfish gathering. In many areas, shellfish offered the advantages of a high-standing biomass combined with zero search costs or risks and became increasingly important in late winter and early spring as stored supplies diminished.

Except where they were very abundant, the comparatively low biomass of sea otters would have made them a poor subsistence hunting option at any time of the year, especially given the labor-intensive group hunting method used. The value of their pelts, not their calories, made sea otters the focus of intensive and seasonally extended hunting efforts during the post-contact era. The quality of sea otter fur probably attracted prehistoric hunters, as well.

The importance of seasonal food storage also is evident. Table 6 illustrates the diversity and intensity of warm weather subsistence activities, followed by the wintertime slack period when most resources were scarce and difficult to obtain. Gideon provides an interesting list of provisions accumulated by a prosperous Koniag household of the first decade of the 19th century:

> . . . plenty of whale meat, two sea lion bladders of whale oil, two casks for water, five kaliukakh (baskets made of bent wood), resembling our Russian baskets filled by shiksha [crowberry] in oil and the same quantity with sarana [Kamchatka lily], a sea lion bladder filled with red fish caviar, ten large bundles of yukola [dried salmon], and the same quantities of halibut and cod yukola (Black 1977:91).

Stored supplies provided the bulk of the food consumed during early winter, when subsistence activity dropped to its lowest point of the year, and the winter ceremonial cycle assumed first priority in the affairs of Alutiiq communities.

Site Types and Settlement Patterns

Binford (1980) suggested that a "logistical collector" pattern of seasonal settlement characterizes northern hunter-harvester groups, which generally face the dual problem of spatial separation of critical resources and pronounced seasonal fluctuations of resource availability. In this strategy, one or several villages are occupied sequentially during the course of a year, serving as home bases where most of the group resides and where large food supplies are stored for winter consumption. Many subsistence activities are carried out away from the base by task-specific procurement parties, which bring food and other supplies back to the fixed settlement. "Residential bases" (villages) are situated near critical resources that are immobile or seasonally concentrated.

Mobile procurement parties create a variety of special-use sites and facilities in the hinterlands beyond the base settlement: temporary camps, locations (places like butchering sites or berry patches, where single resource activities are carried out), stations (e.g. game lookouts), caches (for temporary food storage), and traps for game and fish. Archaeologically, residential bases contain thick midden accumulations and diverse tool assemblages, while camps and locations typically have thin middens and a more limited variety of tools. The remains of substantial houses provide the primary field indication of former residential bases in the Alutiiq region.

In this section, seasonal Alutiiq settlement patterns are described from early ethnohistoric sources, and discussed within the framework of Binford's logistical collector model. Probable differences in post-contact and pre-contact settlement patterns resulting from depopulation, aggregation, and resettlement are evaluated in the section that follows. These discussions provide the background for a detailed analysis of archaeological settlement pattern data from the Alutiiq area (Chapter 7).

Kodiak Island Koniag

Several descriptions of settlement patterns on Kodiak Island are available for the early contact period:

> *Billings, 1790*
>
> In the month of April they move from winter to summer dwellings, which are in places rich in fish and whales.
>
> In October, when all fishing is ended, they return to the winter dwellings, and each takes with him his foodstores, which make it possible for one to live without depending on others.
>
> At the beginning of November they begin festive celebrations which continue all winter. . . Each must entertain the others, until the time comes to set out once again to catch animals and their food supplies are exhausted (Merck 1980:206).
>
> *Sauer, 1790*
>
> They continue this chase [salmon fishing] till the end of October, when they retire to their winter dwellings. November they spend in visiting each other, feasting in the manner of the Ounalashkans, and dancing with masks and painted faces (Sauer 1802:178).

Bolotov, 1794 - 1799

> Almost every family has its own dwelling, and many have more than one dwelling in various places. They settle on the bays and inlets, on the sea shore, and near streams, but change their location and dwellings with the seasons. In the spring they usually stay in places where the run of fish from the sea toward the streams occurs earliest, and in winter near the shallows where they can find subsistence for themselves (Black 1977:85).

Lisianskii, 1805

> In time of scarcity, which seldom fails to occur in winter, and is almost unavoidable during the spring, the islanders live entirely on shell-fish; they therefore form a settlement near some large bank, as the best situation for the means of subsistence (Lisianskii 1814:195).

These descriptions suggest a seasonally shifting settlement pattern on Kodiak during the early post-contact period. Spatially separate components are mentioned: riverine salmon fishing sites, coastal whaling sites, and winter sites near productive shellfish beds. The move to winter settlements occurred in late October or early November, often directly from fishing settlements immediately after the end of the major salmon runs. Billings' account mentions accumulated foodstores taken back to winter dwellings to be consumed during the ceremonial season. By all post-contact accounts, festivals were often followed by a late winter period of want or even starvation, when stored supplies were depleted, hunting was difficult, and shellfish were gathered intensively. Fishing sites were returned to in spring, when the first salmon runs started in April or May. Winter and summer sites each were occupied about six months of the year.

Matching these moves to the four seasonal subsistence phases identified earlier, it appears that Koniag "winter" settlements may have been occupied during late fall, winter, and early spring. "Summer" salmon fishing settlements may have been occupied from late spring into early fall, depending on the timing and productivity of local salmon runs. In areas where salmon were not productive, summer settlements may have been established to exploit seasonal aggregations of whales, pinnipeds, bottomfish like halibut and cod, or other resources. In favorable locations where easy access to a variety of resources was available, some settlements may have been occupied throughout the year.

Early post-contact winter village locations were analyzed by Donald Clark (1987) from data on 32 Kodiak settlements visited or recorded by Lisianskii between late March and early April of 1805, before any movement to fishing sites had occurred. Only four (12%) were located in the inner third of major bays or straits, and several of these were considered marginal or ambiguous cases by Clark; none were in areas of significant winter ice formation. Bay head freezing and low salinity due to freshwater drainage inhibit shellfish growth, limiting suitability for winter village settlement. Eight (25%) were in outer coast locations (including one offshore island site), and 20 (63%) in the outer and middle thirds of major bays or straits. Winter settlements typically were located on small bays, coves, or tombolo beaches that provided sheltered waters for boat launching.

Major salmon streams were readily accessible to only four of the 1805 winter villages, but seven (22%) were situated near moderately productive streams. At least some occupants of these villages may not have needed to move to summer fishing grounds. Most Koniag local groups would have had to move to river mouths at bay heads for productive summer and fall salmon fishing, or traded with groups who had direct access to such habitats. Clark's study indicates that there are relatively few locations on Kodiak suitable for all-season resource procurement. Spatial incongruities in the distribution of seasonally critical subsistence resources are evident, a product of the highly indented coastline of the Kodiak Archipelago and the contrasting resource profiles of outer exposed coasts, semi-protected bay mouths, and protected inner bays.

Optimal Koniag winter village locations may have been selected using two criteria: easy access to good shellfish beds and high local resource diversity. Close proximity to seabird rookeries, pinniped concentrations, and cod and halibut fishing areas - a combination most likely to occur in outer bay locations - would have allowed stored supplies to be augmented during the stormy months of winter and early spring when long distance boat travel was difficult and dangerous. During summer and fall, better weather expanded the area or "catchment" that could be exploited by boat from any given site, allowing bay head settlement at, or day trips to, salmon streams without a loss of access to outer bay and outer coast resources. These hypothetical relationships between resource and site distributions are examined in greater detail in Chapter 7.

In terms of Binford's logistical collector model, both winter and summer villages would be defined as residential bases. Billings' remark that many families owned "more than one dwelling at various places" suggests that permanent dwellings were constructed at both. Winter villages tended to be large, since they resulted from maximum aggregations of local groups for ceremonial and social reasons. Koniag settlements at major salmon rivers could also be very large, however, as shown by surveys of the Karluk River and Lake system where the remains of hundreds of large, multiple-room barabaras are located (Jordan 1983; Jordan and Knecht 1988). Smaller summer base settlements, possibly indicated archaeologically by sites with one to several housepits, were established at less productive streams.

Food supplies and other resources were obtained by individuals or groups and brought back to base settlements for consumption and storage. Food storage was equally important at summer and winter sites, the total household stock accumulating at the former and being drawn down during occupation of the latter. A critical logistical link was the transportation of dried salmon and other prepared foods from fishing sites to winter villages, probably accomplished by umiaq in pre-contact times.

Efficient water transportation probably allowed a same-day return of procurement parties to residential bases in many cases. Traveling camps and short-term field camps for hunting, fishing, or collecting also were established. Various types of temporary dwellings might be erected at camp sites. Davydov (1977:120) observed two types of temporary shelters on Kodiak - a "straw lean-to," and a "tent" made by leaning planks against a beached kayak. Similar light camp shelters are reported for the Chugach (Figure 45).

Alaska Peninsula Koniag

Relatively few early post-contact data are available on Koniag settlements on the Alaska Peninsula coast, although a number of late 18th century and early 19th century villages have been identified from historic accounts and early maps (Orth 1967; Teben'kov 1981; Hussey 1971). Visiting "Toujajak" (Kukak) at Kukak Bay in late July of 1806, Von Langsdorff (1813:233-237) found the inhabitants living in "summer-huts" which were "small and covered with earth grown over with grass." He also noted that the clothing and diet of the people indicated dependence on caribou and other land game.

Chugach and Unegkurmiut

Systematic ethnographic data on the Chugach and Unegkurmiut were not recorded prior to Birket-Smith and de Laguna's field work in the early 1930s. Information on traditional Chugach subsistence and settlement, compiled by Birket-Smith (1953) from fragmentary early data and from information conveyed by Chugach elders many decades after the old annual cycle had been abandoned, is less complete than for Kodiak in most respects. De Laguna (1956) investigated some traditional villages and camp sites in Prince William Sound and gathered informant data on Kenai villages. Hassen (1978) also summarized the data on traditional Chugach subsistence and settlement. Accounts of traditional subsistence practices and seasonal movements at Port Graham and English River on the lower Kenai Peninsula refer to the cannery period of the 1880s (Stanek 1985), while recent data on subsistence practices at Chenega pertain to the 1960s and the early 1980s (Stratton and Chisum 1986).

Existing data suggest that the Chugach were more sedentary than the Koniag, with less commitment to summer salmon harvesting. Oswalt

(1967a:90) estimated that the Chugach lived in winter villages nine months of the year. While Birket-Smith (1953) writes that salmon fishing continued all summer (beginning in May), he and de Laguna consistently refer to salmon fishing settlements as "temporary camps." De Laguna's summary of settlement location factors, based on archaeological survey and Birket-Smith's interview data, emphasizes this distinction and adds defensive considerations as a factor:

> Village sites were invariably on the shore, usually in protected waters, for travel in this area is practically restricted to boats. The village was frequently so placed that it commanded a view of the approaches, and a strategic position seems to have been a much more important consideration than the neighborhood of a salmon stream or a particularly rich bed of shellfish. *Thus no permanent villages were located at the heads of bays, in spite of the tempting presence of some of the best salmon streams,* because these were "dead ends" from which no escape by water would be possible in the event of an attack. *Temporary camps were, however, made at fish streams during the salmon runs.* (de Laguna 1956:11, emphases added).

De Laguna's settlement location model emphasizes defensive positioning over resource distributions. Defensive positioning is not mentioned in Koniag sources, although it was probably an important consideration. Easily-defended refuge rocks were used by both groups for retreat when attacked. De Laguna's data imply that salmon fishing sites were field camps rather than residential bases. Sea otter hunting camps and other temporary sites are included in the same category.

Birket-Smith's (1953:53-56) discussion of Chugach house types also indicates that the Chugach spent more time in winter villages than the Koniag. Both winter and summer houses were built at the same village locations. The summer and autumn "smoke house" is described as a large, multi-family, rectangular plank house with round doorways and a central hearth. The floor was at ground level. Semi-subterranean winter houses were also built, and de Laguna (1956) recorded rows of housepits at several larger sites in southeast Prince William Sound. Walker (1982:140-141) provides the best description of an early contact period Chugach village in the northeastern sound, visited in August of 1786. The village included both house types, linked by covered passageways:

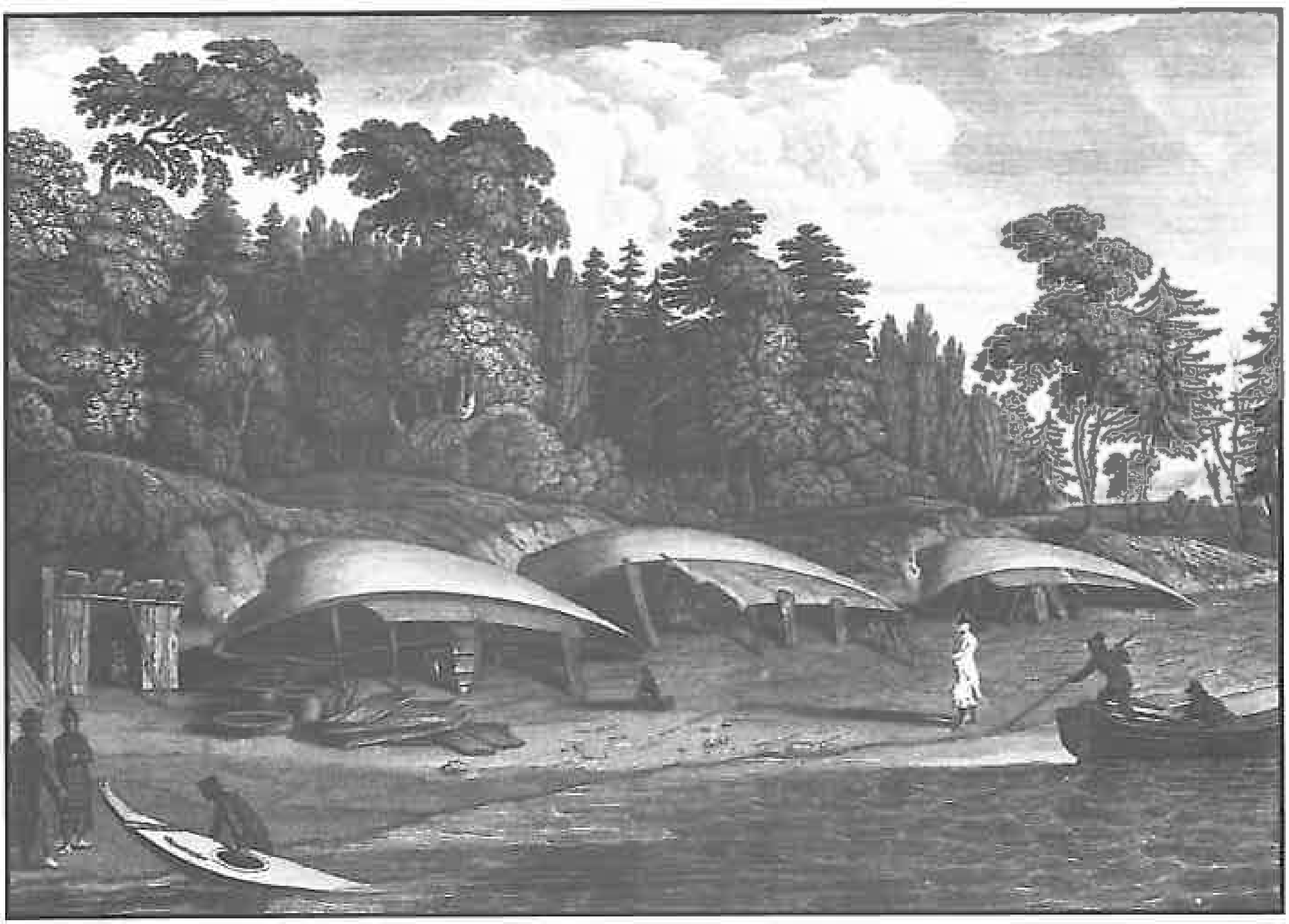
> This Village consisted of twenty or thirty Houses, built along the Beach in three Parallel rows. Most of the Houses were in a state of decay, but some of them with a little trouble might have been rendered habitable. The centre Row of Houses was the loftiest, and we supposed, was the Summer residence of the Natives. The Houses in it were nearly square, but their shortest sides fronted the Streets. The highest of their Walls was from five to ten feet; and of the whole House about twenty feet. The frames were neatly and firmly joined. The roofs sloped to an Angle in the usual manner, and were thatched with Grass and Bushes. Each house has two doors, which are directly opposite. The dimensions of the largest House in this Row were 20 feet by 15.
>
> The Houses in the two outer Rows were built on a different construction, and we supposed them to be the Winter Habitations of the Natives. Their Walls were sunk one or two feet in the ground, and were raised from two to four above it,- They were formed of Smooth Boards supported at proper distances by Posts. The roofs were formed of small Beams or Branches bent in a circular form. Their outsides were covered with turf, earth, chingle, or pine bark, and their insides were lined with polished Planks. Each house had two round Holes cut through the opposite sides, in the same manner as in the Summer Houses . . . The usual dimensions of these habitations were four or five feet in height, twelve or fourteen in length, and from five to seven in breadth. The Doors of these Houses are in their longest sides. From a Thatched Passage, leading in common from two of them to one of the Summer Houses, we concluded, that each winter House serves only for one Family, but that the Summer Houses serve for several.

It is unknown if this village had been abandoned permanently or was temporarily vacant while the residents were at subsistence camps. A nearby village with 10 houses also was discovered, however, where "recent Marks of Fire, and of human feet" suggested that the occupants had departed recently, perhaps at the approach of the English exploring party. The evidence seems to indicate that main Chugach villages were occupied through at least part of the summer, with a possibility of year-round occupation by at least part of the population.

Residence near salmon streams appears to have been on a short-term basis, without the investment of labor in substantial dwellings. Light, temporary structures were occupied at fish camps, including bark huts (Portlock 1789). Overturned boats augmented with planks also were used as temporary travel shelters on hunting and fishing trips (Merck 1980:122).

This pattern indicates a less intensive salmon fishing effort than described for the Koniag, presumably related to lower salmon productivity in Prince William Sound. As suggested earlier, Chugach herring fishing in spring and the hunting of sea lions and mountain goats in the fall may have been strategies to compensate for the lack of more productive salmon resources. None of these components were significant in the Koniag seasonal round.

The use of a single residential base throughout all or most of the year would also make sense from this perspective. The same spatial separation exists on



[Sarychev Atlas, Rare Books Collection, Archives, Alaska and Polar Regions Department, University of Alaska Fairbanks]

Figure 45 Temporary camp on Chugach Bay (Prince William Sound)

Kodiak and in Prince William Sound between salmon streams and good locations for pelagic and intertidal harvesting (bay heads vs. bay mouths, islands, and open coast), but the former would be less attractive even in the summer if fish productivity was low. The Chugach would have invested less time, personnel, and labor (including house construction) at salmon fishing sites if alternative subsistence efforts could be pursued more productively from the main village. Archaeologically, main village sites in Prince William Sound should have thick middens containing abundant bone and shell and surface housepits, while summer field camps should be smaller in extent and have thin middens and little shell. Housepits should be absent at most fishing and hunting camps.

Post-Contact Subsistence and Settlement

The preceding interpretation of Alutiiq resource use and settlement patterns derives almost entirely from post-contact records. The extent to which this information can be used to reconstruct an accurate picture of pre-contact lifeways is unclear, although continuing archaeological and historical research eventually may supply a better understanding of pre-contact conditions and the changes that occurred after European involvement in the region. While many observations discussed above date to within 20 years of Russian conquest, population decline was very rapid in these early years - approximately 25% by 1790 and 50% by 1805 (see demographic history). Of 65 original Kodiak settlements recorded by the Russians (probably including a mixture of winter and summer villages), seven remained by 1840 (Tikhmenev 1978; D. Clark 1987).

Although Clark's analysis of Lisianskii's 1805 village survey led him to conclude that the overall Koniag settlement pattern had not been fundamentally altered by that date, we suspect some villages already had been abandoned and that remaining populations were consolidating at certain traditional locations or in the vicinity of Russian settlements and artels (work stations). Lisianskii's chart of Kodiak shows only one settlement ("S. Ooiatsk") in Uyak Bay on the west side of Kodiak, for example, where five large Late Koniag village sites have been recorded (Crowell 1986). Surface housepits at two of these were tested and produced carbon samples with "modern" dates less than ca. 200 years old, suggesting that they (and possibly others) were abandoned after Russian contact.

A similar process has been documented for Nootka Sound on Vancouver Island, where post-contact depopulation led to a reduction in the number of local groups, expansion of local group territories, and seasonal use of villages formerly occupied year-round (Inglis and Haggarty 1987). Post-contact descriptions of the Nootkan seasonal round present an exaggerated impression of seasonal mobility, and the same distortion may be embedded in descriptions of the Alutiiq seasonal round by Gideon, Bolotov, and others (see Chapter 7).

Russian impressment of many hunters for extended sea otter expeditions, the assignment of many other men, women, and children to labor-intensive work parties, and the direct extraction of food supplies produced by Native labor for Russian American Company use, severely reduced the ability of households and communities to store enough food to last through the winter and early spring. About Kukak in 1806, Von Langsdorff (1813:233) wrote:

> In our conversation we learnt that the place had been much more populous, but that the population had decreased in the last ten years, most of the young people having been carried away to Sitcha [Sitka] to hunt sea otters: indeed, we observed that here, as at Kodiak, we saw chiefly old men, women, and children. Of a thousand men who formerly lived in this spot, scarcely more than forty remained, and the whole peninsula of Alaska they said was depopulated in the same proportion.

Gideon recorded early spring starvation experienced by the Koniags:

> Due to these onerous tasks imposed by the Company, in all settlements Aleuts [Koniags] suffer great privations and hunger; they consume even the seal bladders in which they ordinarily keep

> oil and pickled roe of the red fish. They eat lavtaks [seal and sea lion skins], thongs, and other items made of sinews, when the shallows are covered by ice and mussels and kelp cannot be obtained (Black 1977:103).

It seems likely that the contact period intensified dependence on shellfish, especially as a late winter and early spring resource, and may have increased the importance of intertidal resources as a factor in the choice of winter settlement locations. Pre-contact middens also contain large amounts of shell, however, indicating that heavy use of this resource was not a completely new pattern.

Other Russian policies influenced Alutiiq subsistence patterns, although the actual effects are difficult to evaluate. Russian confiscation of umiaqs, previously used to transport cargo and personnel between settlements, may have contributed to the difficulty of storing sufficient food for the winter. Decisions on the timing and intensity of resource use were to a certain extent made by the company, but the Russians continuing dependence on Alutiiq subsistence skills to ensure their own food supply (Gibson 1987) limited the extent to which the annual round could be altered. The intensification of sea otter hunting is the major exception, and winter trapping and possibly whaling also were increased to meet Russian quotas. Russian attempts to introduce domestic stock and agricultural crops to feed the colony largely failed, and almost all hunting and fishing continued to be done by the Alutiiq using traditional technologies. Iron traps and fish seines were imported, but few firearms were allowed to fall into Native hands. Except for tea, imported foodstuffs were expensive and little used by Native people, although the desirability of other trade goods and extension of company credit increased indebtedness and dependency on supplies from trade posts.

Growing involvement in a cash economy was stimulated by the arrival of American fur trading companies after 1867. The real decline in adherence to the traditional diet and subsistence methods came with the advent of the commercial fishing and canning industry in the 1880s, which directly or indirectly employed large numbers of Natives, consolidated settlements around cannery locations, and increased dependence on purchased clothing, tools, boats, guns, and food. Commercial mining, whaling, fox farming, and logging provided additional sources of cash income (Hassen 1978; N. Davis 1984). Nonetheless, the 15 modern Alutiiq villages in the oil spill region retain a strong involvement with subsistence harvesting (Langdon 1968; Stratton and Chisum 1986; Stanek 1985; Morris 1987; Schroeder *et al.* 1987). Subsistence harvests range from 200 to over 600 pounds per person per year, including fish, sea mammals, birds, invertebrates, and plant foods. In many ways, the general seasonal round of today is similar to traditional schedules.

Society and Political Economy

The sociopolitical organization of the Chugach and Koniag at the time of contact is known in its broad outlines, although many details remain obscure. The best summary of the ethnohistoric evidence is by Townsend (1980), who cautions against classifying the Chugach, Koniag, and other southern Alaskan groups as "tribes," a term which implies a degree of political unification that has not been demonstrated. In her view, Koniag, Chugach, etc. are cultural/linguistic divisions within which the usual level of political integration was the "society" (Burch 1980) or "village cluster," which approximates the "local group" used in discussions of Northwest Coast political organization (Drucker 1983). A local group or society consisted of several hundred persons (up to a maximum of about 1,500 among the Tlingit) from one or more villages (or a set of seasonal settlements), a single headman, and a distinct territory. Although politically autonomous, local groups were linked by trade networks, military alliances, and kin ties.

Ranking and Leadership

Underlying this interaction system was the institution of ranking. A ranked society is one in which access to positions of leadership and prestige is limited by birth (Fried 1967). Koniag and Chugach headmen inherited their positions, but they had to prove worthy of them by being successful "rich-men." This involved the accumulation of food and wealth through contributions by a large group of subordinate kinsmen, who were members of the headman's household or attached to it by blood or marriage. The headman hosted feasts and ceremonies in which this pooled surplus was redistributed to guests, who might include members of his own local group and visitors. Out of this generosity and display of wealth were forged loyalties and return obligations at the local group level, and alliances at the inter-group level. Invitational feasts between local groups were carried out over long distances and in multi-year cycles (Jordan 1988b), and trade networks were extensive. Koniag groups on the west side of Kodiak Island carried out regular trade with the Alaska Peninsula, while the eastern groups traded with the Unegkurmiut and Chugach (Gideon in Black 1977:98).

Members of the headman's lineage were of higher rank than other members of the free class, although details of the ranking system are unknown. Other high status roles and offices were second or assistant chief (Chugach), shaman, whaler, and kassaq ("wise man," i.e. religious specialist). Slaves - prisoners of war who carried out the heaviest labor of the community - were of a distinctly lower social class. Slaves were one of the prime tokens of wealth, belonged to headmen as the spoils of war, and contributed directly to the surplus production that supported chiefly prestige.

Headmen led in war, trade, and village affairs but possessed no absolute authority (Gideon in Black 1977:91):

> The power of the anayugak [Koniag headman] consists of the following: any one who absented himself from the settlement had to declare the reason for the need to do so; the anayugak also made decisions and dispositions in various matters; but he could not punish anyone, except when redressing his own personal insult; he ruled only over his own family, fosterlings, and kalgas [war prisoner-slaves]; he persuaded his fellows to go to war by advice and presents; in the assembly he took the most important seat and delivered various admonitions. In his presence, deep silence was observed. . .

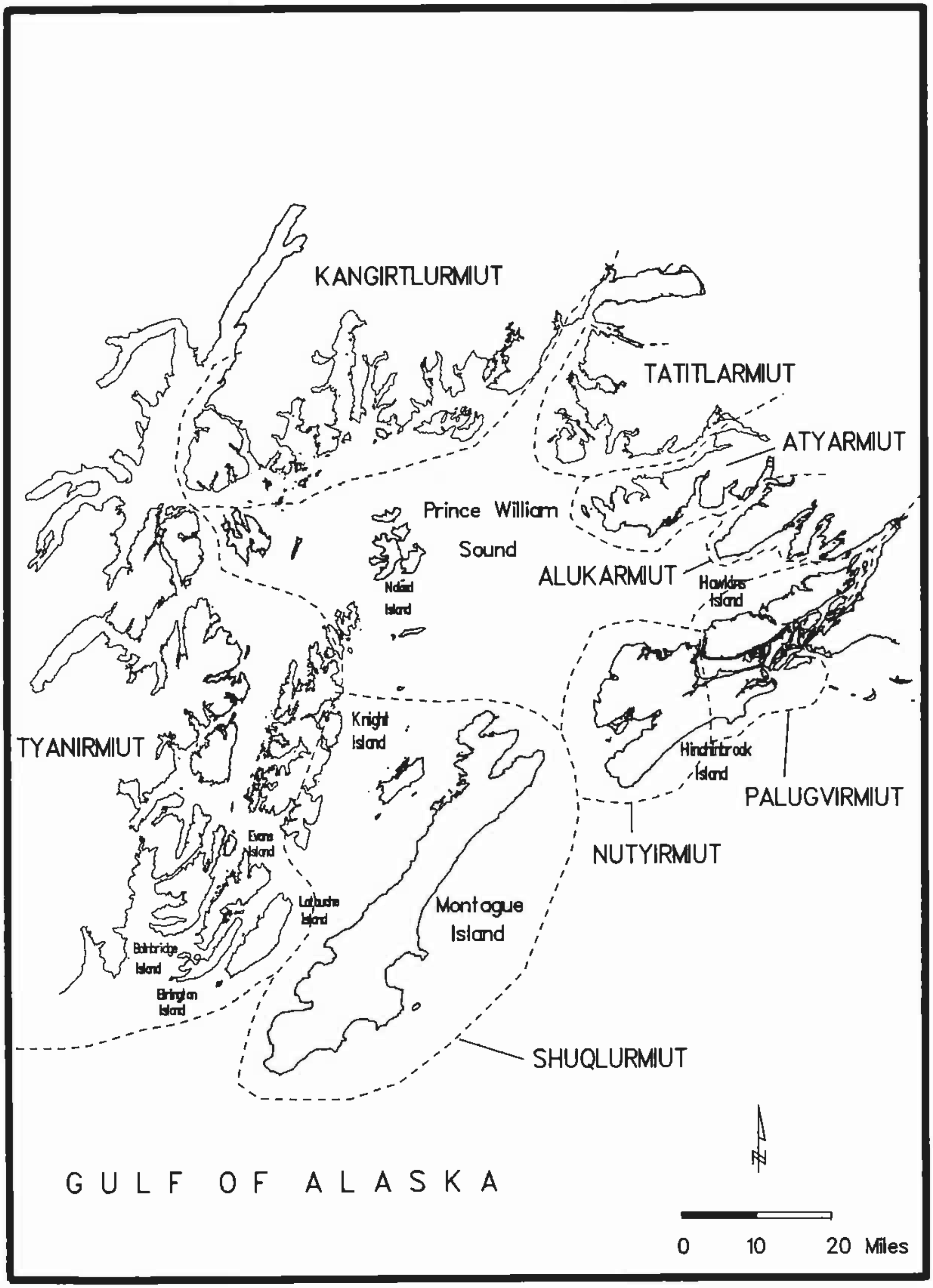
Under Russian American Company rule, headmen were designated as "toions," appointed leaders responsible for assigning local group members to sea otter hunting parties and other labor, and for meeting company-imposed production quotas.

Territories

At contact, the population of Prince William Sound was divided into eight named and politically autonomous local groups, each associated with a fairly well-defined territory (Figure 46). Each Chugach group was under a chief or headman, occupied a main winter village, and claimed ownership to a set of resource locales and associated camps used during the annual cycle. Differences in resource use and abundance between these areas are discussed by Birket-Smith (1953). The Nutyirmiut, for example, whose principal village was Nuchek on Hinchinbrook Island, were thought to have the best resource base, including sea otter herds and abundant whales and salmon. The Atyarmiut of Gravina Bay were one of the poorer groups and relied heavily on mountain goat hunting.

Hassen (1978) believes Chugach ceremonies and inter-group feasting redistributed food and wealth items from richer to poorer local groups. He notes that the four Chugach territories which extended across the mouth of the sound and included its major islands were the richest in both sea mammals and salmon. Villages there always hosted the Great Feast of the Dead, a ceremony similar to the Northwest Coast potlatch (Lantis 1947). The poorer northern territories were always guests at this ceremony, which required large expenditures in food and material wealth by the host group, although this pattern may have resulted from differential access to trade wealth in the historic era.

Comparative ethnographic data on territorial divisions are almost completely absent for the Koniag. Davydov (1977:190) suggests a similar pattern of named local political groups associated with particular territories:



[from Hassen 1978:59]

Figure 46 Chugach local group territories, 19th century

> Their villages, situated on the coastline of the island, each has its chief, called by the Russians a toen. Some of the chiefs rule over many settlements and are all descended from one tribe, and named after the bays and capes near which they live.

Parenthetically, Jordan (1988a:11-12) noted that group territories may have been operative during Late Kachemak times on Kodiak Island based on the different labret styles associated with different Late Kachemak village sites. Some aspects of village territorial claims continued into the early 20th century on Kodiak (Moser 1902:247).

Post-Contact History

The early contact history of the Alutiiq region was driven by the profits to be made from selling (primarily to China) the luxurious pelts of sea otter, fur seal, fox, and other northern fur-bearers. Although England, Spain, and the United States gained a share of this wealth, Russia spearheaded exploration of the region and gained the upper hand in the intense competition for the southern Alaskan fur trade. Through elimination and consolidation, scores of privately-owned Russian companies gave way at the close of the 18th century to a single state monopoly firm, the Russian American Company (RAC). As the fur trade declined so did the RAC, and with the sale of Alaska to the United States in 1867, new efforts were made to exploit the natural wealth of the region, including fur seal hunting, whaling, fox farming, fishing, mining, and logging.

The Exploration Period (1741 - 1783)

Russia's exploration and occupation of southcentral Alaska in the 18th century extended its long eastward sweep of conquest and colonization across Siberia to Kamchatka and the Kurile Islands (Bancroft 1959; Fedorova 1974; Makarova 1975; Dmytryshyn *et al.* 1985-1988; Black 1988). Initial entry into the Alutiiq region was in July of 1741 by two ships of the Second Kamchatka Expedition, commanded by Vitus Bering and Aleksei Chirikov (Golder 1922-25; Fisher 1990). Landing parties from Bering's boat discovered probable Chugach habitations on Kayak and Wingham islands east of the Copper River (Frost *et al.* 1988), but no direct encounter with local people occurred and Bering began his return voyage without exploring further. Chirikov lost a third of his men on shore in southeast Alaska (possibly to hostile action by the Tlingit) and he, too, turned back. Bering and many of his crew died that winter after wrecking in the Commander Islands, but Chirikov's ship and the Bering survivors made it back to Kamchatka.

The geographical "discovery" of mainland Alaska, and the valuable sea otter, polar fox, and seal pelts brought back from the Commander Islands by the expedition, opened a new phase of Russian expansion. By the 1760s, brief expeditions by private companies of promyshlenniki (fur traders) were operating throughout the Aleutians and collecting sea otter and fur seal pelts in taxes and trade from subjugated Aleut populations (Masterson and Brower 1948; Berkh 1974).

Aleutian sea otter populations declined rapidly due to over-hunting, driving a push eastward into the Gulf of Alaska. In the 1760s and 1770s, Glotov, Polutov, Ocheridin, and possibly others tried to trade on Kodiak but all were driven off by Koniag war parties and few furs were obtained. In the meantime, Russian activities in the region triggered explorations by England and Spain, both of which coveted the territory and its potential wealth. Captain James Cook's third voyage reached Prince William Sound in 1778 where sea otter pelts were obtained in trade with the Chugach (Cook 1967). Cook observed that the Chugach already had glass beads and iron blades, evidence of prior direct or indirect contacts with the Russians. Ignacio Arteaga reached Prince William Sound and Cook Inlet in 1779, traded briefly with the Chugach, and claimed the area for Spain (Gormly 1977). Potap Zaikov led a Russian trading expedition to Prince William Sound in 1783, but was driven out by the Chugach after violating their hunting territories and attacking villages.

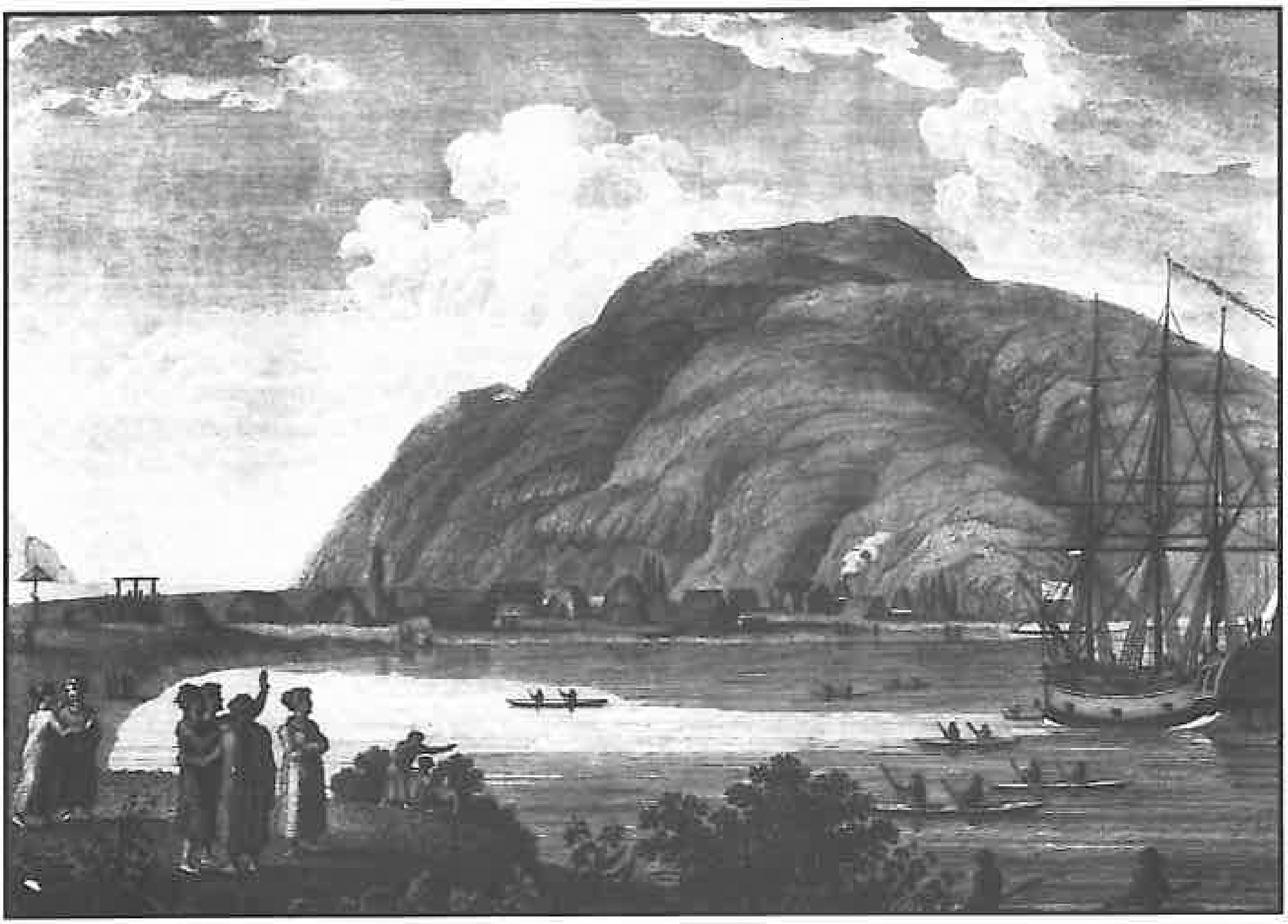
This respite was brief; the region's sea otter riches were known to the world and sustained European contact was inevitable. British expeditions by

Strange, Meares, Dixon, Portlock, Vancouver, and others traded and explored in Prince William Sound and Cook Inlet over the following decade, and a Spanish expedition in 1788 under Martinez and Lopez de Haro visited Prince William Sound and Kodiak to assess British and Russian strength in the region (Hassen 1978). The Russians were best positioned to seize control of the territory, an effort begun in earnest with the establishment of a pioneering settlement at Three Saints Bay on Kodiak Island in 1784 (Shelikhov 1981).

Maritime Trade Period (1784 - 1866)

The Three Saints Bay settlement served several purposes. It was a base for sea otter exploitation in the Kodiak area, established a resident population of traders to bolster Russian territorial claims, and served as a base for expansion into adjacent regions. Under Shelikhov, the heavily armed Russians and Aleuts defeated allied Koniag forces, and further resistance was quelled by executions, hostage taking, and negotiations with Koniag headmen. Buildings, gardens, and fortifications were built at Three Saints Bay, and Russian-Koniag work parties were sent out (Figure 47).

Shelikhov dispatched a party of about 175 Russians, Aleuts, and Koniags to explore and trade in Prince William Sound, Cook Inlet, and the south shore of the Alaska Peninsula during 1785-86. The Ismailov-Bocharov expedition in 1788 traveled as



[Sarychev Atlas, Rare Books Collection, Archives, Alaska and Polar Regions Department, University of Alaska Fairbanks]

Figure 47 Idealized sketch of Three Saints Bay, 1790

far east as Lituya Bay and laid a series of copper plates claiming Russian dominion over the region. Shelikhov's men built forts on Afognak Island and at English Bay (Alexandrovsk) on the southern tip of the Kenai Peninsula. The Spaniard de Haro described a Russian-built structure, probably a fur storage warehouse, on Montague Island in Prince William Sound:

> . . . they found a large house on the edge of the beach. On the side which faced the forest it was not completely finished; but the other three sides were; and on the one which faced the sea it had four windows. It was made of wood and very fine yellow reeds . . . it was wrought with much skill . . . a little way into the forest (they) found many rather large trees cut with an axe, and others with the bark stripped off the outside, and with this, cut in the shape of roofing tiles, they had roofed the house [Moore 1975:8].

In 1793, Shelikhov-Golikov Company headquarters, now led by Alexander Baranov, were moved to the present location of the city of Kodiak. Over the next few years, Baranov aggressively expanded the assets of the company to include trading posts, artels, and shipyards on the Alaska Peninsula and in Cook Inlet, Prince William Sound, and southeast Alaska. Several rival Russian companies were driven out of business, notably the Lebedev-Lastochkin Company which had posts in Cook Inlet and Prince William Sound. In 1799, the Russian American Company was chartered by the Russian government and given a monopoly over all American operations (Tikhmenev 1978). Headquarters were moved to Sitka in 1808.

Kayak hunting for sea otters was a skill never mastered by the promyshlenniki, nor were any other Alutiiq methods of procuring game. The Russian colonial system depended on Native knowledge and labor to secure trade furs, as well as the basic food supplies and clothing (fur and birdskin parkas, waterproof gut garments) that made survival possible (Gibson 1987). Where complete military and political control was achieved (on the Aleutians and on Kodiak), Native labor and products were extracted through force rather than mutually beneficial exchange of goods.

Native service to the company was mandatory on Kodiak, a policy formalized in the 1821 Russian American Company charter. Half the male population between 18 and 50 years of age had to work for the company at all times as sea otter hunters, whalers, bird hunters, etc., and the actual percentage of conscripts may have been far higher. In addition, the Russians assumed ownership of all Koniag slaves and impressed new members into this class for real or fabricated violations of company regulations. Native workers were paid largely in food, clothing, and boots produced by the unremunerated labor of women, children, and men unfit for sea hunting (Black 1977:99-101). Only small amounts of imported trade items (glass beads, iron knives and axes, tobacco, cloth, and ceramics) entered the Koniag economy. Later the RAC improved conditions for Native workers and increased payments for sea otter pelts. As discussed earlier, however, privations caused by the long absences of hunters on sea otter hunting expeditions were severe, and the population declined rapidly due to disease, malnutrition, and social disruption.

The Russians never forced this labor system on the Chugach. The colonial classification system categorized the Chugach and Tanaina as "semi-dependent" while the more thoroughly dominated Koniag and Aleut were "dependent" (Okun 1979). The greater independence of the Chugach seems to have resulted from American and British competition in Prince William Sound. Since British and American traders had no desire to colonize the area, they treated the Chugach as independent trading partners and supplied them with guns which provided military parity with the Russians.

By 1796, when Baranof captured Fort Constantine (near the village of Nuchek on Hinchinbrook Island) from the Lebedev-Lastochkin Company and took over Russian operations in Prince William Sound, much of the sea otter population was gone and company attention was shifting to Tlingit territory. The Chugach never were forced to supply furs to Fort Constantine and when they did were paid in trade goods (beads and tobacco) and later cash.

Many sea otter furs were traded in the Native network or directly to non-Russian foreigners, and Chugach participation in Russian-led sea otter flotillas was voluntary. Debts to the company store obligated many to hunt for the Russians, however, and the Chugach were decimated by the same epidemic diseases that swept the Koniag (Hassen 1978).

In the later years of Russia's American venture (ca. 1805 - 1867), the RAC expanded its operations to the south (Sitka, California, Hawaii) and north (interior Alaska). After Baranov's dismissal in 1818, the administration of the RAC was carried out by high-ranking naval officers, and the company took on a governmental as well as commercial character. It maintained churches, schools, and medical services, and made efforts to inoculate the remaining Natives against the ravages of smallpox. More official rights and educational opportunities were extended to Native peoples, and Creoles assumed increasing importance in church and company affairs. Conservation measures were introduced to prevent the total destruction of sea mammal populations through over-hunting. Commercial fishing, ice cutting, brickmaking, and coal mining were undertaken. Nonetheless, the financial position of the company declined until the decision to sell Alaska to the United States was reached by the government of Tsar Alexander II in 1867.

Commercial Resource Exploitation Period (1867 - Present)

In 1868, the RAC was reorganized as the Alaska Commercial Company (ACC) and later merged with the Northern Commercial Company (Hassen 1978:142). The ACC established district headquarters at Kodiak and established posts at Nuchek (formerly Fort Constantine), Chenega, Kanikluk, and Tatitlek in Prince William Sound and at Katmai and Kaguyak on the Alaska Peninsula. The ACC participated in the declining fur trade while expanding into salmon fishing and other ventures. The fur market collapsed in 1897 resulting in great hardship for Native people. Koniag and Chugach populations continued to fall due to the spread of disease including tuberculosis, while a large "Creole" population resulted from extensive Koniag intermarriage with Russians and Americans.

The American purchase of Alaska had a substantial cumulative impact on Alutiiq life. Commercial over-exploitation of sea otters, fur seals, whales, salmon, herring, pilchard, halibut, and crabs since the late 1800s has reduced the biological productivity of the Gulf of Alaska to a fraction of its pre-contact level. Environmental impacts from mining, logging, defense construction, roadbuilding, and fox farming are all legacies of this commercial era.

Native subsistence and trade were affected by depletion of wild stocks and still more disease epidemics in the early 20th century. Native settlement patterns and lifeways adjusted to the growing availability of store-bought goods and to the seasonal jobs not taken by cheap immigrant labor. Chugach and Koniag cultures have adapted to the Western cash economy throughout this period while retaining elements of a traditional subsistence lifestyle. Social adjustments to catastrophic events such as the 1912 eruption of Mt. Katmai, and the 1964 earthquake and tidal wave have exacerbated the social impacts of the commercial era on Chugach and Koniag communities.

Commercial Fishing

The growth of commercial fishing during this period changed Alutiiq life and culture forever. The industry mushroomed from small local salteries supplied by fishermen with nets in the 1880s to large canneries supplied by massive fishtraps by the early 1900s. Many aspects of traditional Koniag and Chugach material culture persisted into the 1880s, but the use of *baidarkas*, skin clothing, and traditional hunting weapons decreased during the commercial fishing era as manufactured goods became increasingly available and a wage economy was established (Crowell 1991). Settlement patterns were influenced by cannery locations and a sedentary way of life became more common as lives were linked to annual harvest, processing, and facility construction cycles (Mobley *et al.* 1990:53).

The socioeconomic impact of the fishing industry around Kodiak Island and Prince William Sound is well documented (Bean 1891; Moser 1899; Hassen 1978). Roppel describes the character of the industry's initial phase on Kodiak Island:

> . . . salmon were salted on the small streams in several remote bays. Port Hobron on Sitkalidak Island began in 1888 when the Alaska Coast Fishery Company established a saltery with Ivan Petroff as manager . . . Eighteen white men and a few natives harvested the fish from a lake opposite the station. Salmon were transported over a horse-railway to the beach, transferred to barges or dories, and delivered to the curing house. By 1890, this station had been sold and removed to Eagle River in Uyak Bay [1986:13].

The industry grew quickly and canneries were processing millions of fish at Karluk on west Kodiak Island and at the mouth of the Copper River in Prince William Sound by 1890. In 1892, President Harrison set aside most of Afognak Island as the Afognak Island Forest and Fish Culture Reserve - Alaska's first forest reserve - intending to conserve the area's timber and salmon (Rakestraw 1981:10). Early conservation legislation did not deter the insatiable greed endemic to the industry, however. Roppel (1986:45) noted that in 1898 Hume Bros. & Hume of Uyak, Kodiak Island seined 46,000 sockeye salmon from Malina Bay and Creek on Afognak Island by fencing off stream mouths with nets.

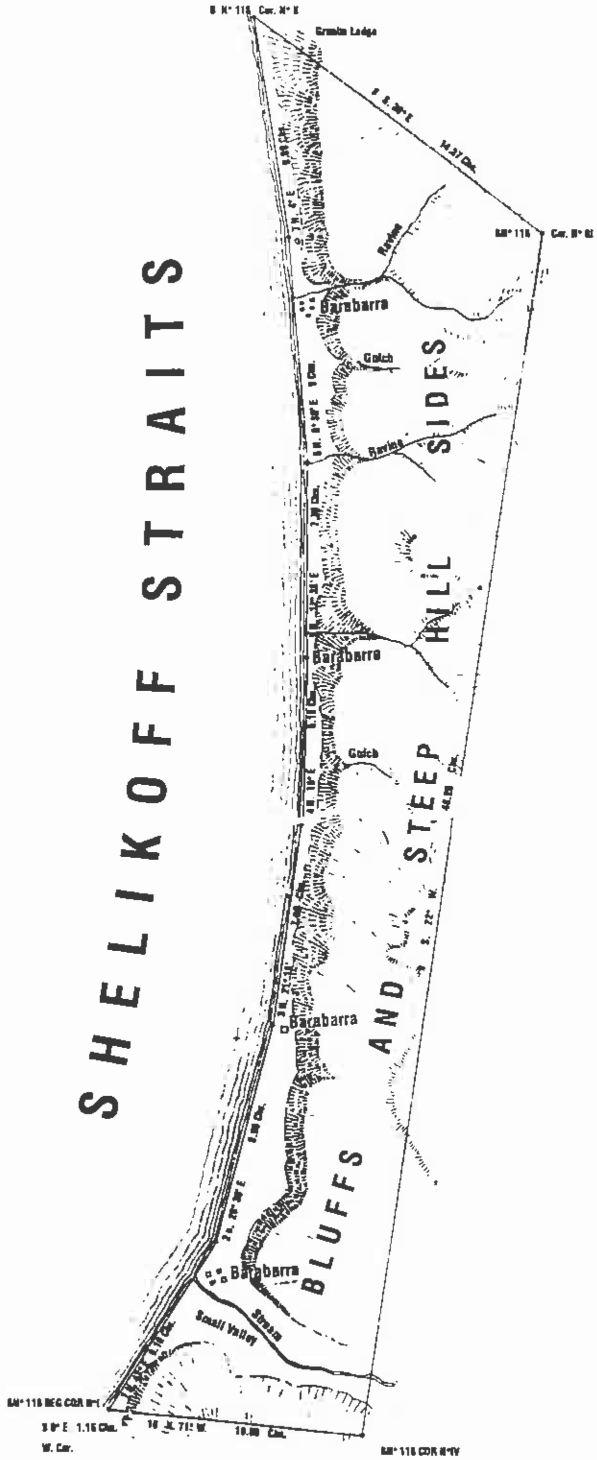
Commercial fishing depleted the fish stocks traditionally relied on by Alutiiq peoples for subsistence and effectively destroyed local control over access to the resource. Moser described the situation in the Afognak area:

> These half-breeds and natives of Afognak according to their own custom, have three recognized districts for hunting and fishing. . . . These limits are accepted by all the inhabitants, and the intrusion of any alien is considered an abuse of their customs. It is natural, therefore, that they resent the fishing of the Afognak streams by the canneries, nor can they understand how these streams which belong to them by tribal rights, can be closed by the government (Moser 1902:247).

Fisheries plats and charts from the early 1900s illustrate changes in Alutiiq residence patterns as many plats note "barabaras" or "native huts" close to canneries on Kodiak Island and in Prince William Sound (Alaska Division of State Libraries and Museums 1982; Alaska Historical Library 1984; Figure 48). Archival records indicate that Capt. John J. Healy formed the Central Alaska Company, a commercial trading venture including land near the Karluk cannery. The plat of U.S. Survey No. 118 (Alaska Division of State Libraries and Museums 1982: Fiche 461) notes improvements (barabaras and sheds) on the Central Alaska Company's property in Northeast Harbor near Karluk (Figure 48).

Fisheries plats of the early 1900s also note the location of commercial fish traps in Prince William Sound and on Kodiak Island. One variety of the fish trap involved construction of a line (or lead) of net-draped pilings which funnelled fish into a vestibule (heart) and through a tunnel into a holding pen or pot (Figure 49). When enough fish congregated in the pot, another tunnel was opened and the fish swam into the removal chamber (spiller) where they were loaded onto barges or skows for transport to the cannery. The advantages of the system were that fish remained alive in the pot or spiller until ready to be processed, and the stationary traps were easier for government agents to regulate (Jones 1915:8). Unfortunately, the traps caught all fish, not only salmon, which led to waste of unwanted species. Traps located near creek or river mouths could destroy entire runs of fish by not allowing any fish to escape and spawn (Jones 1915:9). Remains of these structures were identified during Exxon's cultural resource surveys, including a fish trap anchor (Mobley *et al.* 1990:168) and iron cables possibly used to anchor smaller floating versions of the commercial fish traps. The remains of canneries, salteries, rendering stations, and residences associated with commercial fishing activities also were documented (see Chapters 5 and 6).

Fish traps were outlawed in 1959 when Alaska became a state, but not before they contributed to the decimation of Gulf of Alaska fish stocks. Overfishing depleted Alutiiq subsistence resources and



PLAT

of

U.S. Survey No.118 made under Sections 11,12,13,14,

and 15 of an Act Of Congress, entitled, "An Act to repeal timber culture laws, and for other purposes," approved March 3, 1891, and the regulations thereunder, for a tract of public land, claimed by the

....................Central Alaska Company........................

Situate on West Coast of Kodiak Island near

5 mile Point known as N.E. Harbor

................................in the Sitka Land District, District of Alaska,

containing an area of ..38.52......Acres.

Scale of ....Four......chains to the inch

Variation ....24°.....East.

Surveyed in....August...............1893 by

A. Lascy

United States Deputy Surveyor

Deposited for field work, $.............at San Francisco, Cal.

Deposit No. 44 made Dec. 11/93 for $131 35/00

Deposited for office work, $..

Refunded...........................$..

The original field notes of the survey of the claim of the

........................Central Alaska Co.............................

from which this plat has been made under my direction have been examined and approved, and are on file in this office; and I hereby certify that they furnish such an accurate description of said claim as will, if incorporated into a patent, serve fully to identify the premises, and that such reference is made therein to natural objects and permanent monuments as will perpetuate and fix the LOCUS thereof.

I further certify that the value of the improvements made upon said claim by the claimant or its grantors is of the value of

.....$200 00..........................dollars, and that said improvements consist of..........Barabarras and Sheds..

....

....

as appears by the returns of the deputy surveyor; and that the location of all improvements upon said claim is correctly shown upon siad plat; and I further certify that this is a correct plat of said claim, made in conformity with said original field notes of the survey thereof, and the same is hereby approved.

U.S. Marshal, ex officio, Surveyor General's Office

Sitka, Alaska,............................1893

[from Alaska Division of State Libraries and Museums 1982:Fiche 461]

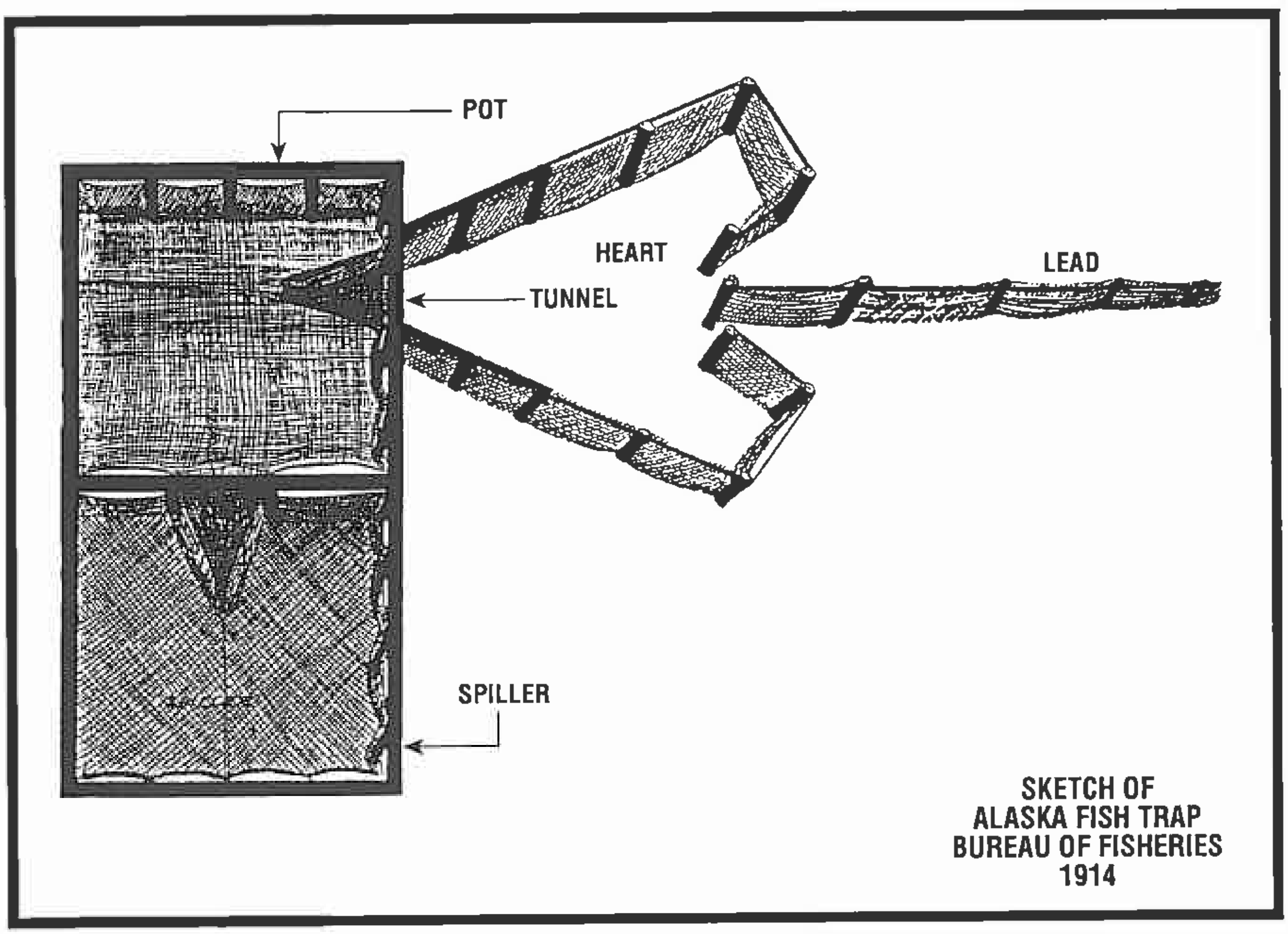
Figure 48 Plat of US Survey No. 118, north of Karluk

caused the loss of pre-commercial resource locales, traditions, and technologies. Chugach and Koniag people relied increasingly on purchased food and supplies as a result of commercial fishing as they adopted aspects of the cash economy. Immigrant Chinese, Filipinos, Italians, and Scandinavians involved in the fishing industry contributed to the increasing ethnic diversity of the region's population during this era.

Commercial Whaling

The annihilation of whale populations by commercial hunting during the early 1900s in Washington, British Columbia, southeast Alaska, and the Aleutian Islands is well documented. The depletion of these species did not directly affect Native subsistence since Koniag and Chugach people had quit whaling by the mid-1800s. A commercial whaling station (KOD-202) was established by the American Pacific Whaling Company at Port Hobron on Sitkalidak Island in 1925. Whale meat, salted and packed in barrels, was worth 10 cents a pound at Port Hobron and 11 cents per pound shipped to San Francisco (Hagelund 1987:70).

The wreck of the vessel *Unimak* (SEW-487), recorded during 1989 Exxon surveys (Mobley *et al.* 1990:169), is located in Prince William Sound. According to Newell (1966:201), a vessel *Unimak* was the first vessel built at the new boatworks in Seattle in 1912 for the Alaska Whaling Company and was



[from Jones 1915:12]

Figure 49 Sketch of Alaska fish trap 1914

one of the Akutan fleet of the American Pacific Whaling Company. In 1942, the *Unimak* was taken over by the Coast Guard for experimental work. SEW-487 may or may not be the wreck of that whaling vessel; however, whaling shipwrecks and abandoned whaling stations are archaeological reminders of the short but intense commercial whaling era.

Fox Farming

The origins of fox farming in Alaska date to the 1760s when Russians introduced blue foxes to the Aleutian Islands. Island leasing during the early 1900s by the Forest Service in Prince William Sound, the Kenai Peninsula, and on Afognak Island encouraged the growth of fur farming in the Alutiiq region. Arctic foxes (especially the desired blue phase) were stocked on islets and left unattended to scavenge bird rookeries and beaches for food (Klein 1986:104). Pelts were collected from animals captured in winter and sold to overseas fur buyers. The best pelt prices - some farmers averaged $100 per pelt - came just before the depression which put most fox farmers out of business (Klein 1986:105). Introduced foxes decimated many sea bird and waterfowl colonies in the region.

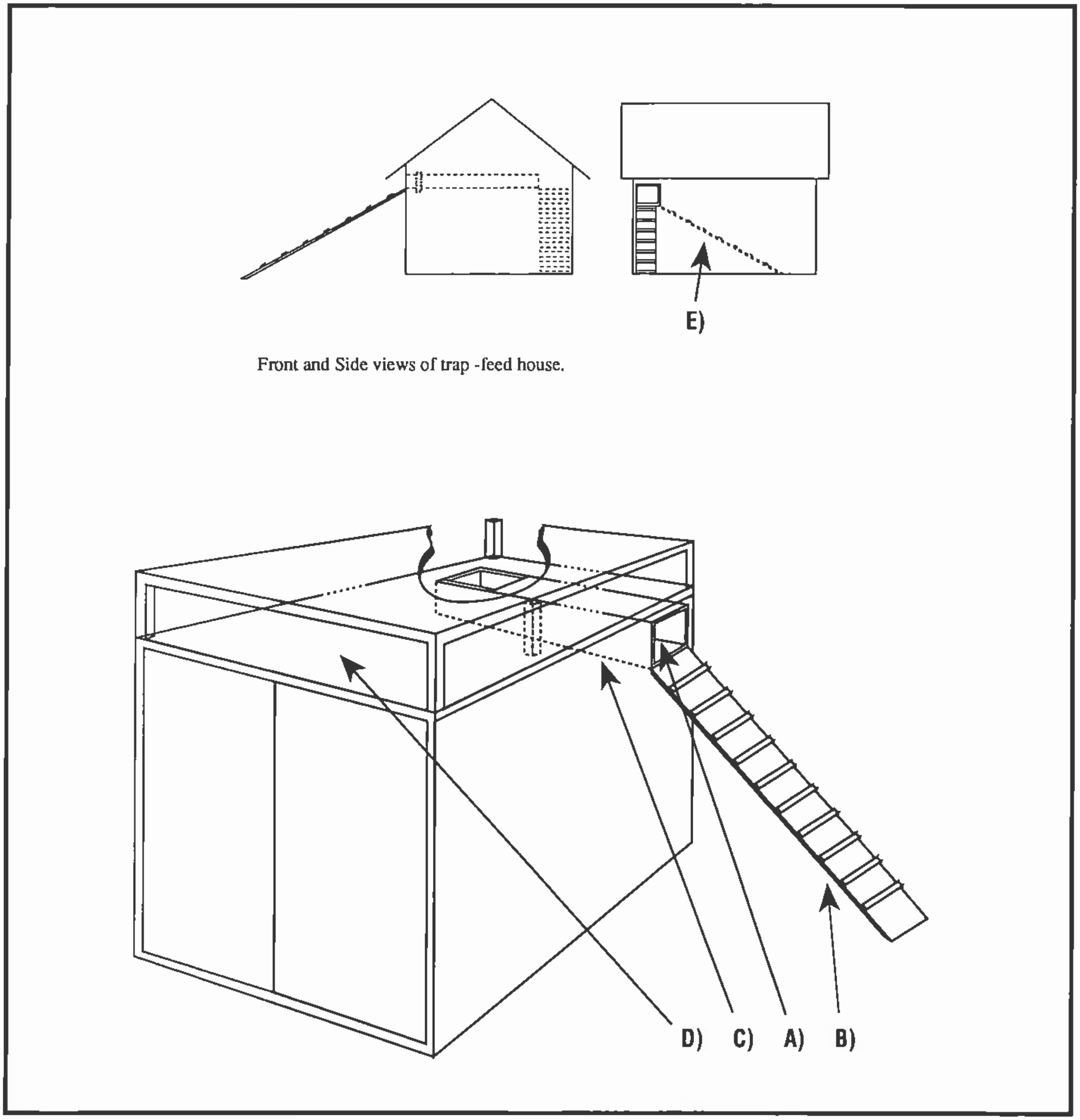
Foxes and other fur-bearers like mink and marten also were farmed in the region through pen rearing. Pen-reared foxes were fed fish, cereal mush, cannery waste, porpoise, and the occasional dead whale (Ashbrook and Walker 1925:20). Pen-rearing the animals was labor-intensive and involved the construction of pens; trapping, branding, and feeding stations; pelting sheds; docks; and residences. Figure 50 depicts a trap-feed house which provided a place for foxes to eat unmolested by ravens or eagles, and where they were captured uninjured for branding or for harvest (Ashbrook and Walker 1925:12) (see also Figure 87). The remains of these and other fox farming structures and residences were recorded throughout the region by Exxon's archaeological consultants. Two sites in particular, SEW-438 and AFG-099, are large fox farm complexes which exemplify the time and effort invested by local and immigrant European fox farmers. Descriptions of specific fox farms, lists of island leases, and anecdotes of individual farmers are available in Janson (1985). A list of Forest Service Special Use Permits for fox ranches in the Chugach National Forest is presented in Appendix G.

Logging

The use of forest products in the region prior to contact was limited to Alutiiq shelters, tools, foods, and medicines (Wennekens 1985). On a regional scale, Russian impact on timber resources was "inconsiderable," although forester W. A. Langille found evidence for extensive local cutting and some fire damage attributable to the Russians while examining Prince William Sound and the Kenai Peninsula forests in 1904 (Rakestraw 1981:4). Langille noted that much of the lumber used in the region in the early 1900s was imported from Puget Sound, and local wood was used as firewood (Rakestraw 1981:37). He also noted that big game animals were being killed by Boone and Crocket Club sports hunters who stayed a short time, killed as many animals as they saw, took the best heads, and left. Traders also hired Natives to kill animals for trophy heads to sell to sportsmen (Rakestraw 1981:38).

The Chugach National Forest was created in 1907, when Valdez was the communications center and supply point for local fishermen and prospectors. The smaller settlements in the Chugach National Forest at its inception were Cordova (population 6 in 1907), Ellamar (a few resident miners), and Latouche and Reynolds (small mining towns). The town of Orca near Cordova was a cannery site inhabited only during the summer. There was also a mobile population of 500 to 1,000 miners and prospectors in the region in 1907 (Rakestraw 1981:44).

Logging was an offshoot of copper mining - the major economic activity in the region in the early 1900s. Timber was needed to supply the mines with ties, pilings, and mine supports (Figure 51). Although high quality timber was rare in the Chugach National Forest, construction grade Sitka spruce, black spruce, and black hemlock were abundant. Some early homestead entries were designed to control the timber which local railroads needed.



[From Ashbrook and Walker 1925:14]

Figure 50 Fox farming trap-feed house

Foxes arrived at the chute (A) by means of a sloped board (B). The weight of the fox triggered release of a collapsible floor (C) which dropped the fox to the floor of the house. The floor was fitted with counterweights which automatically reset. The floor was disarmed when in use as a feed house, allowing foxes onto the feeding platform (D). A runway (E) permitted free passage through the trap into the trap-house when desired.

The Copper River Lumber Company operated a mill in Valdez and a permit was pending for a mill on Latouche Island to supply local mines. Handlogging was common as only one steam logger, owned by the Copper River Lumber Company, operated in the sound (Rakestraw 1981:45).

During World War I, timber sales in the Chugach National Forest increased. Cable logging largely replaced handlogging by the 1920s, and the best timber accessible to tidewater had been cut at least once. Logs usually were cut for mills by contractors, many of whom were Native (Rakestraw 1981:74). In the mid-1930s, the Civilian Conservation Corps (CCC) worked on special projects in the region including road and trail building (Rakestraw 1981:96). During World War II, Afognak Island was used as a source of lumber for a military base on Kodiak Island (Rakestraw 1981:120), and the Afognak salmon hatchery buildings were used as fishing or hunting camps for troops stationed at Kodiak (Rakestraw 1981:131).

[Joe Leahy photo]

Figure 51 Handlogging in Prince William Sound circa 1943

Descriptions of early 20th century life in Prince William Sound are recorded in the Chugach National Forest Ranger Notes and Diaries (Chugach National Forest Rangers n.d.). Rangers and other Forest Service employees kept diaries, journals, and ship logs in which they recorded forestry management activities and anecdotes of life in the region. The history of the Chugach National Forest is currently unwritten; however, ample raw material for its synthesis is present in the notes and journals of the Chugach National Forest Rangers.

Mining

The history of mining in Prince William Sound and the Lower Kenai Peninsula was summarized in Mobley *et al.* (1990:53-54, 180-190), including descriptions of archaeological investigations at Latouche Mine (SEW-026). Copper also was mined in Port Dick on the outer Kenai Peninsula at the turn of the century by the Alaska Commercial Company, and later by J.O. Buzzard (Seward Gateway 1905:1). Gold mining on Shuyak Island and in the Nuka Bay area occurred between the 1920s and 1940s, chromite mining at the settlement of Chrome on the outer Kenai Peninsula during World War I, and coal mining in Kachemak Bay and Port Graham throughout the early 20th century.

A mining camp (SEW-514) recorded in Prince William Sound by Exxon archaeologists in 1990 illustrates various activities associated with prospecting and mining during the early 20th century (Figure 52). According to the daily service report of Chugach Forest Ranger John N. Schurr, the Russell Ball Mining Company had mineral claims in the SEW-514 vicinity. Schurr investigated and wrote a report on the Ground Hog and Helena mineral lode claims in August of 1911 as part of his duties as a Chugach National Forest Ranger (Chugach National Forest Rangers n.d.). Mining sites in the region preserve a valuable heritage which, when combined with archival and oral history data, provide opportunities to reconstruct economic and social aspects of early 20th century life in southcentral Alaska.

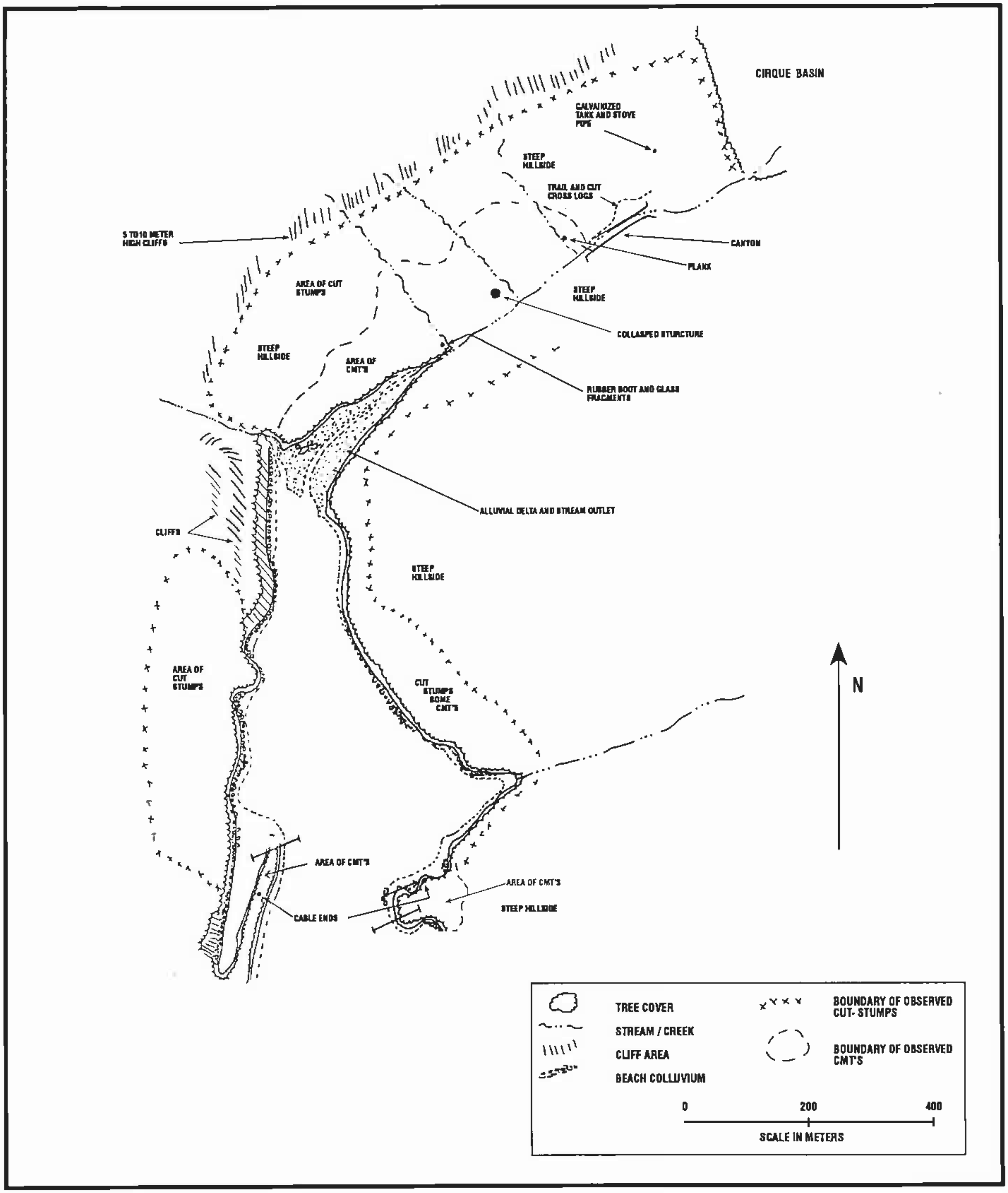
Military Activity: 1942-1946

The World War II military buildup in Alaska resulted in major cultural changes in the Alutiiq region. The Japanese threat early in the war led to an expansion of transportation and communication facilities, the creation of a militia (the Alaska Territorial Guard), and an influx of large numbers of "outside" military personnel. Creation of the town of Whittier in Prince William Sound and the development of military installations in Seward and Kodiak resulted directly from the war. The military buildup during World War II altered Alaska's territorial character and eventually led to the statehood movement.

The remains of previously undocumented military outposts and camps, possibly related to harbor defense, were recorded by Exxon's archaeological consultants in Prince William Sound and on the outer Kenai Peninsula (SEW-435, SEL-202, and SEL-203). Defensive bunker complexes also were noted in the Kodiak area, some of which were built on prehistoric midden deposits. World War II military remains in southcentral Alaska are artifacts of the socioeconomic impact of mid-20th century world events on the region.

The Archaeology of the Alutiiq Region

This summary of southcentral Alaska's archaeological record is undertaken from a dual perspective. The first is descriptive, emphasizing cultural periods, dating, and artifact assemblages. The second is interpretive, focusing on economic and social processes, including cultural adaptation to the environment, population growth, and changing social organization. Except for the earliest phases of prehistory, much of the archaeological sequence for the Alutiiq region has now been established. Many details remain to be filled in for poorly documented areas like Prince William Sound and the outer Kenai Peninsula, however, and for issues like the patterns and causes of subsistence and settlement change,



[adpted from field map by B. Ream and J. Gallison 5/13/90]

Figure 52 Sketch of mining camp (SEW-514), Prince William Sound

the rise of cultural complexity, and the effects of European contact on Alutiiq societies.

A serious problem that prevents more detailed understanding of the history of human adaptations in the region is a lack of faunal samples systematically collected from archaeological sites. Faunal data have been presented for assemblages from a number of sites in the Alutiiq region (e.g., Amorosi 1987, 1988; D. Clark 1974a; G. Clark 1977; Friedman 1934, 1935; Grayson 1977; Heizer 1956; Kellog 1936; Lobdell 1980; Yesner 1991), but these vary widely in detail and quality. Very few excavations have used recovery methods designed to collect representative faunal samples, especially of small or friable remains like fish bones and marine shells. Until comprehensive faunal analyses are available for sites from a variety of periods and environmental contexts, the full range of variation in Alutiiq adaptations cannot be understood.

Research History

Several distinct phases of archaeological research have taken place in the study area. These are characterized by the distinctive theoretical perspectives, research objectives, and field methods of past researchers, differences that reflect historical developments in American archaeology.

Museum Collecting

The mid to late 1800s was an era of intensive ethnographic collecting by American and international museums. In the Alutiiq region, this collecting was similar to the scramble for Northwest Coast objects described by Cole (1985). Museum collectors included Voznesenskii for the Russian Academy of Sciences (Aleutians, Kodiak, and Cook Inlet, 1842 - 43), Holmberg for the Danish National Museum (Kodiak, 1851), Dall for the Smithsonian Institution (Aleutians and Kodiak, 1865 - 1874), Pinart for the Trocadero (Museé de l'Homme) in Paris (Aleutians and Kodiak, 1871 - 72), Jacobsen for the Museum für Volkerkünde in Berlin (Cook Inlet and Prince William Sound, 1881 - 82), and Fisher for the Smithsonian (Kodiak, Alaska Peninsula, and Prince William Sound, 1879 - 1894).

These collectors focused mostly on acquiring contemporary objects, but they also exploited archaeological sites. Most were interested primarily in retrieving museum-quality specimens or human skeletons. There was little or no conception of the potential antiquity of New World cultures at this time, so few researchers were aware that Native American cultures may have changed through time. Dall (1877) was exceptional in applying an evolutionary perspective to his pioneering shell-mound excavations in the Aleutians. More typically, Dall (1878) and Pinart (1875b) removed masks from a burial cave in the Shumagin Islands, and Jacobsen (1977) excavated at burial rockshelters in Prince William Sound and at a post-contact village in Cook Inlet he called "Soonroodna." Fisher dug in middens on Kodiak and compiled survey data on sites in the region (Crowell 1992).

Boasian Culture History

Ethnographic and archaeological research in the Alutiiq region in the early 1900s was aimed at answering the "Eskimo origins" question. Franz Boas (1905, 1925) directed the Jesup North Pacific Expedition (1897 - 1902) with this topic in mind and believed the coastal Eskimo adaptation originated in central Canada, later spreading west into Alaska and northeast Siberia. Birket-Smith (1929) proposed two stages in Eskimo culture history: a New and Old World "Paleoeskimo" stage of early coastal adaptations developed from an interior hunting base, followed by a more maritime "Neoeskimo" stage that emerged in the Bering Strait region under Asian influences from Siberia. Archaeological research has confirmed and modified Birket-Smith's model. Paleoeskimo now includes the Arctic Small Tool and succeeding Bering Sea and Canadian traditions of ca. 4500 - 2000 B.P., while Neoeskimo refers to the post-2000 B.P. Old Bering Sea, Punuk, Dorset, and Thule cultures.

Birket-Smith (1953) brought a Boasian perspective to ethnographic research on the Chugach in

1933. He concluded that Chugach culture was an amalgam of Paleoeskimo, Neoeskimo, Northwest Coast, and Athapaskan elements, with a late addition of Northeast Asian traits (e.g. poison dart whaling) transmitted by way of the Aleutians. Like other Boasian culture historians, Birket-Smith saw diffusion (not invention or autonomous development) as the primary mechanism of culture change, and used trait list comparisons to reconstruct past cultural contacts.

De Laguna's (1956, 1975) pioneering archaeological work in Cook Inlet and Prince William Sound in the early 1930s was done in conjunction with Birket-Smith's research, and reflects its theoretical premises. In her view, the Kachemak Bay sequence demonstrated the "building" of Pacific Eskimo (Alutiiq) culture through adoption of tool types and cultural practices originating among other North Pacific cultures. Kachemak I was seen as a Neoeskimo (Thule) culture, modified later by the addition of Asian, Northwest Coast, and southern Alaskan traits such as mummification, use of refuge islands, decorated stone lamps, splitting adzes, notched pebble sinkers, and rod armor. Prince William Sound materials were thought to be related but exclusively late.

Without radiocarbon dating or detailed information from many other Alaskan sites, de Laguna (1947) underestimated the age of the Kachemak Bay sequence. Her "Thule base" hypothesis led her to suggest an age of slightly more than 1,000 years for the entire sequence, whereas Kachemak I - III are now known to span the period of ca. 3300 - 1100 B.P. (Workman *et al.* 1980). Some time after this terminal date, the Kachemak Eskimo of lower Cook Inlet were replaced by maritime Tanaina Athapaskans (de Laguna's Kachemak IV).

In the 1930s, physical anthropologist Ales Hrdlicka (1943, 1944) carried out regional surveys on Kodiak and in parts of Prince William Sound. Hrdlicka's excavations at the Uyak Site (KOD-145) on Kodiak Island from 1931 to 1936 (Hrdlicka 1944; Heizer 1956) also were concerned with unraveling the origins of the Pacific Eskimos. Hrdlicka viewed Alaskan culture history in terms of successive waves of Asian migration, each introducing a new physical type as well as a new culture. Artifacts and broad-headed skulls from the upper "Koniag" level of the Uyak Site were seen as the remains of a "simpler, cruder people" who replaced the long-headed and artistic "Pre-Koniag" population of the lower and intermediate strata. Hrdlicka's conclusions are now dismissed by most researchers, partly because of his crude excavation techniques. A recent analysis of Hrdlicka's skeletal collections (Scott 1990) suggests some biological continuity between Kachemak and Koniag populations on Kodiak (see also Jordan and Knecht 1988). The "Pre-Koniag" components from the Uyak Site are very similar to de Laguna's Kachemak Bay I - III assemblages. All are now included in the Kachemak tradition.

Chronology, Environment, and Social Process

After nearly 30 years of virtual inactivity in the Alutiiq region, archaeological research resumed (with different methods and goals) in the early 1960s. Cultural-historical concerns still were important, now aided by the chronological precision of radiocarbon dating. Human antiquity in southern Alaska had been pushed beyond 8,000 years by excavations at Anangula in the eastern Aleutians (Laughlin 1951). New discoveries in the Bering Sea region (e.g. Giddings 1951) stimulated interest in the relationships between northern and southern Alaskan Eskimo cultures, which meet along the Alaska Peninsula. New theoretical interests were evident as cultural ecology became a central focus in American archaeology, with new emphasis on reconstructing paleoenvironments, subsistence practices, and settlement patterns. Interdisciplinary teams of archaeologists, geologists, botanists, and other specialists were common in field projects, which also increased in duration and scope (Willey and Sabloff 1980).

The University of Wisconsin's Aleut-Konyag Prehistory and Ecology Project in 1961 - 63, directed by William S. Laughlin, represented this new approach (Laughlin and Reeder 1966). The project's activities on Kodiak included biological surveys and pollen cores, genetic and demographic studies, and extensive archaeological surveys and test excavations (D. Clark 1966a, 1966b, 1970a, 1974c; W. Workman 1966). Clark refined and dated the Kachemak-Koniag sequence on Kodiak and discovered the even older Ocean Bay culture with technological links to Anangula and other sites of the Paleoarctic tradition (D. Clark 1979).

A second large interdisciplinary project, directed primarily by Don Dumond of the University of Oregon, was carried out between 1960 and 1975 in the Katmai National Monument and Alaska Peninsula National Wildlife Refuge (G. Clark 1974; Henn 1978; Dumond 1981). The long-standing existence of a cultural boundary between Bering Sea and Pacific coast cultures on the Alaska Peninsula was demonstrated, although cross-cultural interaction also was evident. Pacific coast cultures at Takli Island and Kukak Bay were found to correspond closely with Kodiak phases. Paleoarctic sites up to 9,000 years old were discovered and studies of faunal remains, pollen, glacial history, and ash fall sequences were undertaken.

The most recent university-based research program in the region was the Bryn Mawr Archaeology Project at Karluk (1983-87), directed by Richard Jordan (Jordan 1983, 1987; Jordan and Knecht 1988). Nearly complete organic preservation at KAR-001 provided the first detailed inventory of pre-contact Koniag wooden artifacts and basketry, and new collections and dates were obtained for the Kachemak-Koniag transition. Related research included extensive site surveys (Jordan and Knecht 1988; Crowell 1986), excavation of an 1840s Koniag house on the Karluk River (Knecht 1985; Knecht and Jordan 1985), new excavations and analyses of the Uyak Site (Jordan 1987; Steffian 1991a, 1991b), and paleoenvironmental research (Nelson and Jordan 1988).

A new theoretical concern with social processes is evident in the work of Jordan and Knecht. Along with more standard topics of cultural chronology, subsistence, and settlement, they examined trends in architecture, trade, warfare, ceremonialism, and post-contact social change. While important external influences are not denied, interpretations emphasize the cultural autonomy of the region and the internal dynamics of change rather than diffusion or migration. Related research continues under the aegis of the Kodiak Area Native Association, including excavations at a major Ocean Bay site (Hausler-Knecht 1991) and at the early Russian settlement of Three Saints Bay (Crowell 1991).

Research by University of Alaska Anchorage scholars in Kachemak Bay has produced new dates and interpretations of Kachemak and Taniana occupations and addressed ecological adaptations and social complexity (K. Workman 1977; W. Workman 1977; W. Workman *et al.* 1980; Lobdell 1980; W. Workman and K. Workman 1988; Yesner 1991). Prince William Sound has not been the scene of intensive academic research since de Laguna's work in the 1930s.

Agency and Contract Archaeology

Numerous archaeological surveys have been undertaken in the Alutiiq area over the past 20 years by state and federal agencies, Native corporations, and private contractors. Basic site data are maintained on the AHRS by the Office of History and Archaeology. Detailed summaries of agency and contract research in the Alutiiq region have been compiled by Mobley *et al.* 1990.

In Prince William Sound, the Forest Service has sponsored surveys (Lobdell 1975b, 1976b; G. Clark 1976; Diters 1982; Mattson 1978, 1985a, 1985b, 1986, 1987) and excavations at SEW-056, the Uqciuvit Village Site (M. Yarborough 1989b). The Bureau of Indian Affairs has investigated traditional sites selected under section 14(h)(1) of the Alaska Native Claims Settlement Act (Kent 1987; Dotter 1988a, 1988b). Other compliance and reconnaissance surveys include Mitchell and Johnson (1982), Stern (1982), Stern and Gibson (1982), Bacon *et al.* (1982), Ketz (1983), and Ketz and Johnson (1983). On the south coast of the Kenai Peninsula, several small surveys have been conducted (e.g., Arndt 1983, 1984; Reynolds 1984; Shields 1983), notably McMahan and Holmes' (1987) detailed description of the Sather fox farm (SEL-131) and other nearby sites.

Surveys and excavations in the Kodiak Island area have been sponsored by the Fish and Wildlife Service (Nowak 1978, 1979; M. Yarborough 1978; Klingler 1980), National Park Service (Cassedy and Dekin 1983), Office of History and Archaeology (Klingler 1983, 1988; Reger 1982b; Crowell 1986; Dixon 1986; L. Yarborough 1976a, 1976b), Bureau of Indian Affairs (Jesperson 1984; Crozier 1987, 1988), Kodiak Electrical Association (Jordan *et al.* 1981; Jordan and Righter 1980; Knecht 1988), and Corps of Engineers (Reynolds 1986, 1988). On the coast of the Alaska Peninsula, the major recent contribution has been Dumond's (1987) survey and predictive model for the Fish and Wildlife Service.

Regional Phase Descriptions

Extensive interaction between maritime groups of southern Alaska promoted a regional unity of culture evident throughout the archaeological record (D. Clark 1984a, 1984b; Crowell 1988). Workman (1980b:52) proposed that archaeological sequences for various areas of the southern Alaskan coast be subsumed into a larger North Pacific Maritime co-tradition, divided into a western sector (the Aleutians), a southeastern sector (British Columbia and southeast Alaska), and an eastern sector including the Pacific coast of the Alaska Peninsula, the Kodiak area, outer Cook Inlet, and Prince William Sound. As defined by Workman, the eastern sector of the North Pacific Maritime co-tradition coincides with the Alutiiq region and our study area. The known archaeological cultures of this region can be organized into five major chronological periods.

Paleoarctic Period - 11,000 to 7500 B.P.

There is growing evidence that a bifacial lithic tradition precedes the more widespread and better documented microblade-bearing Paleoarctic tradition (Figure 53) around the North Pacific Rim (Aikens and Higuchi 1982; Aikens and Dumond 1986), in interior Alaska (Powers and Hoffecker 1989), and possibly in southeast Alaska (Ackerman 1968) and British Columbia (Carlson 1989). Pre-microblade sites have yet to be identified on the southern Alaska coast, however, where the earliest known assemblages (at Ugashik Narrows) date to 9000 B.P. (Henn 1978:13).

Paleoarctic groups appear to have arrived from the north, part of a terminal Pleistocene dispersal from northeast Siberia to northwest North America beginning around 11,000 years ago (Dumond 1980; West 1981). Paleoarctic assemblages include microblades (used in composite bone knives and spearheads), wedge-shaped microblade cores, burins, and occasional bifacial points or knives. The few known Paleoarctic sites of southern Alaska are at inland locations, and faunal remains suggest a focus on caribou, bison, horse, elk, and sheep. Three Paleoarctic sites have been identified on the north side of the Alaska Peninsula, including the 9,000 year old Ugashik Narrows Site (Henn 1978:13), the 8,000 year old Koggiung Site (Dumond 1981:103), and an undated microblade site (Igiugig) at Iliamna Lake (Dixon and Johnson 1971). Recent research on the Kenai Peninsula (Reger 1985:255-257) has produced microblades, wedge-shaped cores, and other artifacts similar to the early Alaska Peninsula assemblages, though the presence of side-notched points suggests the possibility of a more recent age.

Laughlin (1975) believes some Paleoarctic groups were maritime peoples, inhabiting the south coast of the Bering Land Bridge (Beringia) before its submergence ca. 14,000 years ago. Most sites of this hypothetical early coastal adaptation may have been drowned by post-glacial sea level rise. A few coastal Paleoarctic sites are known from southern Alaska, though the economic adaptation is unclear because faunal remains rarely are preserved. All are located outside the study area: Anangula in the eastern Aleutians (Laughlin 1975); the Beluga Point Site on Turnagain Arm in Cook Inlet (Reger n.d.); and Groundhog Bay 2 (Ackerman *et al.* 1979), Hidden Falls (S. Davis 1988:194), and Thorne River (Dale *et al.* 1989) in southeast Alaska. The undated lowest level at Beluga Point contains microblades and microblade cores (Reger n.d., 1981) similar to Paleoarctic assemblages of the Alaska Peninsula

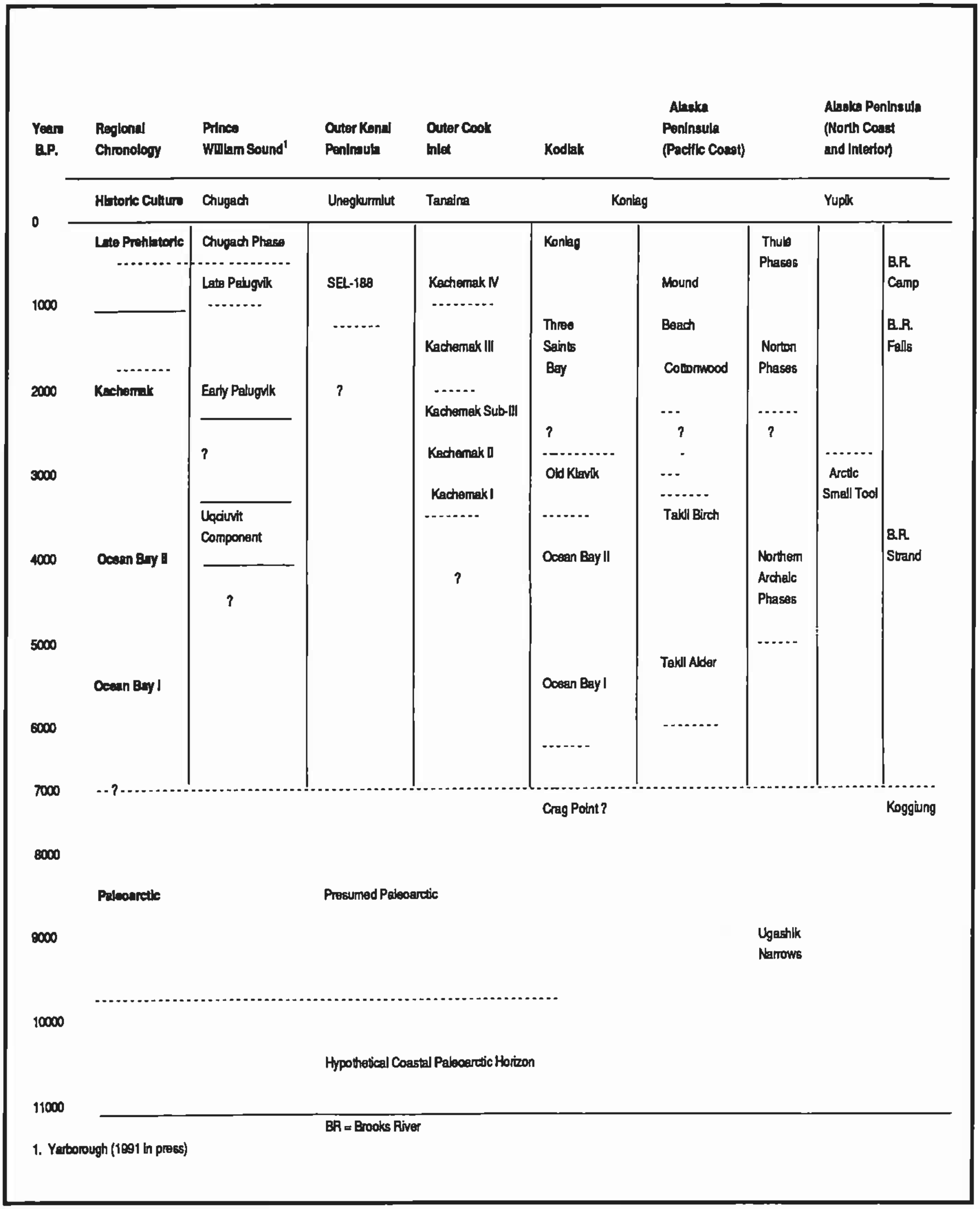


Figure 53 Cultural chronology of southcentral Alaska

(Dumond *et al.* 1976:19). In southeast Alaska, the 8,200 year old Chuck Lake Site on Heceta Island contains a well-preserved faunal assemblage that includes abundant shellfish, fish, and sea mammal remains - unequivocal evidence for an early maritime adaptation (Ackerman *et al.* 1985).

Early coastal sites on either side of the study area suggest that the southern Alaska coast was settled by at least 9,000 years ago. Unfortunately, the available data do not clarify the relationship of Paleoarctic peoples to later cultural traditions, though microblades and burins continue in early Ocean Bay assemblages of the area. According to Jordan (1991), a small assemblage of microblades and other chipped stone artifacts from the lowest level of the Crag Point Site (KOD-044) on Kodiak Island, associated with a date of 7790 ± 620, may be a transitional Paleoarctic - Ocean Bay I assemblage.

Ocean Bay Period - ca. 7000 to 3500 B.P.

The earliest evidence of an intensive maritime adaptation in the study area is associated with the Ocean Bay period, probably beginning sometime between 6,500 and 7,500 years ago. Kodiak phases are designated Ocean Bay I and II (D. Clark 1966a, 1979; Nowak 1979; Jordan and Knecht 1988), in which we place G. Clark's (1977) Takli Alder and Birch phases for the Pacific coast of the Alaska Peninsula. In Prince William Sound, the Uqciuvit Village Site (SEW-056) has a basal date of 3800 B.P. (M. Yarborough 1989b; M. Yarborough and L. Yarborough 1991) and C^{14} dates from two newly recorded rockshelters (SEW-430 and SEW-517; see Chapter 6) also fall near the end of Ocean Bay times (Erlandson *et al.* 1991). Little information is available on the earliest Prince William Sound sites, however, and their relationship to regional chronologies remains uncertain.

Artifacts

Ocean Bay I lithic assemblages are dominated by chipped stone artifacts, although some sawn and scraped slate tools occur. Stemmed projectile points with square to angled shoulders are diagnostic of the phase, accompanied by smaller bipoints, large bifacial endblades (probably for lances), and asymmetric sideblades. Other tool types include microblade cores, linear flakes, chipped burins, boulder flakes, abraders and grindstones, scrapers, hafted mauls, and small pecked stone oil lamps. Excavations at KOD-363 on Kodiak have produced the first full assemblage of Ocean Bay I bone tools, including bilaterally-barbed harpoon heads, fish hooks, needles, and whalebone wedges (Hausler-Knecht 1991).

A transition to assemblages dominated by ground slate occurred by about 4,500 years ago, marking the beginning of Ocean Bay II. On Kodiak, this phase lasts for about a millennium, while on the Alaska Peninsula it may persist until about 2,800 years ago (G. Clark 1977). Ocean Bay II ground slate forms include bayonet blades, stemmed flensing knives, small projectile points, and *ulu* knives. Blades occasionally have incised designs, and stem margins are often serrated (Figure 54).

Subsistence and Settlement

Site locations, tool assemblages, and limited faunal data suggest a strong maritime focus for Ocean Bay peoples by at least 6,600 years ago. Many investigated Ocean Bay sites have poor organic preservation, however, which inhibits economic reconstructions (D. Clark 1979). Hausler-Knecht's research at the Rice Ridge Site (KOD-363), with Ocean Bay I and II components dated between about 3,800 and 6,200 years ago, provides dramatic evidence for a fully maritime subsistence economy, including extensive sea mammal hunting and specialized technology. The faunal assemblage includes the remains of seals, sea otters, sea lions, and whales, along with bear bones and claws (Hausler-Knecht 1991). Shellfish remains are rare or absent in many of the Ocean Bay sites excavated on Kodiak. It is not clear if this is due to differential preservation, sampling, or a lack of extensive shellfish use by early populations. Nowak (1978:28) depicts a "light midden containing shell" in an Ocean Bay I component at KOD-224 that appears to date to about 6600 B.P. This indicates some degree of shellfish use by the time of the first well-documented occupation on Kodiak.

On the Alaska Peninsula, G. Clark (1977) found shellfish remains in Ocean Bay I (5650 ± 115 B.P.) and Ocean Bay II (ca. 4100 to 2800 B.P.) components at the Takli Island Site (XMK-018), though their dietary importance is uncertain. Sea mammals, including seals, porpoises, sea otters, and sea lions, appear to have been the focus of the Takli Site economy, outnumbering land mammals (brown bears, marmots, cervids, and canids) nine to one in the Ocean Bay I sample and 14 to one in the Ocean Bay II sample (G. Clark 1977: Table 5). A diverse assemblage of bird remains, with loon, albatross, fulmar, cormorant, goose, scoter, bald eagle, gull, murre, and auk bones was also recovered (Grayson 1977:210). A few fish (flounder and halibut) bones also were recovered in the midden.

Between 25 and 30 sites of Ocean Bay age have been identified in the Alutiiq region (Figure 55), limiting interpretations of Ocean Bay settlement patterns. All known sites are in coastal locations, however, in some cases on somewhat elevated landforms (G. Clark 1977) or on fossil beach terraces well above current sea level (R. Knecht, pers. comm. 1991). Sixteen sites have been C^{14} dated, and another 10 to 15 can be attributed fairly confidently to Ocean Bay on typological grounds. At least 18 of these are on Kodiak, with others on the Alaska Peninsula, in Kachemak Bay on the Kenai Peninsula, and in Prince William Sound (Figure 55). The earliest dated sites (6000 to 6500 B.P.) tend to be in protected inner bay or semi-protected outer bay locations on Kodiak. By at least 5,500 years ago, sites are found in similar contexts on the Alaska Peninsula and in exposed outer bay locations on Kodiak. By 4,000 to 4,500 years ago, sites are found throughout the Alutiiq area. Aside from the contexts mentioned above, Ocean Bay sites are found on protected lagoons, at bay heads, at the mouth of the Karluk River, and on remote islands. Except for two early components recently identified in Prince William Sound rockshelters, all sites have been found in open-air locations. The diversity of site locations suggests that significant local variation existed in Ocean Bay economies.

Houses

The remains of houses or other structural features have been found at several Ocean Bay open-air sites. Ocean Bay I house floors are oval to sub-rectangular, with outer margins defined by post-molds. The small size of the houses and the lack of internal post-molds suggest that the structures probably consisted of skin covers stretched over light pole frames. House floors are shallow or unexcavated and often covered with red ocher stains. A significant shift in house forms occurs in

[M. Eldridge 10:11]

Figure 54 **Serrated stem point fragment from AFG-098, diagnostic of Ocean Bay II or early Kachemak sites**

Ocean Bay II. D. Clark (1979:138) uncovered an Ocean Bay II pit house floor with stone slabs, internal post-molds, and two stone lamps. This structure indicates that the first substantial semi-subterranean houses may have come into use in the region about 4,000 years ago.

Middle Period (Kachemak) Cultures - 3500 to 1000 B.P.

Throughout the Alutiiq region, regional and temporal variants of the Kachemak tradition span the period between about 3,500 to 1,000 years ago. These include Kachemak I - III in lower Cook Inlet, the Kiavik and Three Saints Bay phases on Kodiak Island, and the Cottonwood and Beach phases on the Pacific coast of the Alaska Peninsula (Figure 53). Only Late Kachemak components are well documented in Prince William Sound (Palugvik I). In general, the Kachemak period is characterized by increasing evidence of coastal sedentism and population growth (larger and more numerous sites, substantial shell middens, semi-subterranean houses), as well as by elaborate ritual treatment of the dead

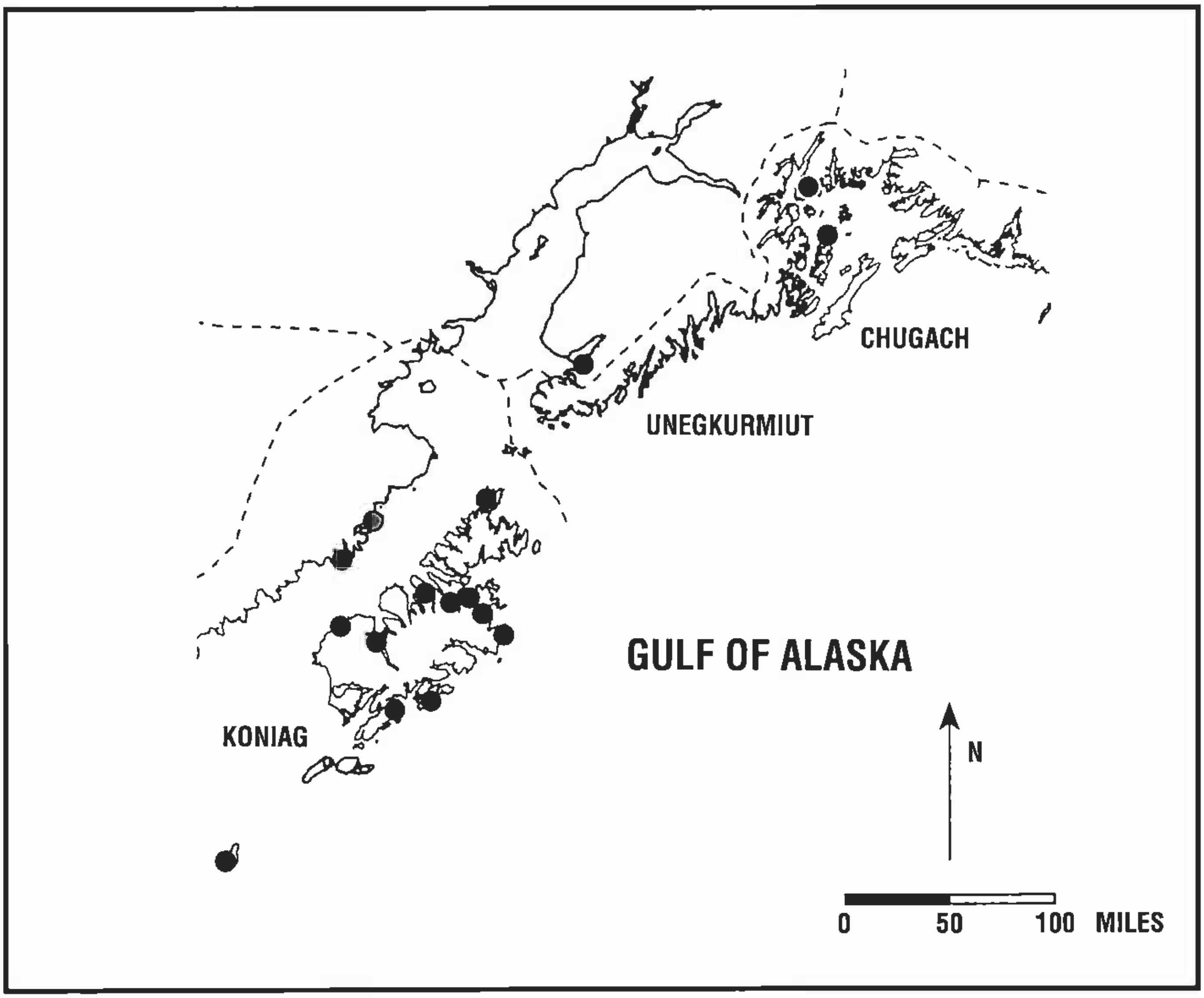


Figure 55 Distribution of Ocean Bay age sites in the Alutiiq region

and stylistically distinctive artistic expressions in carved bone and pecked stone. Ground stone implements continued to be important, and pottery first appears, the latter indicating interaction with Norton cultures of the southern Bering Sea and Alaska Peninsula.

Artifacts

The Early Kachemak period (ca. 3,500 - 2,100 years ago) is represented by Kachemak I in Cook Inlet (de Laguna 1975) and the Old Kiavik phase on Kodiak (D. Clark 1966a). Old Kiavik includes "Three Saints Bay" style ground slate blades with square stems and sharply-angled basal barbs, as well as *ulus* and knives with serrated stems (a possible stylistic continuity from Ocean Bay II). Chipped stone tools (bipoints, large leaf-shaped blades, *ulu*-shaped scrapers) are common in Old Kiavik and Kachemak I. End-grooved cobbles, probably used as heavy fishing plummets, are a diagnostic element, and notched pebble sinkers (for fish, bird, or seal nets) are abundant on Kodiak. Undecorated pecked stone oil lamps, not unlike Ocean Bay examples, were used.

Late Kachemak assemblages (2,100 - 1,000 years ago) include a much greater variety of types, and increased attention to finish, detail, and ornamentation. Among the ground slate projectile points are large and small Three Saints Bay points, shouldered slate points with serrated stems, and long narrow points with pronounced medial ridges and small barbs. This latter type, with a diamond-shaped or "flattened lozenge" cross-section, is an important chronological marker for the transition from Late Kachemak to Koniag and Chugach cultures. Most varieties of ground slate points probably were used to arm harpoons, darts, and lances for hunting sea mammals. Late Kachemak *ulus* - a knife associated ethnographically with fish and sea mammal processing - generally lack tangs and have straight backs and semi-circular blade outlines. Small chipped stone points are very common in Cottonwood and Beach phase sites on the Alaska Peninsula, perhaps due to the importance of bow hunting for caribou there (G. Clark 1977). Otherwise, chipped stone tools are far less abundant than in Early Kachemak sites. Notched pebble sinkers are ubiquitous.

Late Kachemak bone dart and harpoon heads are dominated by barbed varieties. Other bone weapon types are barbed and unbarbed arrowpoints, daggers, clubs, leister prongs, and bird dart prongs. Fishing equipment includes compound fish hooks and small carvings of fish used as lures or amulets.

Household containers and implements include whale vertebra dishes, mortars, scoops, shovels, awls, needles, and decorated spoons. Whalebone splitting wedges and adzes with small greenstone blades were used for woodworking. Charred fragments of twined basketry were found at the Three Saints Bay Site on Kodiak (D. Clark 1970a:80). Late Kachemak ceramic vessels (known from all areas except Prince William Sound) are thick-walled and tempered with gravel, sand, and vegetable fiber. Pecked stone oil lamps range in size and style from undecorated small prowed varieties to massive specimens decorated with breasts, grooves, faces, human figures, scroll work, and zoomorphic designs (de Laguna 1975).

Bone, tooth, ivory, shell, and jet (coal) were used for ornamental carvings, the artistic hallmark of the Late Kachemak period (Heizer 1956; de Laguna 1975;) (Figure 56). Among the ornaments produced were labrets, buttons, beads, nose rings, pins, chains, pendants, and combs. Carved bone amulets, maskettes, and figurines represent birds, sea mammals, and humans, including small seated human figures that were probably hunting hat ornaments. Two partial wooden masks also have been found (D. Clark 1970a: Figure 11b; Jordan and Knecht 1988: Figure 12a).

Subsistence and Settlement

Faunal analyses are available for Kachemak components on Kodiak (Heizer 1956; Kellog 1936; Friedman 1934, 1935; D. Clark 1974a; Amorosi 1987, 1988; Yesner 1989), the Pacific coast of the Alaska Peninsula (Dumond 1977; G. Clark 1974; Grayson 1977), Kachemak Bay (de Laguna 1975; Lobdell 1980; Yesner 1991), and Prince William Sound (de Laguna

1956). Kachemak sites often contain very deep and dense accumulations of shell midden. In many of these, huge amounts of shell refuse may indicate relatively intensive use of mussels, clams, and other shellfish, but densely packed lenses of fish bones and more widely scattered sea mammal bones may represent more edible meat. Intensive salmon use is evident from fish remains found at Karluk on Kodiak Island. Elsewhere, cod, halibut, and other marine fish appear to have been major dietary components. The emphasis on terrestrial mammals varies depending on local geography.

Yesner (1991) has noted considerable variability in Kachemak subsistence. For Kodiak Island alone, he notes that faunal samples from Kachemak village components at Karluk (Amorosi 1987, 1988) and Larsen Bay (Yesner 1989) on the west coast are dominated by fish remains (salmon and cod), with limited amounts of sea mammals, land mammals, birds, and shellfish. This contrasts with sites excavated by D. Clark (1974c) on the southeast coast, where harbor seals, porpoises, and other sea mammals dominate the faunal assemblages (Yesner 1991). Jordan also noted differences in Kachemak faunal assemblages on Kodiak. In a Late Kachemak village midden at Crag Point on north Kodiak Island, Jordan (1988a) found few fish remains, dominated by cod, halibut, and small amounts of salmon. Jordan reported the majority of the assemblage consisted of " . . . massive quantities of molluscan remains, high percentages of seals, small whales and porpoise, [and] quantities of bird remains (Jordan 1988a:9)."

G. Clark's (1977:53-54) data on Kachemak faunal samples from the Alaska Peninsula indicate a diversified economy incorporating a mix of marine and terrestrial resources. Data from the large Kukak Site (XMK-006) suggest that hunting of land mammals intensified compared to the earlier Takli Site (G. Clark 1977:47), though this may be due to local variation in the accessibility of land mammals (Dumond 1977:101-103). The Kukak Site fauna also included a variety of fish, birds, and shellfish remains (G. Clark 1977; Grayson 1977), the latter including 16 distinct taxa from rocky shore, mudflat, and sandflat habitats.

Combined data from the Karluk and the Uyak Bay drainages on Kodiak provide the most detailed picture of Kachemak settlement (Jordan and Knecht 1988:231-232, Figure 2). Of the 41 known Kachemak sites in this area, 12 are large villages with 10 or more surface housepits or at least one meter of midden deposits. The largest site (KAR-039) has 27 surface housepits (Figure 57). Housepits often occur in clusters at large sites, sometimes surrounding larger central structures which may be ceremonial houses. Large and small sites are distributed along the length of the Karluk River, and at Uyak Bay are concentrated in outer and mid-bay locations where resource diversity and abundance (sea mammals, bird colonies, shellfish beds) appear to be highest. No sites have been found on the exposed coasts outside of Uyak Bay and Karluk Lagoon. It seems likely that Kachemak settlement patterns from the Karluk - Uyak area are representative of much of Kodiak, with high site densities in protected and semi-protected outer bay areas, lower site densities in inner bay areas (where sites cluster at high productivity salmon streams), and few settlements located in exposed outer coast areas (see Chapter 7).

Data from the Kukak Site again suggest some differences between Alaska Peninsula and Kodiak Island groups. With 89 surface housepits, this is the largest pre-contact site known on the Shelikof Strait side of the Alaska Peninsula. Based on study of shellfish annual growth rings and the presence of hard (winter) caribou antler, Dumond concluded that the site was occupied year-round. Tools and house forms at Kukak are identical to those occurring during contemporary Brooks River phases in the Naknek River drainage (Dumond 1981), however, which suggests at least part of the Pacific coast Koniag population may have moved into the interior in the fall to hunt caribou and fish for salmon. There they may have established subsidiary villages and returned to the coast when the caribou migration was over. More study is needed to clarify coast-interior movements on the Alaska Peninsula and to examine continuity between prehistoric and post-contact patterns.

Houses and Features

Kachemak houses were sod-covered semi-subterranean structures with internal support posts and frames. Excavated houses are discussed in de Laguna (1975), Heizer (1956), D. Clark (1970a), G. Clark (1977), Jordan and Knecht (1988), Jordan (1987), Crozier (1989), and Steffian (1991b). Small alcoves or side chambers sometimes were appended to corners of the main room (Figure 57), which had an average size of about 24 square meters (4 x 6 m). Floor deposits are made up of compacted wood chips, grass, and food bone (where preserved), with lenses of ash, charcoal, and fire cracked rock. Internal features include large and small post-molds, benches or sleeping platforms paved with stone slabs, clay-lined storage pits, wooden floor planks, cobble hearths, and sub-floor drainage trenches.

Burial Practices

The human burials and detached bones common in Kachemak middens indicate that treatment of the dead was varied and complex (Jordan 1988a). Flexed, articulated burials in shallow pits (some inside dwellings) predominated at the Uyak Site (Heizer 1956:12), at the Three Saints Bay Site (D. Clark 1970a:88), and at Kachemak Bay sites in Cook Inlet (de Laguna 1975). Burial offerings vary in richness from a few tools to the remains of a mask and beaded parka with over 3,000 bone and shell beads found with a female skeleton at the Cottonwood Creek Site in Kachemak Bay (W. Workman *et al.* 1980). De Laguna also reported partially disarticulated burials that were probably in the form of mummies or wrapped body bundles at the time of deposition. Facial plasters of white clay, labrets, artificial ivory eyes, drilled holes through jaws and pelvic bones, tooth extractions, cut marks on bones, and extra bones in graves (jaws, crania) also were reported, and parallels have been drawn between some of these practices and those associated with the Ipiutak and Norton cultures (W. Workman *et al.* 1980:393).

Late Period Cultures Pre-Contact Koniag and Chugach, 1000 B.P. to A.D. 1741

After about A. D. 1000, archaeological cultures of the Pacific Eskimo region closely resemble the Alutiiq cultures encountered by Europeans in the 18th century A.D. In the archaeological record, the beginning of the Late period is marked by the appearance of new implement types such as splitting adzes and triangular slate endblades, broad stylistic

[Courtesy Smithsonian Institution]

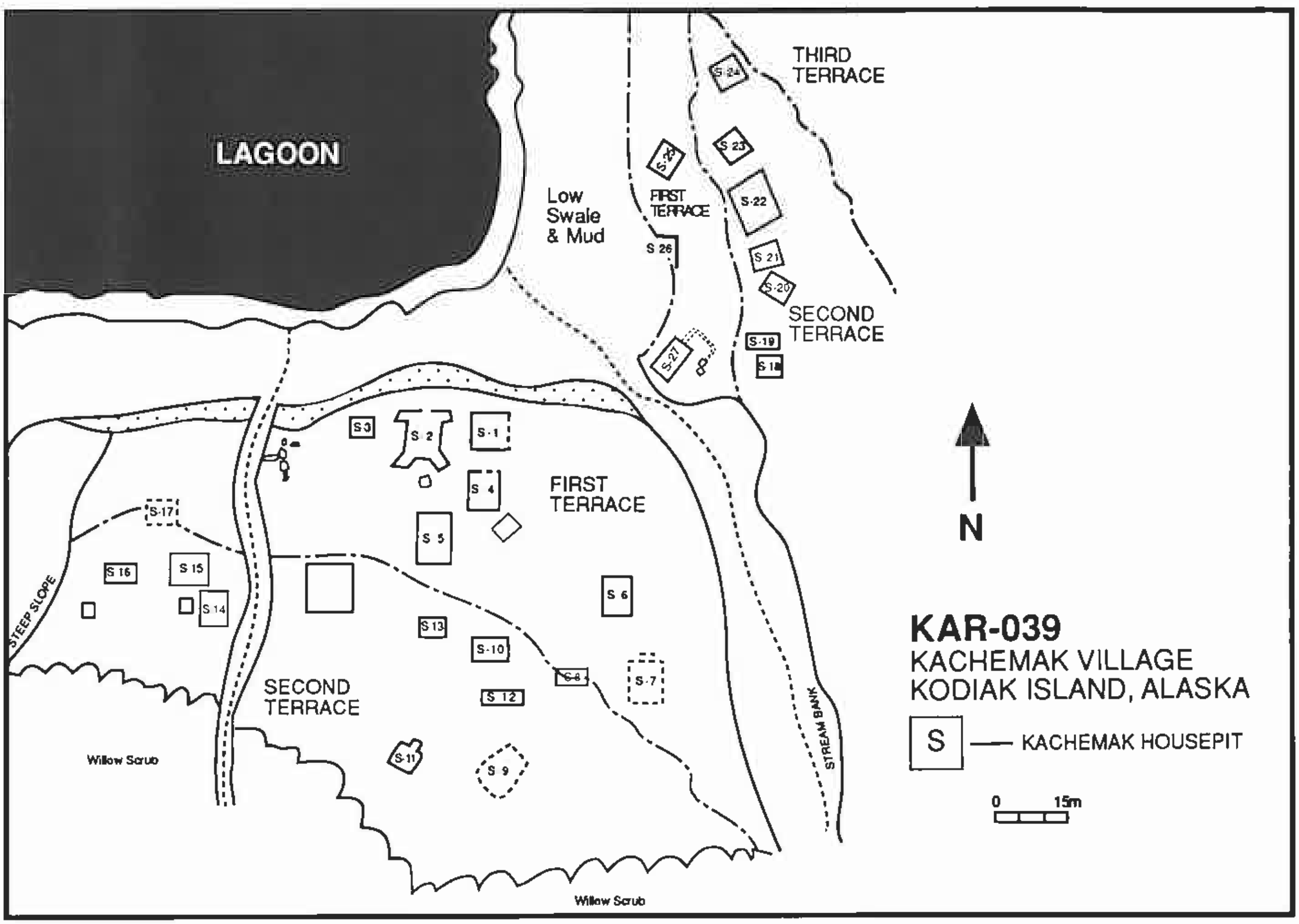
Figure 56 Kachemak maskette from Uyak Site, Kodiak Island, (National Museum of Natural History, #363740)

changes in bone and stone tools, increased use of ceramics and sweatbathing, occupation of larger houses and settlements, and changes in artistic expression and ceremonial practices. Cross-currents of cultural influence link North Pacific and Bering Sea cultures at this time, spurring debate over the relative contributions of migration, diffusion, and independent invention in the development of Alutiiq cultures.

Locally, Late period expressions include the Koniag period on Kodiak Island (D. Clark 1974c) and the Kukak Mound phase on the Alaska Peninsula (G. Clark 1977). The late prehistoric record in Prince William Sound is fragmented and poorly dated, but historic Chugach culture was evidently the outcome of developments very similar to those in the Kodiak area. In lower Cook Inlet, Kachemak IV sites and assemblages are similar to those on Kodiak, but may have been produced by an entirely different ethnic group - Tanaina Athapaskans who moved into the area and adopted Alutiiq patterns of subsistence and material culture.

Artifacts

A progressive reduction in the importance of chipped stone tools during the course of the Kachemak tradition continued through the Late period, when only occasional bifaces and scrapers were made. Most styles of Kachemak ground slate projectiles continued, with the addition of a new diagnostic form - triangular endblades used for arrows, lance heads, and toggling harpoons. Tanged and



[from Jordan and Knecht 1988:33]

Figure 57 KAR-039, Kachemak village, Kodiak Island

untanged *ulus* often have drilled holes for lashing on wooden handles. A new adze form appears in Late Koniag times - the heavy, grooved "splitting adze," usually pecked and ground from graywacke. This style appears to have spread westward from the Northwest Coast, and its adoption may be related to the heavier construction tasks involved in building large, multi-roomed Late Koniag dwellings. Notched pebble sinkers drop in frequency, replaced by notched and grooved cobble sinkers.

Late period bone harpoon heads usually are barbed unilaterally, with wedge-shaped bases and offset line holes. Diminutive versions in the same style served as points for harpoon-arrows. Toggling harpoon heads are found in small numbers, most often with bilateral spurs. Other Koniag bone weapon components include foreshafts, socket-pieces, finger rests, barbed and unbarbed arrow-points, small composite harpoon heads for fish spears, bird spear prongs, and massive barbed dart heads that may have been used for whaling. Composite fish hooks with curved bone barbs are diagnostic of the Late period.

Wooden dart shafts, throwing boards, bow parts, arrows, wound plugs, foreshafts, boat parts, and net gauges were found at KAR-001 on Kodiak (Jordan and Knecht 1988), along with pieces of rod armor and shield fragments.

Household tools and containers of bone include wedges, whale vertebra plates and bowls, awls, needles, spoons, ivory box or quiver lids, whale rib digging sticks, and rodent incisor "crooked knives." Wooden boxes, wedges, scoops, tool handles, fire drills, and twined basketry made of split roots and baleen were recovered at KAR-001 (Jordan and Knecht 1988). Decoration of pecked stone oil lamps was rare during the Late period. Larger formalized lamps have wide flat rims, well-demarcated wick shelves, and are oval to sub-rectangular in shape. Koniag pottery was thick-walled, undecorated, and tempered with sand and gravel (Heizer 1948-9). Pottery has not been reported for Prince William Sound.

Dance masks used at winter feasts, shamanistic figurines, and labrets carved of wood, stone, and ivory (ethnographically, worn as a display of rank) are increasingly common through time at KAR-001. Jordan and Knecht (1988) attribute this intensification of ceremonial life to increasing social and political complexity. These changes begin in the Early Koniag levels at KAR-001 and are even more pronounced in overlying Late Koniag house floors. The masks and tiny maskettes found represent a series of distinctive zoomorphic visages familiar from ethnographic masks collected on Kodiak by Voznesenski, Pinart, Fisher, and others (Fitzhugh and Crowell 1988). Painted mask bangles, drum handles, and puffin beak rattles also give evidence of masked ceremonial dances like those described in early historical accounts.

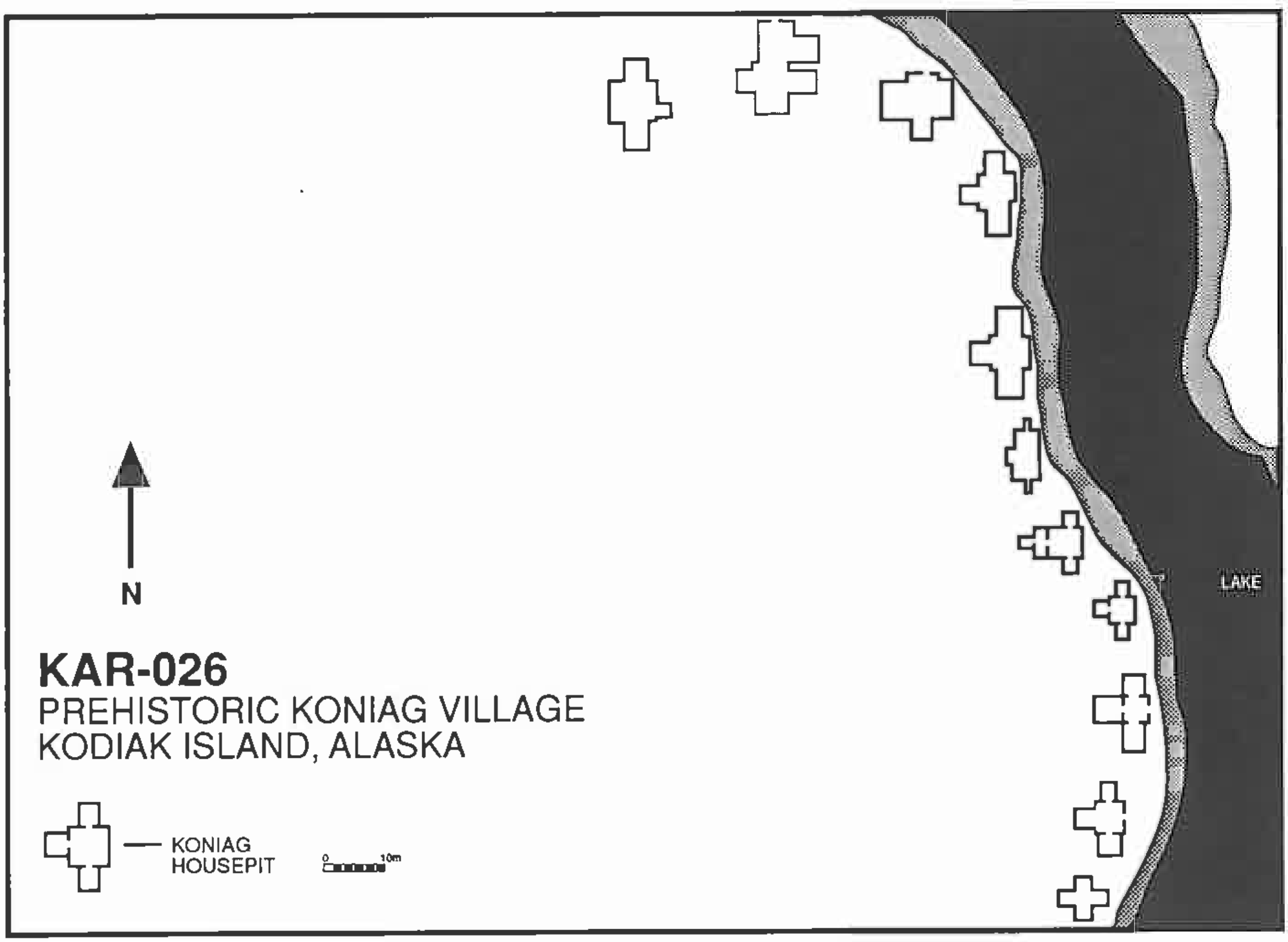
Anthropomorphic wooden figurines, some depicted with labrets, are either dolls or charm figures used by shamans. One figurine represents a woman in labor, her head inset with plugs of human hair (Crowell 1988: Figure 165). Others suggest beings who are both human and avian (Jordan and Knecht 1988: Figure 31). Other forms of ceremonial art include Koniag and Chugach engraved slate pebbles (Heizer 1951; de Laguna 1956; D. Clark 1964; Reinhardt 1981), petroglyphs, and rock paintings (Heizer 1947; de Laguna 1975, 1956; D. Clark 1970b; W. Workman and D. Clark 1979). Bone, ivory (walrus and fossil mammoth), and teeth were used to make a few labrets, tube beads, and the rare carving or amulet, but little of the rich Kachemak bone-carving tradition continued into the Late period.

Subsistence and Settlement

Faunal samples from pre-contact Koniag and Chugach sites indicate little change from the eclectic diet of sea mammals, birds, fish, shellfish, and terrestrial game consumed by Kachemak groups (D. Clark 1974a; Amorosi 1988; de Laguna 1956; G. Clark 1974). Ratios of fur seal and harbor seal bones in archaeological samples from southeast Kodiak (D. Clark 1986) suggest that Koniag fur seal exploitation increased after about A.D. 1650, before declining sharply after Russian contact. Just as Kachemak subsistence varied geographically, we can expect Koniag subsistence to reflect considerable local and regional environmental diversity. Archaeological data on Koniag settlement patterns at Karluk and Uyak Bay also indicate continuity with the Kachemak period, but more than twice as many Koniag sites have been identified (a total of 98), many sites are larger or contain more housepits, and houses tend to be larger (Jordan and Knecht 1988).

Houses

Koniag houses are described in a number of early sources (see Hrdlicka 1944; D. Clark 1984b). Large square or rectangular main rooms (up to eight meters on a side) were excavated to a depth of half a meter or more (Figure 58). A log framework was erected over the earthen floored chamber and covered with boards, sod, and grass. The interior of the main room, used as a kitchen and multi-purpose activity area, was paneled with wood planks and its floor covered with planks and grass. Smoke from a central heating and cooking hearth exited through a roof hole. One to three smaller side rooms, used for storage, sleeping, and sweatbathing, were attached to the main chamber by low tunnels. Side rooms were sometimes also used for burials, after which they were sealed and collapsed. Unlike Late period houses on the Alaska Peninsula, no entrance tunnels were constructed. According to Lisianskii's (1814:193) observations in 1805, Koniag households were extended kin groups that averaged about 18



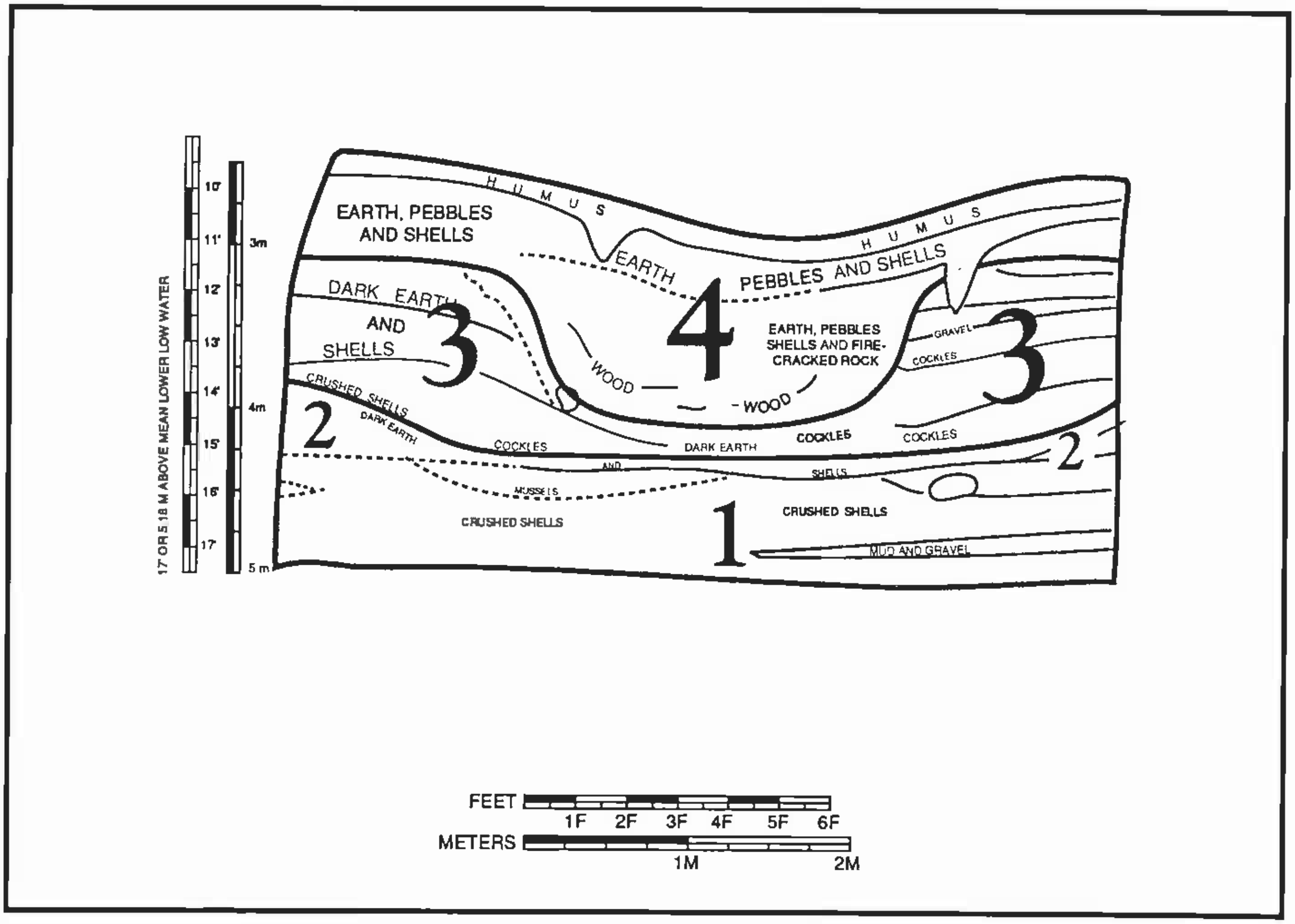
[Courtesy R. Knecht, Kodiak Area Native Association]

Figure 58 KAR-026, Koniag village, Kodiak Island

persons. From a sample of 107 Late Koniag housepits at KAR-022 and KAR-046 along the Karluk River, Jordan and Knecht (1988:234) estimated an average interior space of $79m^2$, about three times as large as average Kachemak houses. Koniag houses are also more variable in size and configuration than Kachemak houses.

Excavations at KAR-001 indicate that this form of large multi-roomed structure came into use during the Early Koniag phase, about 500 years ago. The upper sequence of Late Koniag housefloors demonstrates that rebuilding took place about once a generation. Interior features of the Karluk houses included wood-lined sunken storage boxes and covered sub-floor drainage ditches. No clay-lined pits were found at Karluk, although some are reported from the Koniag level at the Uyak Site (Heizer 1956:30). Floor deposits were packed organic layers containing wood chips, bone refuse, and abundant artifacts. Stone cysts or boxes made with flat slabs are common at other Koniag sites (D. Clark 1974a:153-158).

Only one excavated Late period Chugach dwelling has been described, a semi-subterranean winter house (House III) in Layer 3 at COR-001 (de Laguna 1956:45-48). The housepit was a large oval about 3 x 5 m wide and one meter deep, with a sloping entryway (Figure 59). Wood fragments and grease-stained pebbles (possible cooking stones) were



[from deLaguna 1956:42]

Figure 59 Profile of prehistoric Chugach housepit from COR-001

found on the floor around a rectangular box hearth built of vertical stone slabs.

Burial Practices

Koniag and Chugach burials usually were flexed inhumations in pits, coffins, or cysts covered with wood, rocks, or whale bones (Heizer 1956; de Laguna 1956; D. Clark 1974b; Utermohle 1988). Burials were often placed within the village and were accompanied by hunting tools, beads, or other offerings. Other mortuary practices included burial in side rooms of houses or in abandoned housepits, surface deposition away from the village, secondary bundle burial (reported only at the Uyak Site), cremation, mummification, and cave burial. Cave burial sites have not been described archaeologically on Kodiak, but are common in Prince William Sound (de Laguna 1956). Disarticulated skeletons and ritually-treated bones, common during Late Kachemak times, are rare during the Late period.

Contact Period, A.D. 1741 - 1945

Many Russian and American period sites from the late 18th century up to World War II are recorded for the study area, but few have been investigated intensively. Clark and Workman investigated historic Koniag villages on Kodiak, Afognak, and Chirikof islands (D. Clark 1974a, 1974b, 1987; W. Workman 1966; W. Workman and D. Clark 1979), and at the Russian settlement at Three Saints Bay (D. Clark 1970a, 1985, 1989) where Crowell is currently working. Knecht excavated an 1840s Koniag house at the resettlement village of Nunakakhnak (Knecht 1985; Knecht and Jordan 1985), and the Russian fort at Karluk has been mapped (Jordan 1983). A Russian brick kiln (KOD-011) at Middle Bay dating to 1828 also has been excavated (Dilliplane 1980, 1981; Reger 1982b). Excavations at the 18th century Erskine House in Kodiak also yielded Russian era artifacts (L. Yarborough 1977; Shinkwin and Andrews 1979). In Prince William Sound, de Laguna's work at COR-001 and other sites yielded post-contact Chugach artifacts and burials, and large numbers of glass trade beads are reported for the upper component (200 - 300 B.P.) of the Uqciuvit Village Site (M. Yarborough 1989b).

In early post-contact assemblages, beads replace labrets as favored facial ornaments, but metal objects only partly replace traditional stone tools. Fragments of glass and imported ceramics also indicate trade, but firearms and bullets are rare. Traditional burial practices are replaced by the use of coffins, with body position changing from flexed to extended. By the 1840s, the Koniag and Chugach had access to an expanded trade inventory, including English transfer-ware plates and cups and numerous iron tools, although ground slate knives continued to be used.

The devastation wrought by European diseases and economic changes had major impacts on Alutiiq settlement and subsistence. As populations declined and survivors coalesced along family lines, the number of Alutiiq villages declined. Many village locations were moved - forcefully or voluntarily - as Native people became increasingly involved in Russian and American period commercial economies. Abandonment of villages, or in some cases entire bays (Pullar and Knecht 1990), separated people from their traditional resource territories. Where distances to salmon streams or other resource locations now required increased travel, settlement patterns may have changed further as more permanent structures were built to accommodate longer residence. Such shifts may be the source of many "summer" or other seasonal Koniag villages noted by early Russian observers (e.g., Lisianskii 1814). Economic changes must have occurred as many hunters were induced to hunt sea otters and where resource locations were damaged due to commercial overexploitation.

Many of these changes began in the Russian period but have continued or intensified during the American period. American period archaeological sites contain a record of these and other socioconomic changes among Alutiiq and Euroamerican peoples. Such sites include abandoned Native villages, canneries, mines, whaling stations, salt works, ice works, fishing cabins, fox farms, cattle ranches, cemeteries, churches, and World War II military facilities. Exxon surveys in 1989 and 1990 documented many examples of these relatively recent sites for the first time.

Summary

This chapter summarized Alutiiq material culture and adaptations, discussed some historical influences and events that transformed the Native cultures of the region, and explored the origins and development of these vibrant societies. For thousands of years, the cultures of the Alutiiq region have adapted to a dynamic natural environment and to the ever-changing influences of regional and world events. The origins of maritime adaptations in southcentral Alaska appear to extend back to the end of the Pleistocene (ca. 10,000 years ago), when Paleoarctic groups from northeast Asia settled the region and gradually developed unique boats, hunting and fishing tools, clothing, and houses adapted to a sometimes harsh environment of unusual productivity.

Crucial aspects of this maritime lifestyle appear to have been established by Ocean Bay times at least 6,500 years ago when a diversified maritime diet and complex maritime hunting technology (specialized harpoons, fish hooks, etc.) are present (Hausler-Knecht 1991). Some Ocean Bay I cultural elements (e.g., skin tent dwellings) may reflect interior Paleoarctic roots, though it has yet to be proven that they did not develop out of a contemporary coastal tradition. Two major technological changes in Ocean Bay II - the adoption of ground slate tools and semi-subterranean houses - provided early peoples of the Alutiiq region with a characteristically Eskimo cultural inventory. Throughout the sequence, distinctive elements are added to the material cultures - evidence for long-term interaction among North Pacific peoples. The appearance of some traits might indicate migrations, cultural amalgamation, or even replacement, but the continuity of adaptations and artifact forms is striking and many changes appear more stylistic than functional.

The interpretation of social evolution must remain even more tentative for now, although several significant trends can be identified. Increasing house size through time appears to reflect the gradual development of large kin-based corporate households, associated with ranked social systems typical of Alutiiq societies at the time of European contact. Evidence of long-distance trade, warfare, and ceremonialism also appear to increase through time on Kodiak Island (Jordan and Knecht 1988).

The archaeological resources of the southcentral Alaska coast cover a vast geographic area and encompass a great expanse of time. Information from archaeological sites and artifacts provides the data with which the larger puzzle of regional prehistory is pieced together. It is essential to preserve and protect this information so the history and prehistory of the region may be more fully understood. The following chapters describe the 1990 Exxon Cultural Resource Program's protection efforts and interpret data from archaeological sites investigated.

CHAPTER 5

THE 1990 SITE PROTECTION PROGRAM

Cultural and ecological factors affecting the location, character, and depositional context of archaeological sites in the Alutiiq region have been discussed in previous chapters. Natural processes such as glaciation, isostatic rebound, subsidence, landslides, tidal waves, windthrown trees, and forest fires, along with differential preservation, have altered, obscured, destroyed, or otherwise affected archaeological sites in the area. Coastal erosion, particularly on the Kenai Peninsula and Kodiak Island, continues to impact sites, removing irreplaceable portions of the prehistoric record every year. Such impacts may have removed whole classes of sites from the archaeological record of the Alutiiq region.

Human impacts such as timber harvesting (Debloois *et al.* 1975; Gallagher 1978; Wood 1979), flooding (Wildeson 1982), recreation (Mobley and Morris 1981; Bowers 1984; Flenniken and Haggarty 1979), military maneuvers (Briuer and Niquette 1983; Briuer and Show 1983), and vandalism (Williams 1978; Crowell 1987) also continue to impact archaeological sites. Exxon Cultural Resource Program reports (Mobley *et al.* 1990; Betts *et al.* 1991) and a recent oil spill atlas (Dickins *et al.* 1990) address potential and actual impacts to cultural resources from oil spills and subsequent decisions to treat sections of impacted shoreline. The mitigation of impacts to archaeological sites is a growing concern of land managers, cultural resource managers, members of the scientific community, and the general public. The mitigation of potential impact to sites during treatment was the focus of the 1990 Exxon Cultural Resource Program.

Since both intertidal and upland cultural resources were potentially at risk from treatment, the primary objective of the Exxon Cultural Resource Program was to work with state and federal agencies and Native organizations to ensure that disturbance to archaeological and architectural sites was minimized and mitigated during shoreline treatment. Specific intertidal resources thought to be threatened by treatment include stone wall and wooden fish weir structures, petroglyphs, shipwrecks, piers and pilings from historic domestic and commercial facilities, and prehistoric and historic artifacts and features formerly in the uplands but now subsided into the intertidal zone due to erosion and tectonic activity. Potentially vulnerable sites in the upland zone included prehistoric villages, camps, caves and rockshelters with habitation deposits and burial remains, historic domestic and commercial facilities, and other isolated cultural features.

Sources of Potential Impact to Cultural Resources

The shoreline treatment methods employed in 1990 differed substantially from those used in 1989. The 1990 effort occurred after oiled shorelines had been treated in 1989, and after almost a year of weathering by wind, sun, and wave action. As a result, the treatment methods which were employed in 1990 consisted primarily of manual removal of weathered oil and bioremediation to stimulate the breakdown of the oil, with more intensive mechanical treatment in a limited number of problem areas.

The technology involved in the massive 1989 treatment program included free oil containment and recovery with booms, vacuums, and skimmers. Shoreline treatment methods included the manual removal of sediments with shovels and rakes, cold water deluge, and cold and warm water wash. Bioremediation and driftwood removal and burning were also employed in 1989. A technology assessment and operations overview of the 1989 response program (Exxon 1990) describes the treatment activities, the particular types of equipment used, and the massive infrastructure required to successfully deploy personnel and equipment. The potential impacts of these activities on cultural resources were assessed and the actual impacts were documented and described in Mobley *et al.* (1990:101-114 and 133-145). A summary of the potential impacts noted in 1989 is provided here.

In 1989, oiling temporarily obscured certain intertidal artifacts in a few locations within the project area. Those artifacts oiled prior to their collection in 1989 were cleaned successfully. Another source of potential impact was contamination of upland sites through unintentional transport of oil on boots, clothing, and material stored in the upland zone. This type of impact was prevented by a standard "no uplands access" policy incorporated by Exxon into the 1989 and 1990 shoreline treatment programs.

No contamination of organic archaeological samples was observed in the project area in 1989 or 1990. The chemical impact of oil on cultural resources is unknown, but the potential for contamination of organic archaeological materials exists in situations where these materials come in direct contact with oil. Accurate radiocarbon dating of oiled organic materials may be impaired through contamination of the organics by hydrocarbons if the contamination remains undetected. This is primarily an issue in sites that contain datable organic material associated with archaeological remains and in sites older than about 250 years, conditions in which C^{14} dating is effective. Decontamination of organic samples which have been exposed to foreign hydrocarbons is possible: archaeological materials from the La Brea tar pits have been cleaned with solvents prior to radiocarbon dating. Experimentation has not been conducted as a part of this project because no contamination of organic archaeological materials was observed. Moreover, intertidal sites may have been exposed to hydrocarbons repeatedly as a result of sheens produced by boat engines, float planes, and from other industrial sources such as canneries, salteries, and mines.

The number of individuals and vessels involved in the 1990 shoreline treatment program was approximately 10% of the 1989 emergency response program. Treatment was conducted in a greatly restricted area, as well. As a result, the range of potential impacts to cultural resources was greatly reduced compared with the 1989 program. The primary treatment methods in 1990 were manual treatment, mechanical treatment (including mechanical relocation of storm berms in selected subdivisions), and bioremediation. These techniques held the potential for direct impacts to cultural resources and were the primary focus of the 1990 site protection program.

Human activities peripheral to actual treatment were also a source of potential impact to cultural resources. The restriction on upland access by all Exxon treatment personnel including contractors was strictly enforced in 1990 and served to minimize this potential impact. In addition to treatment program activities, specific sediment and biological assessments were conducted by scientists briefed in the sensitivity of cultural resources. These activities also were considered a source of potential impact and were monitored by Exxon archaeologists.

The 1990 Exxon Cultural Resource Program sought to minimize and mitigate direct and indirect impacts to cultural resources during treatment. The specific sources of potential impact are examined in detail below, and the measures taken to mitigate them are discussed throughout the chapter.

Manual Treatment

Manual treatment involves the removal of pooled oil, tarmats, asphalt patties, mousse patties, and oiled sediment using shovels, rakes, sorbent pads, and trowels (Exxon 1990:55). Over the summer of 1989, oil from the *Exxon Valdez* changed from viscous crude oil to weathered mousse to asphalt. In 1990, the oil had weathered through exposure to sun, wind, and wave action associated with winter storms. As a result, weathered oil in the form of asphalt (also referred to as "tarmat") was common during 1990. Manual treatment of asphalt areas entailed the breakup and removal of patches of consolidated oil and beach sediment (Figure 60). Isolated tarballs, oiled debris, kelp and driftwood, and occasional litter were picked up in 1990. These activities constituted approximately 90% of the treatment effort in 1990.

The size of the treatment crews may be considered a gauge of treatment intensity and of potential impacts to cultural resources. In 1990, manual treatment crews composed of 10 Oil Spill Response Technicians (OSRTs) and a crew foreman led by an Exxon supervisor conducted manual treatment activity during the lower end of the tidal cycle to maximize the amount of accessible intertidal work area (Figure 60). There were eight vessels in 1990 whose crews conducted manual treatment of shoreline subdivisions. Occasionally, bioremediation crews also conducted some manual treatment.

The greatest direct potential impact of the manual treatment method was unmonitored manual treatment of subdivisions known to contain intertidal artifacts. These artifacts generally were deposited through wave erosion of midden sites. Remnants of intact upland midden deposits subsided into the intertidal zone are known to exist in the region, but these deposits are rare and none were known to exist in subdivisions scheduled for treatment in 1990. Potential direct impacts posed by manual treatment were minimized through the CTAG constraint approval process and by the development and execution of the 1990 site protection

[Exxon Media Relations]

Figure 60 Manual treatment, 1990

program described below. The greatest indirect potential impact of manual treatment was access to adjacent upland areas containing cultural sites.

Bioremediation

Bioremediation is the application of fertilizing nutrients such as nitrogen and phosphorus on shorelines to accelerate natural biodegradation of oil (Exxon 1990:76). Bioremediation was a key element of the 1990 treatment program and it enhanced populations of hydrocarbon-degrading microorganisms which are indigenous to Prince William Sound:

> Oil biodegradation is the natural process by which micro-organisms attack petroleum hydrocarbons and eventually reduce them to carbon dioxide and water. Bioremediation is a way of helping or accelerating this natural process. It has been known for many years that many areas of the world have indigenous bacteria that are capable of degrading crude oil. . . . The EPA Office of Research and Development (ORD) had been studying microbial degradation of oil as part of its long-term research program but had not yet developed a field process. In a joint effort with Exxon, this program was accelerated soon after the spill so that bioremediation could be part of the overall shoreline treatment (Exxon 1990:76).

[Gary Lok photo]

Figure 61 Bioremediation (Customblen), 1990

Several types of fertilizers and application methods were tested in 1989. A liquid oleophilic fertilizer (INIPOL EAP 22) and a time-release granular fertilizer (Customblen TM) were selected for large-scale application in 1989 and 1990 (Exxon 1990:76).

The potential direct impact of bioremediation agents on cultural resources appears to be minimal. Inorganic artifact materials such as stone are not affected by bioremediation, and the potential impact to organic intertidal artifacts is considered insignificant (Mobley *et al.* 1990:114). The potential indirect impact of bioremediation on cultural resources was also considered negligible as its application does not involve any ground disturbance or sediment removal. The three crews assigned bioremediation tasks in 1990 worked swiftly and were present on individual beaches only for short periods of time (Figure 61).

Mechanical Treatment

Storm berms were relocated in 24 subdivisions in 1990. SSAT survey results identified several locations where oil was stranded in beach gravel storm berms that formed in the upper intertidal zone during episodes of high tide and wave action. Relocation involved manual raking of oiled gravels into the intertidal zone, or more commonly, the use of a "trackhoe" or a small "bobcat" bucket loader to push oiled storm berm gravels into the surf zone for exposure to cleansing wave action (Figure 62). Bioremediation agents were often applied to enhance the biodegradation process at these sites after the gravel had been redeposited. The technique is most effective on beaches with moderate to high wave energy conditions. A small "bobcat" bucket loader was also used to break up and remove a large patch of asphalt created by oil stranded near Yalik Glacier on the outer Kenai Peninsula.

Mechanical treatment had the greatest potential for disturbing cultural resources of any method employed during the 1990 program, but mechanical treatment was generally conducted on active, exposed beaches where intact cultural deposits were unlikely to be preserved. Because of the history of subsidence in the region, however, and the extreme sensitivity of any intact cultural deposits which might exist in the intertidal zone, the SHPO and members of CTAG determined that mechanical treatment had the potential to cause an adverse effect to cultural resources. Storm berms were relocated on 24 Prince William Sound beaches by three treatment teams. The measures taken to avoid disturbance to cultural resources from mechanical treatment are described in detail later in the chapter.

Mitigation of Potential Impacts

The CTAG review of treatment plans and their approval of appropriate constraints was the primary mitigation employed in 1990 to minimize potential impacts to cultural resources. Culturally sensitive areas were avoided by using constraints which required inspections, monitoring, or verbal clearance by an Exxon archaeologist. The Exxon Cultural Resource Program included an educational component which informed all treatment personnel of the potential for encountering cultural resources, and instructed them regarding correct procedures if discovery occurred. The identification and mitigation of potential impacts through administrative and field efforts enabled treatment to proceed in compliance with state and federal historic preservation laws, regulations, and permits.

The 1990 Field Program

The 1990 field program began in Prince William Sound on March 29 and expanded into the Kenai Peninsula, Kodiak Island, and Alaska Peninsula regions as shoreline treatment expanded. Field work ended on September 15 in Prince William Sound. The sources of potential impact to cultural resources had been considered by CTAG representatives who reviewed each specific work order prior to treatment. Field work was necessary to collect information for CTAG and to implement the constraints which CTAG, the SHPO, and the FOSC had approved.

There were six components to the 1990 field program: intensive archaeological survey of approximately 164 linear miles of shoreline, site consultation and inspection of 76 treatment areas, on-site monitoring of 33 treatment areas, updating of 157 AHRS sites, review of 28 potential site incidents, and collection of 47 artifacts within the project area. Eleven contract field archaeologists conducted all CTAG-required subdivision surveys and worked with Exxon treatment crew supervisors to ensure compliance with CTAG-approved archaeological constraints. Implementation of the 1990 field program was enhanced by the involvement of CTAG and by the development of effective working relationships between archaeologists and the 20 Exxon beach treatment supervisors.

Administrative Resources

The technical and operational headquarters of Exxon's shoreline treatment program are located in Anchorage, as are the offices of state and federal agencies, and Chugach Alaska Corporation. The close proximity of the offices facilitated personal interaction between members of the participating agencies and organizations, particularly during CTAG. The Exxon Cultural Resource Program administrative staff served as liaison for the duration of the field program. Administrative staff interacted daily with Exxon's technical and operations staff, Exxon field archaeologists and treatment supervisors, as well as agency and Native organization representatives to ensure that important

[V. Butler 11:6]3

Figure 62 Storm berm relocation, 1990

cultural resource data were communicated to all parties in a timely manner, particularly when treatment plans were altered on short notice.

Field Offices and Resources

The Cultural Resource Program maintained a full-time field office in Valdez throughout the summer. One of two Twin-Star helicopters dedicated to the program was assigned full-time to the Valdez-based field crew. A two-person crew normally left Valdez in the morning, conducted survey, inspection, on-site monitoring, and/or site update assignments throughout the day, and returned to Valdez in the evening. A second helicopter crew was assigned to Prince William Sound during the early part of the field season to complete CTAG-required archaeological surveys. As treatment expanded to other regions in the Gulf of Alaska, this helicopter crew was reassigned accordingly.

Temporary field offices were established in Homer and Kodiak while beaches on the Kenai Peninsula, Kodiak Island, and Alaska Peninsula were being treated. Offices were located in both the Homer and Kodiak Exxon Command Centers and enabled archaeologists to have access to phones, faxes, and computers. The archaeologists working out of these facilities used the second helicopter to conduct CTAG-required survey, inspection, on-site monitoring, and site update tasks.

A third archaeological team was assigned full-time to a fishing vessel operating primarily in Prince William Sound to conduct survey, inspection, on-site monitoring, and site updates in subdivisions inaccessible by helicopter. The *Sourdough* was used early in the field season in Prince William Sound and supported the field crew conducting site investigations at SEL-188 on the Kenai Peninsula in April. The 18.3 m (60 ft) vessel *Ultimate* replaced the *Sourdough* early in the field season. The *Ultimate* worked primarily in Prince William Sound, but later expedited various field tasks on the Kenai Peninsula and in the Kodiak Island area. Effective coordination and communication between the Valdez and Kodiak helicopter teams and the crew on the *Ultimate* was maintained throughout the summer to avoid duplication of effort and to ensure that field data and records required by the Anchorage office were transmitted soon after the field work was completed.

Overall direction and scheduling of the helicopters, the vessel, field personnel, and office staff were the Anchorage staff's responsibilities. Various factors such as tide levels, weather, treatment crew schedules, and task priorities were considered and reconsidered daily.

Staffing Levels

The Exxon Cultural Resource Program employed 14 professional archaeologists in 1990, all of whom had an M.A. or Ph.D. and regional or coastal experience. The field archaeologists worked a three-week on, one-week off field rotation schedule. Two-person field crews alternated on helicopters and vessels during different rotations, and rotated through the four regions in the project area as well. Two of the remaining four archaeologists working on the project in the Anchorage office managed the 1990 field program and CTAG, and two worked to complete the 1989 final report and prepare it for publication.

The field archaeologists were responsible for communicating the project's goals to engineers, biologists, environmentalists, village residents, agency and Native organization representatives, and treatment workers. Field archaeologists conducted field work, responded to and executed last-minute requests, maintained good rapport with Exxon supervisors, workers, and agency monitors, and worked to protect cultural resources from potential impacts.

Management and Logistics

There were few administrative or logistical problems during the 1990 field program due to support provided in Anchorage and in the field. Treatment schedules were updated daily by Exxon operations and reviewed by treatment crew supervisors and Exxon contract archaeologists. These forecasts provided the framework for scheduling daily archaeological field tasks. The daily tracking of survey requirements, treatment schedules, and the approved archaeological constraints in specific subdivisions was a time-consuming management task.

Planning and implementing inspection and onsite monitoring tasks for the 10 treatment crews were the most important management functions of the 1990 field program. When treatment schedules changed (often at the last minute) according to weather, logistical, and personnel constraints, the treatment program's extensive communication system made adjustments feasible.

Logistical concerns were few because field teams were largely self-sufficient. Weather occasionally prevented helicopter teams from reaching scheduled treatment areas, occasionally for days at a time. This was a serious concern, especially late in the season when treatment was nearly complete and sensitive subdivisions required the presence of an archaeologist. If deteriorating weather conditions were anticipated, arrangements were made to house an archaeologist overnight on a treatment vessel so that treatment scheduled for the following day could proceed. The vessel *Ultimate* provided reliable back-up for scheduled inspection and onsite monitoring tasks. Field crews constantly communicated with each other, treatment crew supervisors, and the Anchorage office through satellite and mobile phones, marine radios, faxes, and messages relayed by pilots and ship captains.

Educational Efforts

Exxon's 1990 shoreline treatment program involved hundreds of treatment personnel and different treatment techniques, all focused on specific shorelines throughout the region. As noted earlier, the potential existed for inadvertent or intentional damage to cultural resources by treatment personnel. The educational program begun in 1989 acquainted treatment personnel with cultural resource issues. The program was continued and expanded in 1990, and focused on communicating Exxon's cultural resource policy: "*Any employee or contractor found willfully removing artifacts or destroying, damaging, or otherwise altering cultural resource sites would be dismissed immediately and the appropriate authorities notified.*" The program also involved distributing information indicating the confidential and sensitive nature of cultural resources, their vulnerability to treatment, and the protection they are afforded under state and federal laws and regulations. The education of treatment personnel was an important first step in mitigating potential human impacts to cultural resources.

Objectives and Implementation

The educational program informed all Exxon personnel and contractors of cultural resource laws and the scientific value of these non-renewable resources in reconstructing Alaska's history. A 20-minute video was produced and shown to all personnel to familiarize them with the importance of cultural resources in the project area. The video addressed a wide range of questions and issues regarding the nature of archaeological sites along the Gulf of Alaska coast, and outlined procedures to follow should cultural resources be found during shoreline treatment.

The 1990 program was initiated in Anchorage with a presentation of the cultural resource video to all SSAT pre-treatment survey personnel as part of a two-day orientation and briefing session. In addition to Exxon staff and contractors, agency and Native organization representatives directly involved in the SSAT survey program were briefed on cultural resources. The cultural resource video was shown throughout the summer to treatment supervisors and their crews as part of their safety briefing when each new treatment crew rotated into the field.

In addition to the video, an information packet which reinforced the cultural resource issues addressed in the video was distributed to all personnel and contractors during formal briefing sessions. The packet contained a copy of Exxon's cultural resource policy as well as information on the types of resources potentially encountered during beach treatment. The packet included a synopsis of the

Figure 63 **1990 and 1991 Alaska Archaeology Week posters**

[Courtesy NPS and Keith Hoofnagle]

laws and regulations designed to protect sites from vandalism and other forms of disturbance. Copies were provided to Exxon supervisors for field reference.

Throughout the summer, general interpretive information regarding the archaeology and prehistory of the area was provided informally to treatment personnel by Exxon field archaeologists during inspection and on-site monitoring. It became obvious early in the field program that treatment crew members were interested in archaeology. As field archaeologists began to address questions raised by treatment personnel, archaeologists noted an increased level of concern expressed for cultural resources in general and site protection in particular.

A clear example of this occurred during monitoring events at SEL-188 (Betts *et al.* 1991), a site containing intertidal artifacts. Archaeologists trained treatment crews to recognize artifacts, and crew members were responsible for identifying numerous artifacts during treatment. The training fostered a competitive spirit among workers who closely examined the oiled sediments which they removed from within grid squares. Workers indicated to the archaeologists that they appreciated being included in the mitigation process.

Another illustration of the education program's effectivenesss is noted in Table 10. Eight "incidents" involved reports of cultural material being encountered during survey or treatment. Follow-up investigations resulted in the documentation of two new AHRS sites. The other six sites turned out to be of natural origin; however, the effectiveness of the education program is evident because archaeologists were called when unusual material was encountered during treatment. These examples validate the notion that long-term site protection goals are best achieved through educational efforts which build on the public's interest in archaeology.

Exxon's educational program in 1990 informed treatment personnel about historic preservation laws and regulations and the heritage value of archaeological sites. Personal contact between Exxon contract archaeologists and treatment supervisors and crews was largely responsible for the overall success of the 1990 site protection program.

Public Education

Along with the educational program for 1990 shoreline treatment personnel, Exxon provided funds and personnel over the winter to help promote the first annual Alaska Archaeology Week (Figure 63). Exxon helped design and fund a travelling exhibit coordinated by Susan Morton of the National Park Service and assisted by Michele Hope of the Minerals Management Service that opened in conjunction with Alaska Archaeology Week. "The Mask: A Day in the Life of an Artifact" opened to the public at the Anchorage Museum of History and Art for a month and had a strong anti-vandalism message as its central theme. Exxon increased its support of the 1991 Alaska Archaeology Week so that the exhibit could travel to communities throughout Alaska. Exxon remains committed to helping agencies reduce vandalism to heritage sites in Alaska through public education.

1990 Field Work

The primary objective of the 1990 Cultural Resource Program was to identify archaeologically sensitive subdivisions and ensure that CTAG-approved archaeological constraints were observed during shoreline treatment. Six major 1990 field components accomplished this objective: intensive site survey, consultation and site inspection, on-site monitoring, the site update program, site incident investigations, and artifact collection.

Three hundred and sixty-seven treatment events required consultation and inspection or on-site monitoring by an archaeologist in 1990. Cultural Resource Program administrative and field staff called or were contacted by an Exxon supervisor when a subdivision with an inspection or monitoring constraint appeared on the treatment schedule. The archaeological monitor met with the Exxon supervisor at the subdivision prior to treatment, instructed the supervisor to keep the crew away from the sensitive area, and monitored treatment. Site condition was recorded before and after treatment (Figure 64). In some cases, archaeologists personally treated sections of shoreline near intertidal lithic scatters so artifacts would not be damaged or inadvertently removed. The presence of archaeologists on sensitive shorelines conveyed the importance of cultural resource protection to treatment crew members, Exxon supervisors, and agency representatives, and minimized impacts to cultural resources. The objectives and implementation, logistical and methodological constraints, and results of each component of the 1990 field program are discussed in the following sections.

Intensive Site Survey

Reconnaissance-level archaeological surveys were conducted in 1989 by archaeologists working with oil geologists and biologists as part of three-member SCAT teams. These surveys preceded treatment under emergency conditions which enabled only cursory examination of many survey segments and archaeological sites in the project area. Most new sites identified during these surveys were plotted, assessed, and documented quickly and at relatively cursory levels. As oiling conditions changed from heavy to light, particularly near the outer limits of the project area, the pace of the shoreline surveys increased accordingly.

[R. Betts 22:5]

Figure 64 Archaeologist Paul Buck records eroding midden (AFG-148) prior to treatment

Little time was spent surveying beach segments which were not directly impacted by oil. As a result, survey intensity and site documentation vary depending on the degree of oiling and the potential impact of subsequent treatment.

In 1990, more intensive field survey was required by CTAG to develop constraints (Appendix H). New and previously known sites visited during the 1990 field season were documented in detail (Figure 65). Three teams of two field archaeologists operated in the field at any given time in 1990. These teams were independent field units responsible for surveying subdivisions CTAG identified as needing intensive survey data to apply an archaeological constraint.

The 1990 constraint approval process was simplified by the intensive survey data, the extensive data compiled during the 1989 SCAT assessments, and by the site data compiled during preparation of the 1989 compliance report (Mobley *et al.* 1990). Alaska Heritage Resource Survey (AHRS) site data and BIA 14(h)(1) site data were also available in 1990, having been compiled during the 1989 program. On rare occasions, information pertinent to the protection of cultural resources within a subdivision but not contained in AHRS or 14(h)(1) records was volunteered at CTAG and considered during the

[R. Betts 10:26]

Figure 65 Archaeologists record new site (AFG-176) on Alaska Peninsula during intensive survey

constraint approval process. If 1989 segment or subdivision survey documentation was considered inadequate to formulate a constraint for whatever reason, an intensive survey was initiated during the 1990 constraint review process (see Chapter 2).

Of the 587 subdivisions treated in 1990, 139 were surveyed intensively prior to treatment (Appendix H). Site documentation resulting from intensive surveys was forwarded to the Anchorage office, packaged for CTAG, and considered during the constraint review process. Site data from 1989 and new site data from 1990 were considered by Exxon prior to constraint formulation as part of the CTAG review.

Objectives and Implementation

The Secretary of the Interior's Standards and Guidelines for Identification defines intensive survey as a category of archaeological survey that describes:

> . . . the distribution of properties in an area; determines the number, location, and condition of properties; determines the types of properties actually present within the area; permits classification of individual properties; and records the physical extent of specific properties.

This type of survey should document:

> . . . the kinds of properties looked for; the boundaries of the area surveyed; the method of survey, including an estimate of the extent of survey coverage; a record of the precise location of all properties identified; and information on the appearance, significance, integrity, and boundaries of each property sufficient to permit an evaluation of its significance.

In 1989, due to the emergency nature of the undertaking and the Advisory Council's declaration that all sites within the oil spill area would be treated as eligible for the National Register of Historic Places, the information collected may not be sufficient to permit an evaluation of significance (MOA Stipulation A.1). This provision remained in effect in 1990. Additional information that would permit an evaluation of the sensitivity of cultural resources to planned treatment or other potential oil spill-related impacts was collected in 1990. Extensive subsurface testing, including the use of soil probes, was employed to determine the boundaries of known cultural properties and the presence of buried sites in the intertidal zone and uplands (Figure 66).

The objective of intensive survey was systematic survey of the intertidal and near upland zones of all subdivisions scheduled for treatment in 1990 where additional cultural resource documentation was required. To accomplish this, field archaeologists documented all cultural resources observed in the subdivision including site features by recording observations in notebooks, on detailed sketch maps, and with 35 mm film and videotape. All site documentation was quickly forwarded to the Anchorage office for review and transmittal to the SHPO.

As noted in Chapter 2, subdivisions were identified as needing intensive survey data if the area had received only cursory examination in 1989, if CTAG had low confidence in the 1989 SCAT data, if 1990 planned treatment intensity in the subdivision involved mechanical treatment and large numbers of cleanup personnel, if the subdivision was sensitive from an agency or Native perspective, or if the subdivision was not surveyed in 1989.

Shoreline treatment was more localized in 1990 than in 1989. In 1989, shoreline "segments" were the discrete units of treatment. The same segment descriptors were used in 1990 but were subdivided into smaller units (subdivisions). In many cases, the Cultural Resource Program Director or CTAG required subdivision-specific archaeological data which was not available. Intensive surveys were scheduled to gather the data required to apply archaeological constraints at the subdivision level and mitigate any potential impacts. Two anadromous fish stream mouths were included in the 139 surveyed subdivisions. The survey and review processes for anadromous fish streams were identical to those employed for subdivisions.

Archaeologists surveyed the subdivision and forwarded the results to the Anchorage office, usually that same day by fax. The Cultural Resource Program Director considered the new data when recommending an appropriate constraint, and these were included in the subdivision packet submitted to CTAG as part of the review process.

Logistics and Methodology

If CTAG required a survey in a subdivision for constraint formulation, adjacent subdivisions in the segment were surveyed as part of the Cultural Resource Program "segment completion" surveys. The Cultural Resource Program initiated 30 intensive surveys in subdivisions adjacent to 106 required by CTAG, and three judgmental surveys in areas of high site potential. Segment completion surveys were undertaken to document the status of cultural resource sites within the treatment area, to compare survey results from 1989 with those of 1990, and to expand the site database of the project area so that site type, site distribution, and site density information could be analyzed and included in the 1990 final report.

Two survey crews began intensive archaeological surveys in Prince William Sound on March 29, 1990. Survey was conducted exclusively on foot, both in the intertidal zone and just inside the treeline. The intertidal zone was examined closely for surface artifacts and features by walking systematic transects along the beach between the drift zone and the low intertidal zone. Archaeological survey also was conducted in the near upland zone

[J. Gallison 14:16]

Figure 66 Archaeologist excavates test pit in Prince William Sound rockshelter (SEW-517)

to determine the intensity of past land use along the shoreline and to record cultural features that could be impacted by treatment. Archaeologists recorded historic structures, midden deposits, culturally modified trees (CMTs), and other sites and surface features by walking systematic transects up to 100 m inland.

Subsurface testing was limited to those circumstances where cultural deposits or features were suspected but not confirmed and generally consisted of either one inch diameter soil probes or 20 cm^2 shovel probes to the level necessary to determine the presence or absence of cultural material. No mechanical screening of sediments occurred, but shell, tephra, and C^{14} samples were obtained when encountered in test pits, and any artifacts which were found in the tests were also collected. No further subsurface excavation was conducted once a site was identified as cultural in origin.

Summary of Results

Intensive survey was conducted in 139 subdivisions, covering 164 linear miles of shoreline. Fifty-one of the 62 archaeological sites identified and recorded during 1990 were discovered during intensive survey (Appendix H, Appendix I). The low site density observed in Prince William Sound relative to Kodiak Island and Alaska Peninsula in 1989 was apparent again in 1990. These results substantiate the adequacy of the 1989 reconnaissance surveys for constraint formulation and site protection since few new sites were found in 1990 in subdivisions surveyed in 1989.

Table 7 presents a classification of the 62 new sites found in 1990, and Table 8 defines the site types. The 1990 intensive surveys contributed substantially to the knowledge of Native and Euroamerican history within the project area, particularly when combined with the 1989 results. Intertidal artifact scatters, including the two sites where prehistoric wood and fiber artifacts are preserved (Figure 67), are evidence of the effects of tectonic activity on archaeological sites in Prince William Sound. (One of these sites, SEW-068, was previously known, but the preserved organics had not been documented). The survey results indicate apparent low site density in Prince William Sound compared with adjacent regions. The many intertidal sites and rockshelters in the sound demonstrate the physiographic and geological uniqueness of this region, however, and signify the need for continued intensive survey to understand settlement and subsistence in the Chugach culture area.

Intensive shoreline survey on the outer Kenai Peninsula documented 15 new sites, including many intertidal artifact scatters, in an area that had not been systematically surveyed prior to 1989 (Figure 68). These results should provide the incentive for further survey along this tectonically active shoreline. Additional research on the outer Kenai Peninsula coast and offshore islands will provide data pertinent to Alutiiq maritime adaptations in the region and will further an understanding of historic Russian and Alutiiq interactions in this poorly documented area.

The identification of five previously undocumented middens including two large villages on Kodiak Island illustrates the extraordinary prehistoric site density in the Kodiak region. The analysis of ecological factors which affect settlement, resource use, and technology in the Kodiak area (Chapter 7) is both possible and necessary because of the high site density in this area.

The documentation of five previously unrecorded prehistoric sites within a small portion of the Takli Archaeological District in Katmai National Park and Preserve adds detail to a region rich in known cultural resources. Clearly, many more miles of shoreline require intensive survey if cultural resources are to be managed effectively and if basic archaeological research questions are to be addressed.

Important data were collected on a wide range of historic sites. Approximately 50% of the previously undocumented historic sites in Prince William Sound and the Kenai Peninsula are historic fox farms, traps, pens, and feeding stations. The remains of a military camp were found in Prince

Table 7 1990 New Sites by Type

Site Type	PWS	Kenai Penin.	Kodiak Island	Alaska Penin.	TOTAL
Prehistoric					
Midden	-	4	5	5	14
Wet Site	1	-	-	-	1
Rockshelter	7	-	-	-	7
Rock Art	1	-	-	-	1
Artifact Scatter	4	3	1	1	9
Isolated Find	1	3	3	3	10
Subtotal	**14**	**10**	**9**	**9**	**42**
Historic					
Structure	11	5	2	-	18
Artifact Scatter	-	-	-	1	1
Shipwreck	1	-	-	-	1
Subtotal	**12**	**5**	**2**	**1**	**20**
TOTAL	**26**	**15**	**11**	**10**	**62**

Table 8 1990 Site Types

PRE-CONTACT SITE CATEGORIES

Midden	Accumulation of living refuse with or without surface features, and with or without artifacts. Includes shell mounds, depressions, possible depressions, and FCR and/or lithics eroding from site matrix.
Isolate	Single stone tool, burial, flakes, or FCR found without associated site matrix. Includes sites reported by Native elders for which there are no features other than CMTs reported.
Artifact Scatter	Formed tools found without site matrix, generally within blowouts or in ITZ. Does not include flakes or FCR (see isolate).
Rockshelter	Overhang tested with positive results, or with observable surface artifact(s), feature(s) or burial(s). NOTE: Some PWS rockshelters considered cultural based solely on presence of charcoal within test. More extensive testing at these sites difficult because of possibility of burials.
Structure	Cairns, kayaks or fish weirs.
Reported	Report of a site unconfirmed by archaeologist.

POST-CONTACT SITE CATEGORIES

Artifact Scatter	Artifacts and/or debris without structural context.
Structure	Ruins of, or standing fox farms, traps, and/or pens, cabins, camps, canneries, abandoned houses, villages or settlements.
Isolate	Single navigational markers, or aids, and other single items such as boilers or other machinery without structural context.
Shipwreck	Intact or scattered remains of abandoned or wrecked vessel.

William Sound, and inscriptions at the site indicate that the camp was related to World War II-era defense activities (Figure 69). Other historic sites documented during survey include a mining camp, the remains of an early 20th-century steamer shipwreck (Figure 70), a wooden fish weir, and two historic artifact scatters which predate 1912. The discovery and documentation of these sites adds a physical dimension to the post-contact history of the region. These sites can and should stimulate the collection of oral history from knowledgeable people who lived in the region early in the 20th century.

Consultation and Inspection

The consultation and inspection constraint is intermediate between a standard constraint and an on-site monitoring constraint. As noted in Chapter 2, this constraint normally applied to subdivisions where treatment might impact intertidal lithic scatters and visible sites adjacent to treatment areas. It also applied to all storm berm relocations. This constraint required an Exxon supervisor to consult with a field archaeologist prior to treating such subdivisions. An archaeologist physically inspected the site with the Exxon supervisor if the archaeologist decided the treatment situation warranted it. This constraint effectively transferred final decisions regarding site protection from CTAG to the field archaeologists.

Of the 587 subdivisions which were treated as part of Exxon's 1990 shoreline treatment program, 98 required consultation and inspection by an Exxon contract archaeologist prior to treatment. After consultation and inspection of the culturally sensitive area, the field archaeologist determined whether treatment could proceed with or without a monitor. If a field archaeologist felt the site required an archaeologist be present during treatment, the constraint was elevated to on-site monitoring. If the field archaeologist determined that the site would not be impacted by planned treatment, no further action was required. Many subdivisions were treated several times and Exxon supervisors were required to consult with an archaeologist each time treatment was planned for the subdivision to ensure that no impacts to sites occurred. Consultation proved invaluable in the second half of the treatment schedule, particularly during repeated bioremediation treatments. In many such situations, the Exxon supervisor and field archaeologist were very familiar with the subdivision and could clear it for treatment through consultation.

Consultation and inspection put decision-making regarding the need for on-site monitoring in the hands of the field archaeologists. Field archaeologists consulted with Exxon supervisors regarding cultural sensitivities in subdivisions scheduled for treatment, inspecting the site(s) in the subdivision with the Exxon supervisor to determine if the planned treatment would impact the site(s), determining if an archaeologist needed to be present during treatment, and updating the AHRS records of site(s) in the subdivision.

The Anchorage administrative staff and the field staff tracked the location and corresponding archaeological constraints of treatment crews and sampling teams. When a subdivision with the consultation and inspection constraint appeared on the treatment schedule, the field archaeologist contacted the Exxon supervisor scheduled to treat the subdivision and they discussed planned treatment. Arrangements were made to meet at the subdivision prior to treatment, inspect the site(s), and discuss options.

The field archaeologists normally arranged to meet with the Exxon supervisor the day before treatment was scheduled. Ideally, the field archaeologists visited the site(s) in the subdivision prior to the meeting and familiarized themselves with the site(s), and, if time permitted, completed a formal site update. The treatment plan and its potential impact on cultural resources were discussed, and, based on this discussion, the field archaeologists determined if an archaeologist needed to be present during treatment.

If formal updating of the site(s) present in the subdivision was not done prior to the meeting, it was completed afterwards. All sites were photographed, videotaped, and site recording forms were completed in order to record the status of all sites before and after treatment. If it was necessary for the archaeologist to remain at the site throughout treatment, as was the case during storm berm relocations, treatment was closely monitored and documented (Figure 71).

Flight logistics, weather restrictions, biological constraints, and treatment progress affected scheduling and implementation of consultation and onsite monitoring tasks. Biological restrictions included no-access buffer zones around active eagle nests, pinniped haulouts, and bird rookeries, but these conditions affected all field personnel equally and did not significantly hamper implementation of consultation and inspection. Few logistical problems were encountered in conducting CTAG-required consultation and inspection tasks due to the availability of two helicopters and a vessel.

Of the 98 subdivisions that required consultation and inspection by an Exxon contract archaeologist, 43 required two consultations, 29 required three consultations, three required four consultations, and two required five consultations. In summary, 272 separate consultations and/or inspections were conducted in those 98 subdivisions. None of the CTAG-required consultation and inspection subdi-

[R. Reanier 14:5]

Figure 67 Wooden wedge preserved at wet site (SEW-526) in Prince William Sound

visions was missed by the Cultural Resource Program, despite the 272 treatment events that were conducted in these subdivisions.

In addition to fulfilling the requirements of the consultation and inspection constraint, field archaeologists identified and recorded eight new sites while conducting site inspections. Most of these are located in backshore areas investigated during inspection.

On-site Monitoring

On-site monitoring constraints required an archaeologist to be present during subdivision treatment. As noted in Chapter 2, this constraint applied primarily to subdivisions with highly visible or sensitive cultural resources such as rockshelter burials or intertidal artifact concentrations. Subdivisions with upland burial sites were extremely sensitive and required an archaeologist to be present to prevent access to the uplands. Archaeologists helped treatment crews conduct cleanup in subdivisions with intertidal artifact concentrations to minimize disturbance or removal of artifacts (Figure 72).

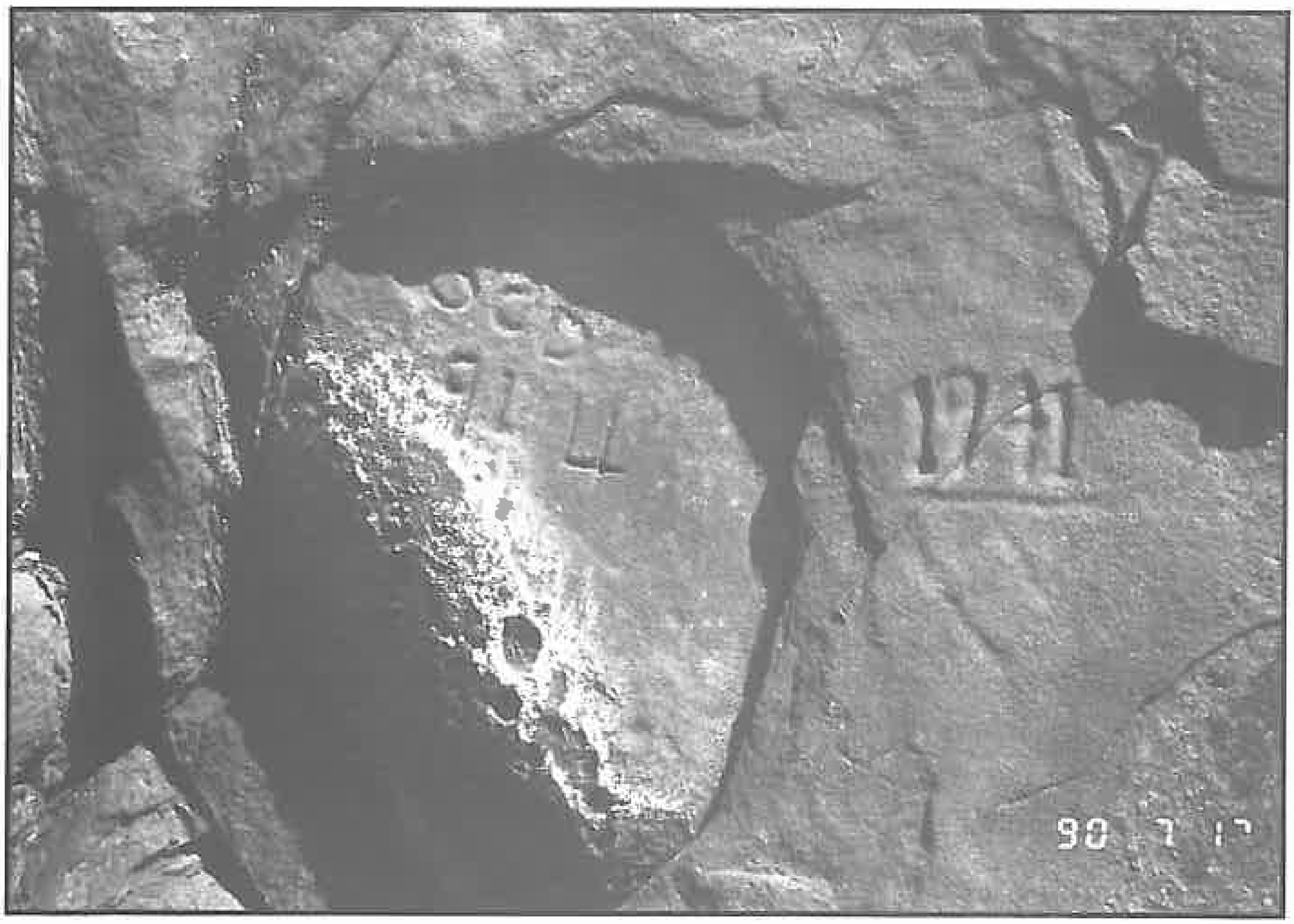
The presence of an archaeologist was required by CTAG as the best method to mitigate any potential impact to cultural resources in these subdivisions during treatment. Approximately 6% (34) of the 587

[R .Betts 7:29]

Figure 68 Large greenstone adze from SEL-217, outer Kenai Peninsula

subdivisions that were treated as part of Exxon's shoreline treatment program in 1990 required the presence of an archaeologist during treatment, and many of these subdivisions were treated more than once. Except for two subdivisions mistakenly treated without a monitor present during the first days of treatment, an Exxon contract archaeologist was present during every required treatment event. Of the 34 subdivisions that required on-site monitoring by an Exxon contract archaeologist, 17 were treated twice and 10 were treated three times. In summary, the 34 subdivisions that required on-site monitoring represent 95 separate treatment events. In addition to fulfilling the CTAG on-site monitoring requirements, field archaeologists identified and recorded three new sites while conducting on-site monitoring activities.

Unlike the consultation and inspection constraint, the on-site monitoring constraint was inflexible in the sense that no treatment could proceed without an archaeologist present during the entire treatment period. The archaeologists assisted treatment crews on sections of shoreline with intertidal artifacts, strictly enforced Exxon's no uplands access policy - particularly when burial remains were present in the subdivision, and updated AHRS records of sites in monitored subdivisions.



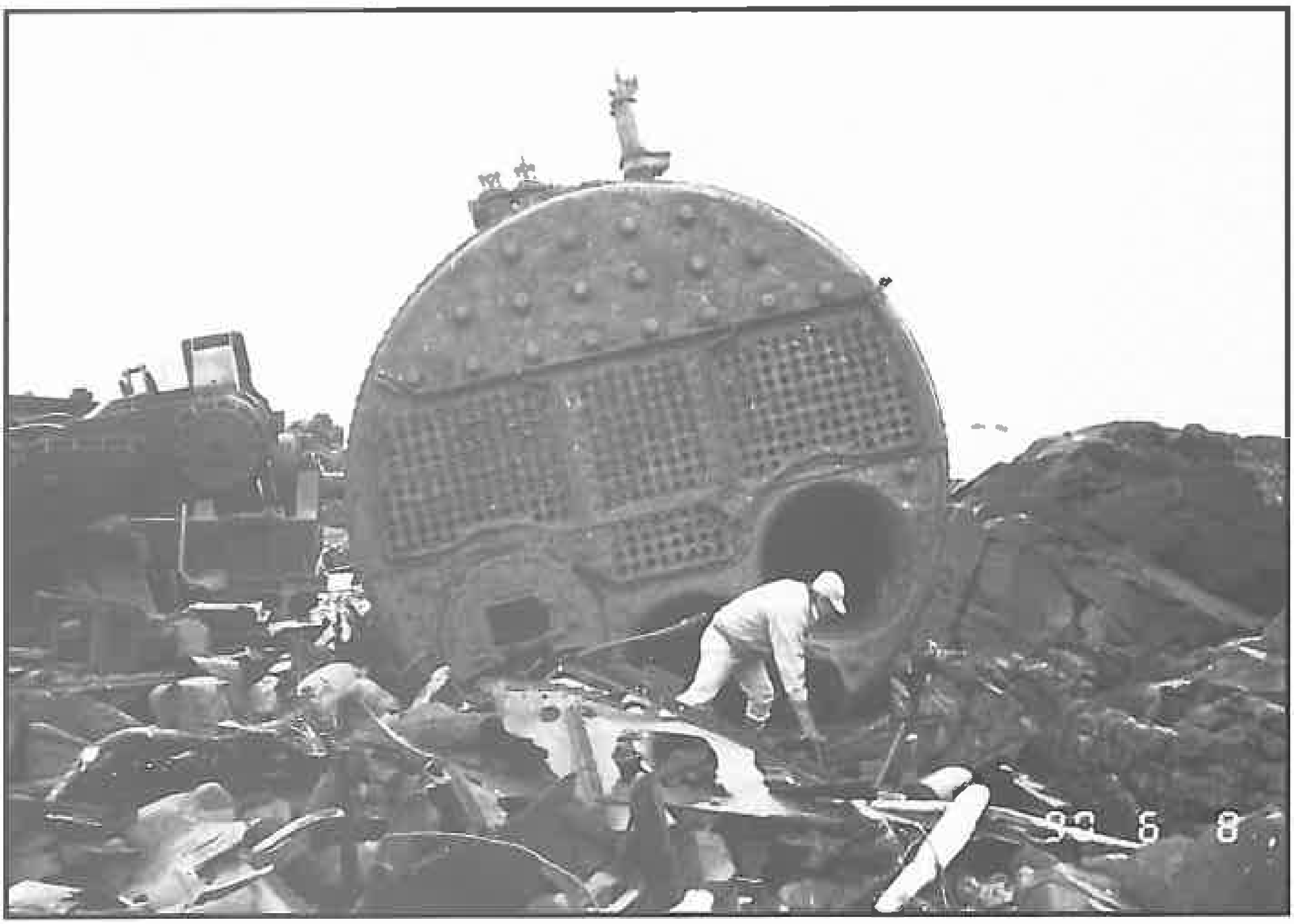
[R. Reanier 16:6]

Figure 69 Inscriptions on WW II-era structure (SEW-435), Prince William Sound

Archaeologists normally visited the subdivision requiring on-site monitoring several days in advance of the planned treatment, often with the treatment supervisor, to examine and update the site(s). If the treatment supervisor was present, the specific treatment methods were discussed.

Site protection often presented problems requiring solutions that ranged from total avoidance of an area with intertidal artifacts to treatment conducted by the field archaeologists rather than treatment crew members. Each on-site monitoring situation was unique and creative solutions were required to prevent disturbance to cultural resources while facilitating planned treatment. For instance, a rock art site was discovered in Prince William Sound in 1990 in a segment scheduled for bioremediation. It was unknown whether the application of the fertilizing agent would affect the rock art; therefore, the monitoring archaeologist and Exxon supervisor covered the panel with plastic sheeting to prevent any inadvertent application of fertilizer to the site (Figure 73).

Sensitive upland sites such as burial or habitation caves and rockshelters were less difficult to protect during treatment of the adjacent shoreline. In these types of on-site monitoring situations, the field archaeologist's major task was to prevent access to the uplands.



[R. Mack 4 :3]

Figure 70 Boiler and other metal debris from wrecked steamship (SEW-528) in Prince William Sound

Sites with an on-site monitoring constraint were updated before treatment. After treatment crews left the area, the condition of the site was again documented with photographs, videotape, and fieldnotes. Sensitive sites such as burial caves were avoided during the treatment event, and specific site locations were never disclosed to treatment crews.

During the first week of treatment in 1990, two subdivisions were inadvertently treated without an archaeologist present. These incidents occurred when Exxon treatment supervisors and agency monitors were still becoming familiar with archaeological and biological constraints specified on the work plan. These incidents triggered an intensive re-education program for Exxon supervisors, agency monitors, and treatment crews. Fortunately, no damage to cultural resources resulted from either mishap. Within two days of the incidents, archaeologists visited every operating treatment crew, re-emphasizing the meaning of each constraint, and informing the supervisors and agency monitors of the procedures to follow.

The re-education program appears to have worked since no further mishaps occurred in the remaining 367 treatment events. Field archaeologists and Exxon supervisors worked closely all summer to ensure that archaeological treatment constraints were followed and that no impacts to cultural resources occurred.

[J. Gallison 21:17]

Figure 71 Archaeologist Stefanie Ludwig inspects storm berm relocation in Prince William Sound

Synopsis of SEL-188 Monitoring

On-site monitoring at SEL-188 involved development and implementation of a specific site protection strategy to protect the site during three treatment events in August 1990. The administrative, research, and on-site monitoring activities at this site, located in the Kenai Fjords National Park region of the Gulf of Alaska, are reported in detail in Betts *et al.* (1991).

The site was discovered in 1989 by Mike Yarborough, an archaeologist working on an Exxon Shoreline Cleanup Assessment Team (SCAT). A multi-agency team of archaeologists from the NPS, SHPO, and CAC evaluated the site shortly after discovery and recommended that no treatment occur in 1989 due to the presence of cultural materials in the intertidal zone. The site was visited and evaluated in April 1990 by a team of archaeologists from Exxon and CAC. As a result of these investigations, an archaeological monitoring program was developed for the three separate treatment events in August 1990.

The three on-site monitoring events covered five days of treatment in the subdivision. Pre-treatment orientations were conducted to sensitize workers and supervisors to the cultural resources potentially at risk. Archaeologists helped direct treatment and minimized disturbance to the site. A grid system

[J. Gallison PMB 17:11]

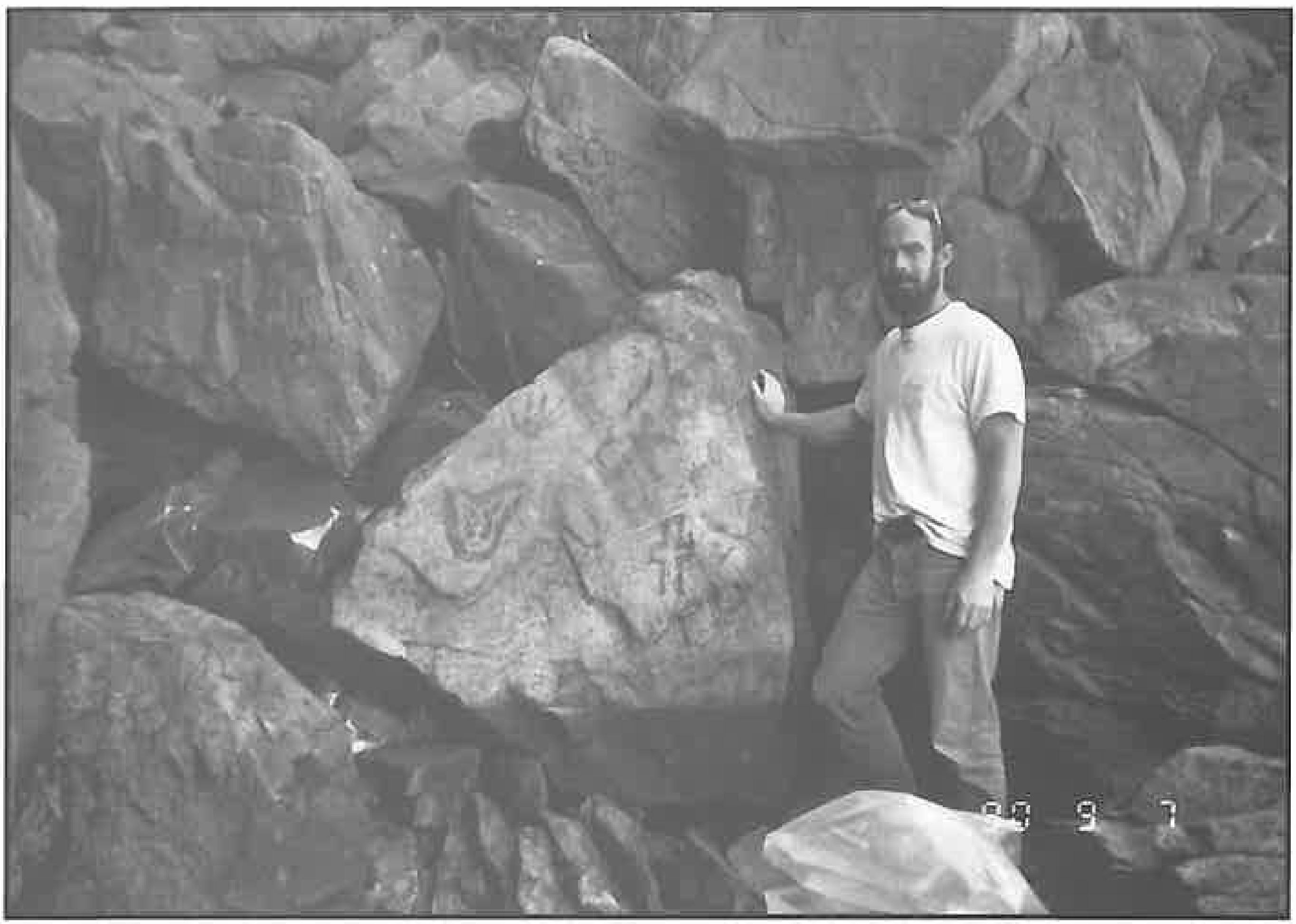
Figure 72 Archaeologist Pete Bowers removes oil from intertidal site (SEW-488)

was established over the treatment area enabling archaeologists to map and collect artifacts found during manual removal of oil from beach rocks and sediment (Figure 74). Crews successfully treated the oiled shoreline, the cultural site was protected, and 39 artifacts were collected from the intertidal zone. Joint NPS/CAC investigations in the intact upland portion of the site collected a charcoal sample which dates the site to approximately 1400 years B.P.

AHRS Site Updates

The updating of AHRS sites throughout the 1990 field season was an important part of the Exxon Cultural Resource Program. One hundred and fifty-seven sites previously entered on the AHRS were visited and documented according to standards employed for recording sites during intensive survey (Appendix J). These records, when added to those generated for the 62 new sites recorded in 1990, total 219 sites recorded at this level. These 157 sites were mapped, photographed, videotaped, and their conditions documented in field notebooks.

During 1989 reconnaissance surveys, many sites had been superficially investigated because of the emergency nature of the undertaking. In 1990, many of these were revisited and more thoroughly documented, resulting in a more complete site database for the project area. Many updated sites in



[J. Gallison 21:16]

Figure 73 Rock art (SEW-537) protected during treatment, Prince William Sound

Prince William Sound had originally been recorded in the 1930s by Frederica de Laguna (de Laguna 1956). Archaeologists recorded new data at many of these, including observations on the effects of tectonic processes on the sites. One Prince William Sound site (SEW-068) that was uplifted during the 1964 earthquake was found to have well-preserved organic artifacts eroding out of a terrestrial peat deposit in the lower intertidal zone (Figure 75). This site had evidently subsided rapidly into the subtidal zone at some time during the past, preserving the organic artifacts. During the 1964 earthquake, the site uplifted into the lower intertidal zone where it is only visible during low tides. This site is evidence of the complex geological processes which have affected cultural resources in the region.

Site updating had to be worked into the daily schedule of each archaeological team. Inspection and on-site monitoring took precedence over updating AHRS site records. Nevertheless, site records were updated opportunistically whenever archaeologists were in the vicinity of known sites. In addition to updating records of known sites encountered during other project functions, a separate program of site record updating was initiated to increase the regional site database.

Most AHRS site updates were conducted when archaeologists were fulfilling subdivision constraint obligations. Each archaeological team had a priority list of sites to update as time permitted within their current work area, and sites were updated on the way to or on the way back from inspection or on-site monitoring activities. Specific scheduling of site updates was left to the individual teams and depended almost entirely on their constraint schedules. As the field season lengthened, much of this work became the responsibility of the team on the *Ultimate* because helicopter-based teams were still very involved in assisting treatment crews with inspection and on-site monitoring. Site recording standards were established early in 1990 for documenting new sites discovered during intensive survey, and these standards were met during site updates.

Six sites were removed from the AHRS after investigations revealed that they were either non-cultural or non-existent (Table 9). During 1990, two AHRS site numbers were found to be duplicates, and these were subsumed under the correct original AHRS records as a result of Exxon field work. The 157 AHRS site records updated in 1990 represent a substantial amount of detailed site information which has been added to the AHRS as a result of the project.

Site Incident Investigations

Twenty-eight relatively minor site "incidents" were documented during the 1990 program (Table 10). These fall into three distinct categories (Appendix K): reported artifact finds (8), site disturbance reports (9), and agency incident reports (11). All reported artifacts, site disturbance reports, and non-routine agency interactions concerning sites or artifacts were considered incidents. Site incident forms documented the information received and the response by the Exxon Cultural Resource Program, including the results of any related field investigation.

Archaeologists investigated eight potential artifact finds, three of which turned out to be authentic. Since all treatment crew members had received the Cultural Resource briefing including the video, they knew that artifacts could be encountered on the beaches. They often noted unusual stones and called archaeologists when they suspected the artifacts were cultural. The reports included beach cobbles with unusual hollow areas caused by natural erosion, but which resembled the pecked depressions in stone lamps. Another crew member identified wood he thought was potentially cultural in the intertidal zone. Upon closer investigation, the wood turned out to be unmodified. These reports, including the reports of artifacts which turned out to be authentic, testify to the effectiveness of the educational program and the practicality of the constraints.

Nine site disturbance incidents were reported but none was a case of site vandalism. Two reports of possible vandalism in rockshelters turned out to be the result of natural disturbance by animals, possibly land otters. A recent investigation of Alaska Department of Fish and Game (ADFG) land otter study sites (Yarborough 1990:2) was conducted because of concern over the possible impact of the ADFG study on sites in the Prince William Sound area. The report concluded that " . . . the greatest disturbance to these sites has been caused by the otters themselves." The disturbance of archaeological sites in Prince William Sound, particularly burial caves, by otters needs to be considered by both researchers and cultural resource managers. The other reports of disturbance were investigated but no site impacts were noted.

Eleven administrative site incidents were recorded. These incidents generally involved procedural or permitting questions, although one involved "artifacts" replicated by an agency monitor and subsequently collected by Exxon contract archaeologists. Incident types 1 and 2 were dealt with by both the field and office archaeologists. Type 3 incidents were addressed primarily from the Anchorage office.

Artifact Collection

Hundreds of artifacts were observed and photographed in intertidal and upland zones during intensive survey, inspection and monitoring, and

[R. Betts 16:27]

Figure 74 Treatment in progress in SEL-188 grid, outer Kenai Peninsula

AHRS site update activities in 1990 (Figure 76). Forty-seven artifacts determined to be at risk from treatment were collected (Appendix L). Thirty-nine of these were recovered from the intertidal zone during treatment at SEL-188 and are discussed and illustrated in Betts *et al.* (1991). The other eight artifacts were collected from various sites in the project area, and illustrations and brief descriptions of these items follow (Chapter 6). Additional artifacts collected from the upland portion of SEL-188 by NPS and CAC archaeologists are also described in Betts *et al.* (1991).

In addition to the artifacts listed in Appendix L, a slate flake and slate fragments were collected from an intertidal test pit adjacent to SEW-488. In the field these items were thought to be potentially of cultural origin. Laboratory examination failed to identify any clear cultural modification, however. Seven artifacts were collected at XMK-074 on the Alaska Peninsula. NPS archaeologist Michele Jesperson accompanied Exxon archaeologists on intensive survey in Katmai National Park and Preserve and determined that the seven artifacts were in imminent danger of loss due to erosion or vandalism. Jesperson collected the artifacts with the assistance of Bruce Ream and Morley Eldridge, and these items are curated by the National Park Service at their laboratory in Anchorage.

[R. Reanier 20:22]

Figure 75 SEW-068, Prince William Sound, note eroding peat

Exxon field archaeologists also collected radiocarbon (C^{14}) samples (Table 11) and tephra samples (Table 12) in 1990. The results of the sample analyses are discussed in detail in the following chapter.

Summary and Conclusions

In 1990, the Exxon Cultural Resource Program successfully minimized disturbance to cultural resources that might have resulted from the treatment of oiled shorelines in Prince William Sound, Kenai Peninsula, Kodiak Island, and the Alaska Peninsula. The site protection program involved inspection or monitoring of 132 archaeological sites during 367 separate treatment events to mitigate potential site impacts. Twenty-eight site incidents including non-routine agency interactions were recorded. All incidents involving potential artifact finds and site disturbance were investigated, resulting in the discovery of three new sites. Sixty-two new sites were found and documented, 51 during intensive survey of approximately 164 linear miles of shoreline. Archaeologists also revisited and updated the AHRS records for 157 previously recorded sites.

The 1990 Exxon Cultural Resource Program's primary goal of safeguarding sites from potential disturbance during oil spill treatment was achieved. In doing so, program archaeologists made a number of significant new discoveries that contribute to our knowledge and understanding of the Native and Euroamerican history of the Alutiiq region. These discoveries are discussed in the next chapter.

Table 9 Sites Removed From the AHRS as a Result of Site Updates

AHRS #	Region	Upland Land Manager*
SEL-199	Kenai	NPS
SEL-182	Kenai	DNR
KOD-431	Kodiak	AJV/BIA
AFG-107	Ak Penin	NPS
AFG-131	Kodiak	NOK/AJV/FWST
SEL-205	Kenai	NPS
Sites Subsumed Under Other AHRS Sites		
SEW-439 (Subsumed under SEW-438)	PWS	NPS
AFG-145 (Subsumed under AFG-034)	Kodiak	AJV/FWST

* See List of Landowner Abbreviations

[PEB 18:4]

Figure 76 Rick Reanier videotapes artifact at SEW-076, Prince William Sound

Table 10 Summary of 1990 Site Incident Reports

Prince William Sound

Incident Number	Incident Type	Description
1.	(1)	Possible stone artifact encountered by treatment crew. Determined non-cultural. Treatment crew complied with terms of the standard constraint.
2.	(2)	Intertidal zone disturbance reported by SSAT geologist. Archaeological investigation revealed activity of non-Exxon winter cleanup crew. Exxon contract archaeologists assessed site and concluded no damage occurred, then discussed archaeological constraints with treatment crew.
3.	(3)	BIA Artifact Collection. Intertidal artifacts collected from sites Exxon Cultural Resource Program had been monitoring.
4.	(3)	Eroding wood artifacts collected from intertidal zone, subsequently returned to intertidal zone after objections raised to any artifact collection near Chenega Island.
5.	(2)	Intertidal zone disturbance reported by SSAT geologist. Exxon contract archaeologists assessed site and concluded no impact to site.
6.	(1)	Suspected artifacts encountered by treatment crew. Archaeologist concluded objects were non-cultural. Treatment crew complied with terms of standard constraint.
7.	(3)	Forest Service archaeologist reported disturbance of site to Exxon Cultural Resource Program and noted he was planning investigation. Archaeologists had noted animal disturbance at site earlier in the year, and had reported it to SHPO. No action taken.
8.	(2)	Disturbance noted at fuel cache. Investigation revealed no impact to sites in area.
9.	(1)	Site location reported by government researcher to Exxon archaeologist during survey. Site was located, documented, and monitored.
10.	(3)	State of Alaska representative on the August Shoreline Assessment Program reported presence of known upland archaeological site. Information collected, no action taken.
11.	(3)	Slate artifact replication undertaken by ADFG fisheries technician, and "artifacts" left at mouth of stream. "Artifacts" subsequently collected by Exxon contract archaeologist.
12.	(1)	Fire cracked rock noted in intertidal zone by Exxon biologist. Site was already known. Investigation updated site, no disturbance to site.
13.	(2)	Non-compliance with archaeological constraint during treatment. Site impact minimal, well documented. Incident touched off successful re-education effort.

Table 10 Summary of 1990 Site Incident Reports (cont'd)

14.	(2)	Disturbance noted by archaeologist in non-cultural rockshelter. Source of disturbance unknown.
15.	(2)	Non-compliance with archaeological constraint during initial treatment. Archaeological investigators concluded no disturbance to site resulted.
16.	(2)	Reported disturbance in a rockshelter. Investigation documented animal activity at site.
17.	(2)	Intertidal zone testing by BIA archaeologists (see Incident # 3). Also, movement of boulders by ADFG personnel in stream with prehistoric fish weir noted.
18.	(1)	Possible artifact noted by treatment crew. Archaeologists concluded non-cultural item. Treatment crew complied with terms of standard constraint.
19.	(3)	Report of agency helicopter pilot digging for clams in area of intertidal artifacts. Archaeological investigation revealed no disturbance to site. Much otter digging/ disturbance in intertidal zone.
20.	(1)	Buried wood noted by treatment crew. Archaeologist concluded wood was non-cultural. Treatment crew complied with terms of standard constraint.
Kenai Peninsula Area		
21.	(2)	Access to treatment segment overland through sensitive segment without archaeological monitor present. Archaeological investigation concluded no site impact resulted.
22.	(3)	Stone lamp collected by land manager representative during Spring Shoreline Assessment. No action taken.
23.	(3)	Attempted restriction of Exxon archaeologists' access to National Wildlife Refuge. Issue resolved through permit review and administrative discussion.
24.	(1)	Site originally plotted as outside a treatment segment. Exxon supervisor encountered site just within edge of subdivision, and followed standard constraint. No disturbance to site occurred. Site monitored throughout treatment.
25.	(1)	Stone lamp noted by biologist during Spring Shoreline Survey. Artifact collected by Exxon archaeologist prior to subdivision treatment.
Kodiak/Alaska Peninsula Area		
26.	(3)	Reported but unconfirmed unmonitored sampling of sediments from intertidal zone within archaeological district.
27.	(3)	Report of maps with site information found in dumpster outside of Kodiak Exxon Command Center according to KANA. Investigation revealed no site information on maps.
28.	(3)	Archaeological inspection of shipwreck cleanup area.

CHAPTER 6

SUMMARY OF 1989/1990 FIELD INVESTIGATIONS

The archaeological sites, features, and artifact types recorded during the 1989 and 1990 Exxon Cultural Resource Program are discussed in this chapter. During these two seasons of field work, 326 new sites were recorded along Gulf of Alaska coastlines, more than doubling the total number (608) of known sites within the project area. This increase, along with updated information for many previously recorded AHRS sites, is a major contribution to the coastal prehistory and history of the Prince William Sound, Kenai Peninsula, Kodiak Island, and Alaska Peninsula areas. In addition to contributing descriptive site information, Exxon archaeologists collected C^{14} and tephra samples in 1990. The samples have been analyzed and the data are presented and discussed in the appropriate sections of this chapter.

For the convenience of cultural resource managers, the data in this chapter are organized by major agency landholders (State of Alaska, Forest Service, National Park Service, and Fish and Wildlife Service) within the project area. The summaries are organized according to individual administrative units within government agencies (e.g., by national park, wildlife refuge, etc.). Minor and widely scattered landholdings of government agencies like the Coast Guard, the Bureau of Land Management, and the Federal Aviation Administration have been excluded. The even more widely scattered private holdings of the numerous Native village and regional corporations are also excluded. Many properties with archaeological sites have been selected by Native corporations for conveyance from the federal government under ANCSA. Land status of sites was determined from records compiled by Department of the Interior (DOI) for the treatment subdivision in which the site is located. In some cases, landownership is mixed or indistinguishable, so some sites appear under multiple landholders.

In Chapter 7 we synthesize Alutiiq archaeological site data by geographic region and discuss regional variation in settlement type distribution. General discussions of survey coverage and limitations, and descriptions of site types and features are presented prior to a summary of archaeological data related to major government landholders in the project area. A more detailed discussion of natural and cultural factors affecting the reliability of shoreline survey in the Gulf of Alaska can be found in Mobley *et al.* (1990:149-154).

Survey Coverage and Limitations

After the 1989 field season, Mobley *et al.* (1990:168) estimated that ca. 5,440 km (3,400 mi) of shoreline had been surveyed, including ca. 1,600 km (1,000 mi) in Prince William Sound, 800 km (500 mi) of the outer Kenai Peninsula coast, about 2,000 km (1,250 mi) on the Kodiak Archipelago, and over 1,040 km (650 mi) of the Alaska Peninsula's Pacific coast.

The 1989 reconnaissance archaeological surveys were conducted under emergency conditions and were dictated solely by the distribution of oil. As a result, the surveys were neither continuous nor equally intensive. In some cases, particularly in Prince William Sound, long stretches of coastline were surveyed systematically by one or more archaeologists covering both the intertidal zone and the adjacent uplands. In areas with little or no oil, survey teams travelling by boat or helicopter conducted only sporadic and rapid ground inspections. Consequently, the precision of individual 1989 reconnaissance surveys should be judged independently by reviewing Cultural Resource Survey forms for individual segments within the project area. Despite the uneven nature of 1989 survey coverage, 271 new sites were recorded and updated information was gathered on 238 previously recorded AHRS sites.

During 1990, about 262 km (164 mi) of shoreline were surveyed systematically and intensively (Haggarty and Wooley 1990:i), including 180.2 km (112.6 mi) in Prince William Sound, 39.8 km (24.9 mi) on the southern Kenai coast, 23.8 km (14.9 mi) on the Kodiak Archipelago, and 18.1 km (11.3 mi) on the Alaska Peninsula. Fifty-one of the 62 new 1990 sites were recorded during intensive surveys, and 157 previously recorded AHRS sites were updated, many with detailed maps. In 1990, archaeologists walked virtually all habitable (or formerly habitable) landforms within the survey area. The 1990 survey results substantiate the adequacy of the 1989 reconnaissance surveys for constraint formulation since few sites were found in segments surveyed in 1989 (Haggarty and Wooley 1990:23).

Despite increased survey intensity during 1990, there are limitations to both data sets. The area of potential impact from spilled oil and its cleanup involved discontinuous shoreline segments and subdivisions of relatively narrow bands of intertidal and upland landforms. As a result, both 1989 and 1990 archaeological surveys were restricted to accessible upland areas located within a maximum of 100 m of the shoreline. Many Gulf of Alaska shorelines have moved in response to tectonic or isostatic adjustments, to sea level changes over the past 12,000 years, and to erosion or sedimentation. Consequently, terrestrial sites located along former shorelines may now be found submerged offshore or located on uplifted terraces or older beach ridges situated some distance from the modern coast (Figure 77). Because the effects of such natural processes ordinarily are cumulative, they generally affect the preservation and identification of older sites most drastically.

Other environmental factors also influence the reliability of survey data in the region. Housepit villages tend to be more visible in the extensive tundra-covered lowlands of the Kodiak and Alaska Peninsula areas than in the heavily forested areas of Prince William Sound, the Kenai Peninsula, and Afognak Island. Sizeable accumulations of midden refuse in unforested areas of Kodiak and the Alaska Peninsula tend to be covered with lush and characteristic vegetation that is particularly visible during late spring and early summer. Clearings or cut stumps associated with historic activities also may provide important clues to the location of relatively recent archaeological sites in forested areas.

The differential distribution of volcanic ash deposits in the project area also can affect the accuracy of archaeological survey. For example, where Katmai ash from the 1912 eruption of Novarupta is thick, sites can be covered with 50 cm or more of ash that obscures surface features and inhibits site identification.

As emphasized by Mobley *et al.* (1990:149-151), cultural factors such as the size of the group occupying a site, the length of their occupation, and the archaeological visibility of their activities also affect the likelihood that it will be discovered during survey. Because of their high archaeological visibility, the remains of most large housepit villages are more likely to be found than those of most small satellite camps. Likewise, the remnants of a specialized site used for shellfish processing (an activity that generates large amounts of refuse) are more likely to be identified than those of a seaweed gathering camp (where little refuse is likely to be preserved).

Distinguishing Between Natural and Cultural Materials

A problem underappreciated by archaeologists is the fact that natural processes sometimes produce objects, features, or deposits that resemble the constituents or structure of archaeological sites. Such processes often cause confusion in the identification and interpretation of archaeological sites. Some of the most common constituents in Native coastal sites are marine shells, fish and mammal bones, charcoal, and fire cracked rock, all of which may be produced or mimicked by natural processes. For instance, marine shells or fish bones may be transported onto upland landforms (and incorporated into soil horizons) by animals such as ravens, seagulls, eagles, land otters, mink, brown bears, and others. While isolated specimens or diffuse scatters of shells or bones normally will not be confused with dense shell middens, they can be concentrated

[R. Reanier 2:32]

Figure 77 **Beach ridge development, Green Island, Prince William Sound**

under some conditions (e.g., in rockshelters). There has been confusion about the cultural or natural origin of faunal remains in Prince William Sound sites (Mobley *et al.* 1990:144-5), for instance, where recent shells and bones were noted on the surface of several rockshelters. Some recent faunal remains may come from animals dying in rockshelters; others may have been introduced by non-human predators or carrion-eaters. Two Kenai Peninsula "sites" recorded in 1989 were identified in 1990 as land otter middens and have been deleted from the AHRS (Table 9).

In 1989 SCAT field notes, Erlandson noted occasional clusters of clam and mussel shell fragments on open-air upland landforms of the Alaska Peninsula. After initial bewilderment about the origins of these 50 to 100 cm wide shell clusters, shell fragments were found in piles of recent bear scat indicating that they had been redeposited by brown bears that forage in the intertidal zone. Isolated shells and fish bones, as well as occasional concentrations of such faunal remains, commonly are found on terrestrial landforms adjacent to the coastline in southeast Alaska. These appear to be deposited primarily by land otters which inhabit much of the Gulf of Alaska coast.

Such processes have been occurring for thousands of years and naturally derived shells and bones undoubtedly have been incorporated into accumulating soil horizons in a variety of geological settings. Where concentrated, such materials may cause non-cultural deposits to be confused with archaeological sites or lead to the misidentification of "middens" at limited activity sites such as burial caves. The problem may be compounded by the presence of charcoal in a sedimentary matrix. Chunks or flecks of charcoal are common and durable constituents in many sedimentary contexts, where they may be redeposited from older sediments eroded by stream or beach erosion, wind deflation, or other natural processes. Charcoal is produced naturally by forest fires, including roots that burn underground (Erlandson *et al.* 1991), and may be redistributed by wind and flowing water. Wood debris or root systems sometimes carbonize without burning, leading to the apparent presence of "charcoal" or "burned wood" and confusion about the cultural nature of a deposit. Similar problems may be encountered in identifying burned rock, normally recognized by the reddening of the rock matrix. This reddening is caused by the oxidation of iron, and iron-poor rocks may not redden significantly when burned. More commonly, iron-rich rocks oxidize naturally through contact with air or wild fires.

Types of Sites and Attributes

The variety of sites, features, and artifacts found in the project area reflects the antiquity and cultural diversity of human settlement in the Alutiiq region. Various cultural features and artifacts were recorded by field archaeologists in field notes, on AHRS forms, and on cultural resource survey forms (see Mobley *et al.* 1990:126, 129). The 1989 classification system was refined in 1990 and all coastal sites within the project area have been categorized by various archaeological and management attributes (Table 7, Appendix M). Archaeological variables recorded for each site include primary site type, site size (where available), secondary site attributes, and age or cultural affiliation. Management attributes recorded for each site include landowner(s), date of site recording (pre-1989, 1989, 1990) and updating, presence or absence of known upland or intertidal components, the number of artifacts (if any) collected by Exxon investigators, and the occurrence of oil spill monitoring, inspection, post-cleanup assessment, mapping, and site incidents. A site was given an intertidal designation if it consisted of an upland site actively eroding within five meters of the beach. The management attributes summarized in this chapter's tables and in the appendices provide a concise summary of the activities of Exxon Cultural Resource Program archaeologists at each AHRS site within the project area.

In the following sections, these management attributes are discussed by primary land manager. The broadest division among recorded site attributes exists between post-contact and pre-contact sites, although some sites or features such as fire cracked rock scatters and some housepits were difficult to assign to even such gross temporal periods. In addition, a number of the AHRS sites contain both post-contact and pre-contact components, often with unrelated functions. Multicomponent sites can pose problems since refuse from the most recent occupation often obscures evidence (such as housepits) for the age and function of earlier occupations.

Pre-contact Feature and Site Types

Surface depressions are common site features in the project area. The Alutiiq and their predecessors built semi-subterranean houses at permanent residential sites. The remains of such sites are found throughout the project area and are most common in the Kodiak area. Surface depressions formed by natural processes (tree fall, beach ridge scouring, etc.) can be confused with cultural features, especially where vegetation is thick and only brief inspection is possible (Mobley *et al.* 1990), but many obvious housepits have been identified (Figure 78). Sites with housepits have been classified in the project site database as villages, and the number of observed housepits and the length and depth of midden deposits were entered into the database when the information was available. Large villages

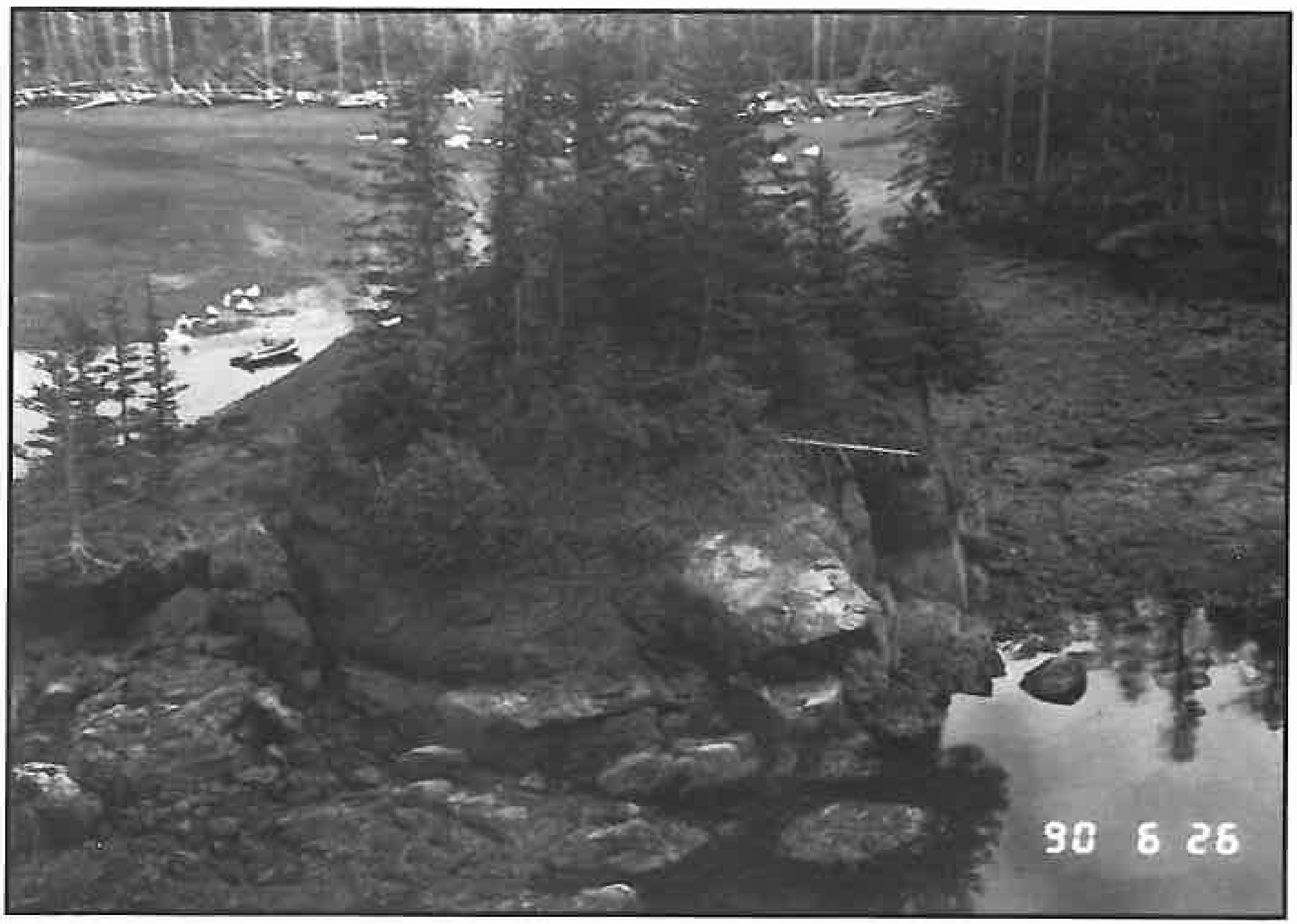
[P. Buck 19:36]

Figure 78 Housepit at XMK-007, Alaska Peninsula

have been defined arbitrarily as those containing more than ten housepits, or with midden deposits extending at least 100 meters.

Middens are occupational refuse deposits, not always apparent on a site surface, but often visible in cut banks or steep erosional slopes. The remains of marine shellfish are often the dominant cultural material in the Gulf of Alaska middens, though bone or fire cracked rock middens also occur. Midden thickness may range from a few centimeters to several meters depending on the length and intensity of occupation and the nature of site formation processes. Midden refuse is common at a variety of site types, including large and small villages, seasonal campsites, forts, and some rockshelters. The term "midden" as used in this study includes depressions, faunal remains, fire cracked rock, and/or stone artifacts found in an intact sedimentary matrix (Table 8).

Defensive sites, also known as forts or refuges, are another characteristic site type found throughout the Alutiiq and adjacent coastal regions (Figure 79). Typically, these are located on naturally defensible points or small islands ("skerries" or "hippas") surrounded by steep rocky cliffs. Defensive sites often contain midden deposits and may have housepits as well. In southeast Alaska, a growing body of evidence suggests that defensive sites ap-



[R. Mack 6:1]

Figure 79 Defensive site (SEL-181), outer Kenai Peninsula

pear relatively late in time, after about A. D. 1000 or slightly earlier (Moss 1989; Moss *et al.* 1989). Few defensive sites along the southcentral Alaska coast have been dated, though Dotter (1988a) reports C^{14} dates from three possible Chugach forts in Prince William Sound that fit the southeast Alaskan pattern (Chapter 7).

All rockshelters or caves containing artifacts, faunal remains of apparent cultural origin, burials, other features such as rock art, or other evidence of human use were recorded as AHRS sites. Rockshelters are rock overhangs whose walls and ceilings provide natural shelter from the elements (Figure 80). These are most common in Prince William Sound where they can contain midden, burials, pictographs, or artifacts. Radiocarbon dates of more than 4000 years B.P. obtained from deposits in Prince William Sound rockshelters SEW-517 and SEW-430 indicate ancient use of these sites (Table 11). Artifacts of wood, skin, and other perishable materials may be preserved in rockshelters if the deposits remain relatively dry. Some Prince William Sound rockshelters have been recorded as archaeological sites based on the presence of buried charcoal alone.

Prehistoric structures include fish weirs and cairns. Fish weirs located in streams, tidal channels, or intertidal flats adjacent to streams reportedly

[S. Ludwig 5:17]

Figure 80 Rockshelter (SEW-517), Prince William Sound

were used by both the Chugach and Koniag to capture salmon and other fish (Chapter 4). These generally were constructed of rock walls or wood stakes, though some weirs may have combined elements of both materials (Langdon *et al.* 1986; Moss *et al.* 1990). No weirs in the Alutiiq area have been dated, but wood stake weirs in southeast Alaska date to more than 3,000 years (Ream and Saleeby 1987:142; Moss 1989; Moss *et al.* 1989, 1990). Very few fish weirs have been documented within the project area (see Chapter 7), but several previously unrecorded examples were found during the 1989 and 1990 field seasons. These include both rock and wood stake weirs, including one rock alignment and one wood weir in Prince William Sound (Figure 81) and another rock alignment on the outer Kenai coast.

Wood stake weirs are one class of "wet site" where wood and other perishable materials are preserved by saturated anaerobic conditions. In the Gulf of Alaska, and particularly on the Kodiak Archipelago, some residential sites with "wet" components exist and have the potential to clarify aspects of prehistoric art and technology not normally available for archaeological study (Jordan and Knecht 1988). Three wet sites were identified by Exxon Cultural Resource Program archaeologists including two intertidal examples in Prince William Sound in 1990 (Figures 67, 82) and an upland example on Afognak Island in 1989. De Laguna (1956)

[M. Eldridge 12:14]

Figure 81 Intertidal fish trap (SEW-502), Prince William Sound

noted prehistoric stone artifacts at one of the Prince William Sound wet sites but the organic component was unknown. The Prince William Sound examples are rare evidence of sites which appear to have subsided rapidly into an anaerobic environment in the intertidal zone at some time in the past and have recently (post-1964) been uplifted into the middle or upper intertidal zone where they are eroding. These intertidal wet sites contain information about the prehistory of Prince William Sound which is otherwise unobtainable.

Rock art sites, including pictographs painted on rock surfaces and petroglyphs incised into the rock, were produced by Native people and are also relatively rare in the Alutiiq region. Pictographs preserve poorly in most contexts, but are sometimes found on vertical rock faces, under rock overhangs, or in caves (see de Laguna 1956:102-105). Most petroglyphs known in the project area are in the Kodiak region, whereas most pictographs are located in Prince William Sound (Figure 83). Several examples of rock art were documented during the 1989 and 1990 surveys, though most had been recorded previously or were found at known sites.

At some severely eroded sites, the more fragile midden constituents may be destroyed by wave action, stream erosion, or dune deflation, leaving only lag deposits of fire cracked rock and stone

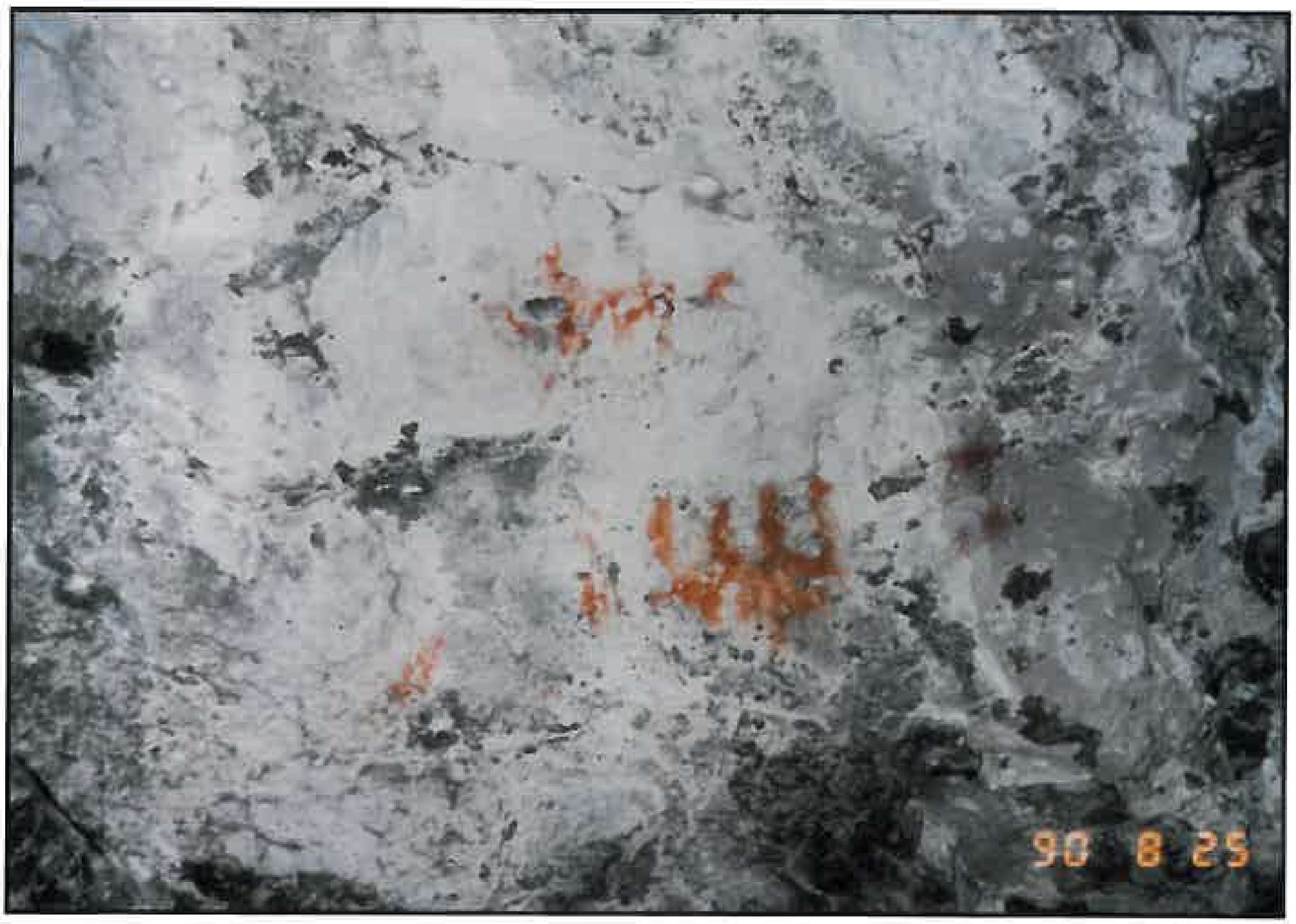
[P. Bowers 33:15]

Figure 82 Curved and notched wood from wet site (SEW-068), Prince William Sound

artifacts in the intertidal zone (Figure 84), stream channels, or in coastal dunes. Redeposited sites not found in their original sedimentary matrix were classified as prehistoric artifact scatters (multiple objects) or as prehistoric isolates (individual objects). Artifacts observed during surveys or site monitoring were classified by manufacturing technique. Flaked or chipped stone artifacts are made mostly of chert or other siliceous rock that fractures conchoidally. Ground stone tools are formed by a variety of techniques that combine cutting and snapping, flaking, or pecking an object into rough shape (blanks or preforms) with grinding into a finished form. Examples of ground stone tools include adzes, mauls, net weights, *ulus*, and projectile points. Other artifacts made of bone, ivory, shell, copper, whale bone, and wood also were noted at sites.

Post-contact Sites, Features, and Artifacts

A number of post-contact Native, Russian, and Euroamerican feature types were recorded, sometimes as isolates, but more often in association with other features. Cabins, fox traps, and other structures were most common and have been classified as historic structures. AHRS numbers generally were assigned to all cabins or abandoned structures assumed to be more than 50 years old. Prince William Sound and the Kenai Peninsula have the most



[P. Bowers 27:26]

Figure 83 Rock art (SEW-073), Prince William Sound

log cabin sites in the project area, probably reflecting the general availability of trees in the project area. On the unforested areas of Kodiak Island and the Alaska Peninsula, construction of driftwood, shiplap and/or milled lumber was more common (Figure 85). Historic commercial structures throughout the project area were almost exclusively of frame construction. Heavy milled timbers were used in mining facilities. Logs were used as pilings for dock facilities that serviced commercial sites (Figure 86). Other historic features included a log cache, a corduroy mining road, a road cut, a flight of stairs leading to a probable World War II observation post, concrete World War II bunkers, and cemeteries associated with historic villages. Historic artifact scatters and isolates also were found throughout the survey area.

Fox farming was a specialized commercial activity on Gulf of Alaska islands during the early 1900s (Janson 1985; Klein 1986; Appendix G). A number of small frame structures found on islands appear to have played a dual role as fox feeding stations and traps. These structures were built with trap doors disarmed for most of the year while the building was used as a feeding station (Figures 50, 87). During pelting season, a trigger was armed to trap foxes as they came to feed. Other types of domestic or commercial structures (cabins, etc.) are often associated with fox farm or fox trap locations. Fox

[J. Gallison 2:26]

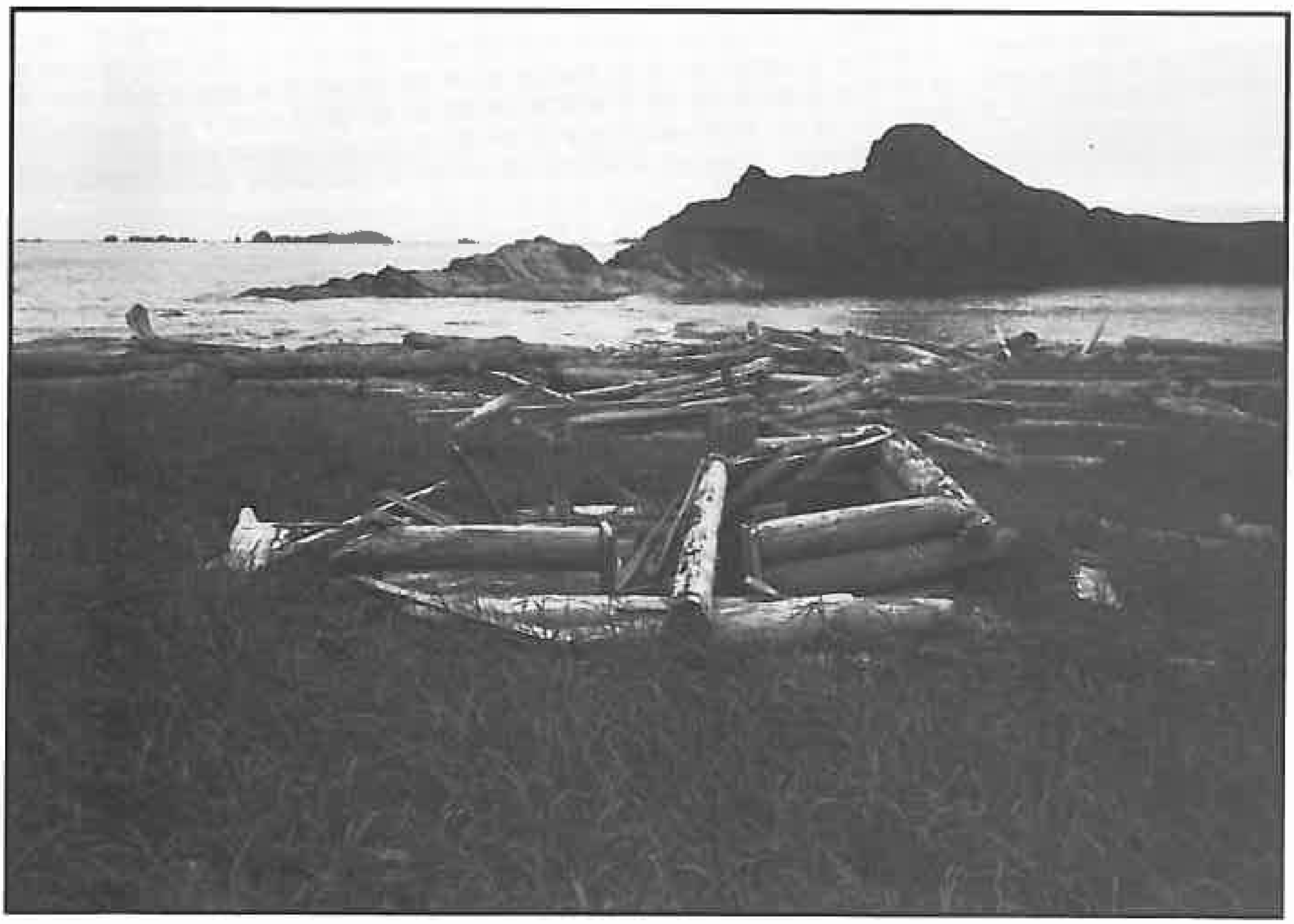
Figure 84 Stone adze in intertidal lithic scatter (SEW-488), Prince William Sound

traps and feeding stations were constructed of milled lumber and occasionally driftwood or salvaged boat lumber.

Some ship and boat wrecks were recorded as AHRS sites while others were noted as associations with larger historic sites. Most wrecks were found in the intertidal zone, on landforms uplifted out of the intertidal zone by the 1964 earthquake, or on storm berms adjacent to the beach. A unique example was an abandoned kayak frame fastened with metal brads (Mobley *et al.* 1990:50). Another wreck was recorded in 1989, the vessel *Unimak* (Mobley *et al.* 1990:169). The wreck of a large steamer was located in Prince William Sound in 1990 (Figure 70), but the identity of the vessel has not been determined. Its length was estimated at over 40 m based on the length of the drive shaft.

C^{14} and Tephra Sample Analysis

Exxon field archaeologists collected radiocarbon (C^{14}) samples (Table 11) and tephra samples (Table 12) in 1990 while testing and updating sites. C^{14} dates of two sites in Prince William Sound extend the cultural chronology of the sound to over 4,000 years, and dates from sites on Kodiak Island provide important temporal data. The analysis of a tephra sample collected from a site on the Barren Islands has contributed the first chronological infor-



[P. Buck 13:12]

Figure 85 Historic cabin, driftwood construction (KAR-112), Alaska Peninsula

mation from the islands. The samples and dates are discussed in the appropriate sections below.

Summary of Archaeological Field Data

Three hundred and twenty-six previously unrecorded AHRS sites were recorded by Exxon Cultural Resource Program archaeologists in 1989 and 1990. The site records of 335 previously recorded AHRS sites were updated significantly during this period, 178 in 1989 and 157 in 1990. Six sites reported to be cultural were removed from the AHRS after closer examination revealed that they were not cultural, and two site records were subsumed under other AHRS numbers after inspection indicated duplicate site numbers (Table 9).

The following sections summarize archaeological and management data for sites in the project area located on lands administered by major government agencies. These data are organized by agency administrative units and are current as of January, 1991. As stated earlier, some sites appear more than once because they are on properties owned or administered by multiple agencies or organizations. A common example is the many sites containing upland areas administered by a federal agency and intertidal areas administered by the State of Alaska. A significant number of sites were identified on the basis of intertidal artifact scatters alone. At many of

[P. Buck 9:9]

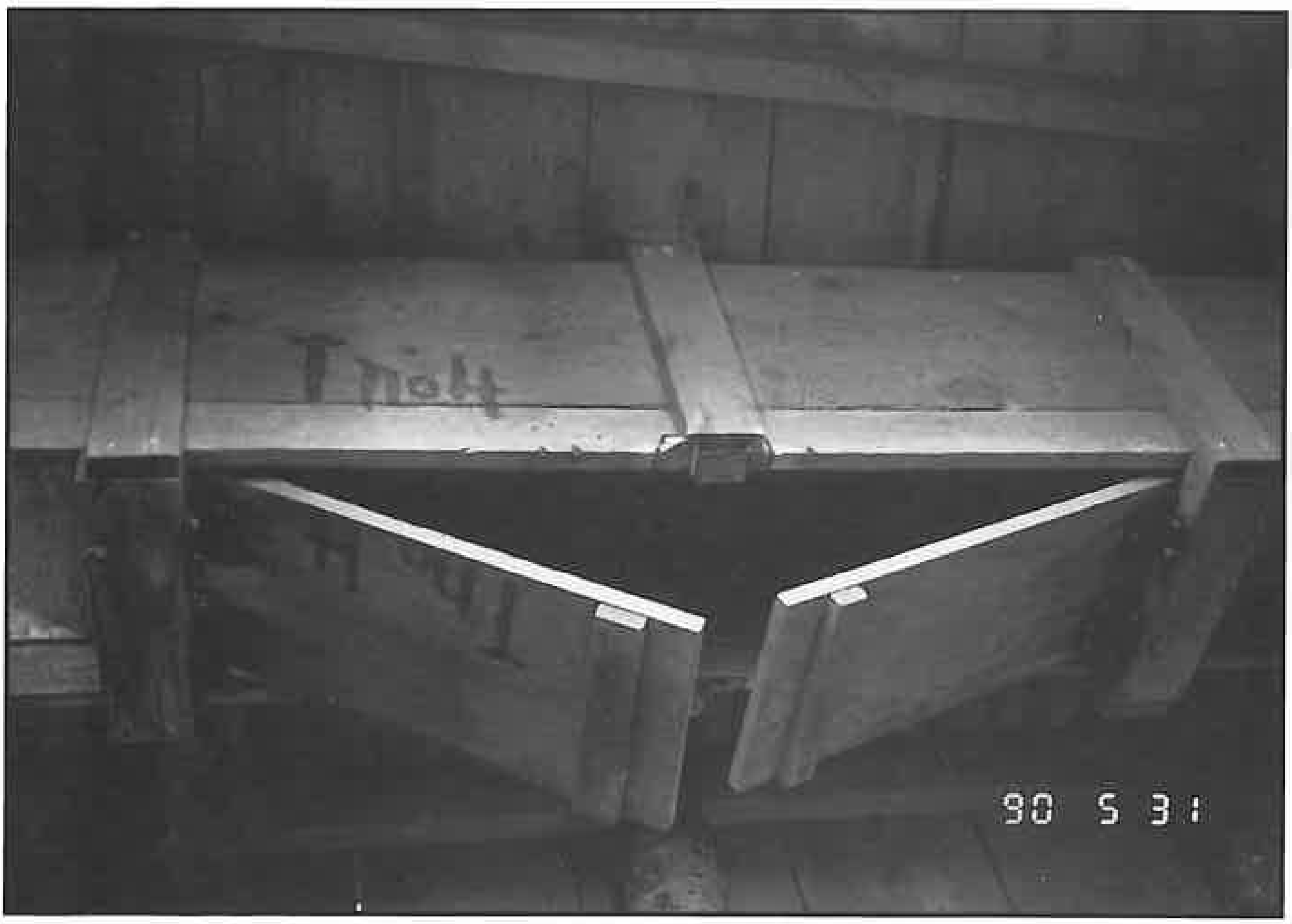
Figure 86 **Log pilings at historic copper mine, Prince William Sound**

these (shipwrecks are a notable exception), even where no explicit evidence for the presence of cultural resources on adjacent upland landforms may have been found, such terrestrial landforms are high probability areas for archaeological remains. Consequently, artifact scatters identified only in the intertidal zone are included in summary tables for the agency that manages the adjacent upland property.

State of Alaska Lands

At least 297 of the 608 sites in the project area are known to contain intertidal components that fall under the State of Alaska's jurisdiction. In addition, 108 AHRS sites are located on or adjacent to upland parcels administered by the State of Alaska, an increase of 145% over pre-1989 levels (Table 13). Of these, only one is located in Prince William Sound, 17 on the Kenai Peninsula, 87 on the Kodiak Archipelago, and three on the Alaska Peninsula.

State of Alaska lands in the project area include an essentially continuous intertidal strip of the coastlines of Prince William Sound, the southern Kenai Peninsula, the Barren Islands, the Kodiak Archipelago, and the Alaska Peninsula. There are conflicting claims in some areas, however, such as USFWS claims over intertidal lands adjacent to their upland holdings.



[J. Gallison 6:4]

Figure 87 Open fox trap inside fox pen (SEL-224), outer Kenai Peninsula

Table 11 Radiocarbon Dates From the 1990 Exxon Cultural Resource Program *

AHRS #	Region	C^{14} Date Uncorrected	C^{13}/C^{12} Adjusted Date	Calendar Age Range	Lab Number	Dated Material	Cultural Affiliation
SEW-471	PWS	160 ± 60	130 ± 60	1670-1950 AD	Beta-42080	Charcoal	Chugach?
SEW-430	PWS	700 ± 80	660 ± 80	1280-1390 AD	Beta-42077	Charcoal	Chugach?
"	"	3970 ± 150	3950 ± 150	2210-2860 BC	Beta-42078	Charcoal	Ocean Bay?
"	"	4440 ± 70	4950 ± 70	2850-3000 BC	Beta-42079	Mixed Shell	Ocean Bay?
SEW-517	PWS	-	3035 ± 55	1220-1400 BC	Beta-42081 /Eth-7651**	Charcoal	Kachemak?
"		4220 ± 90	4590 ± 90	2450-2690 BC	Beta-42082	Mixed Shell	Ocean Bay?
AFG-005	KODIAK	620 ± 70	620 ± 70	1280-1410 AD	Beta-42073	Charcoal	Koniag?
AFG-119	KODIAK	1000 ± 80	1010 ± 80	980-1150 AD	Beta-42074	Charcoal	Kachemak /Koniag?
KAR-121	AK PEN	900 ± 80	980 ± 80	1020-1220 AD	Beta-42075	Charcoal	Koniag?
KOD-077	KODIAK	280 ± 80	250 ± 80	1520-1950 AD	Beta-42076	Charcoal	Koniag

* All dates given at one standard deviation (sigma)

** Dated by Accelerator Mass Spectrometry

Upland parcels owned by the state are scattered through much of the project area (Figures 7, 8, 9), including coastal properties in northeast Prince William Sound, much of the eastern part of the outer Kenai Peninsula coast, the south coast of Kachemak Bay State Wilderness Park, and lands near the southern end of the Kenai Peninsula. State of Alaska coastal holdings are extensive in the Kodiak Archipelago, including essentially all of Shuyak and Marmot islands, the northwest half of Raspberry Island, the entire shore of Ugak Bay and the north shore of Kiliuda Bay, much of the Kupreanof Peninsula, and most of the Trinity Islands at the south end of the archipelago. Within the Alaska Peninsula portion of the project area, major DNR upland landholdings are limited to parts of the northwest shore of Wide Bay.

Prince William Sound

In Prince William Sound, nearly all upland properties administered by DNR lie outside the project area. Consequently, little shoreline survey occurred on upland parcels under state jurisdiction. In fact, only one AHRS site within the project area (SEW-220) is known to exist on an upland parcel owned by the state, a site not visited by Exxon investigators. However, there are at least 55 sites located on Forest Service or other non-state lands in Prince William Sound that contain intertidal components for which the state is responsible, including two wet sites with organic artifacts (SEW-068 and SEW-526).

Table 12 Tephra Sample Analysis From the 1990 Exxon Cultural Resource Program *

AHRS #	REGION	SAMPLE #	IDENTIFICATION		AGECOMMENTS
AFG-104	KENAI	PB-90-2	Katmai/Novarupta	1912 AD	Distal Ash
AFG-177	AK PENIN	ME/BAR-90-1	Katmai/Novarupta	1912 AD	Proximal Lapilli and Ash
N/A	AK PENIN	PB-90-6	Katmai/Novarupta	1912 AD	Proximal Lapilli Fall
AFG-175	KENAI	PB-90-3	Katmai/Novarupta	1912 AD	Distal Ash
N/A	AK PENIN	PB-90-7	Katmai/Novarupta	1912 AD	Proximal Lapilli Fall
N/A	PWS	PB-90-1	Mt. Wrangell	Unknown**	Correlates With Undated Mt. Wrangell Ash Found Widely In Prince William Sound
AFG-175	KENAI	PB-90-4	Mt. St. Augustine	ca. 750 BP	Correlates With Well-Dated Prehistoric Tephra Eruption Of Mt. St. Augustine
AFG-175	KENAI	PB-90-5	Mt. St. Augustine	ca. 750 BP	Correlates With Well-Dated Prehistoric Tephra Eruption Of Mt. St. Augustine

* Geochemical Analysis Conducted By Dr. Jim Beget, University of Alaska Fairbanks

** Approximate Age Appears To Be Older Than Ca. 2000 B.P.

The Kenai Peninsula

DNR upland holdings on the eastern Kenai Peninsula include most of the coast from Puget Bay to Resurrection Bay, along with the intertidal zone adjacent to coastal landforms. Along the limited amount of shoreline visited by Exxon archaeologists, no archaeological sites were recorded.

Seventeen coastal sites are now known from areas surveyed by Exxon archaeologists on or adjacent to the State of Alaska's upland properties on the southwest Kenai coast (Appendix N). On upland parcels controlled by other entities, 17 more sites contain intertidal components. Of the 17 upland sites, four had been recorded previously, six were recorded in 1989, and seven during 1990. Five sites recorded earlier were updated during the 1990 intensive survey and nine sites were mapped in 1990 (Appendix N). Six of the upland sites are post-contact, including the remnants of a mining community at Chrome, a cabin, a shipwreck, and three fox-farming sites. The 11 other sites all appear to be

Table 13 AHRS Sites on State of Alaska Land Within the Project Area

Sites Known Prior to 1989	50
Sites Recorded in 1989	46
Sites Updated in 1989	21
New Sites Recorded in 1990	11
Sites Updated in 1990	16
Total Sites on State Land in Project Area	**108**

pre-contact and range from isolated artifacts and intertidal artifact scatters, to a rock alignment and house depressions with associated midden deposits. At least seven of the sites contain intertidal scatters, and several of these are likely remnants of eroded upland sites.

In 1989, artifacts were collected from two sites, including three stone tools recovered at SEL-178 and a possible splitting adze fragment found at SEL-196 (Workman and Workman 1990:280-281, 287). A stone lamp was collected from a site in this general area in 1990 (Figure 88). Exxon SSAT biologist Mike Fawcett found the lamp in the state-owned intertidal zone below Port Graham Village Corporation uplands in April, 1990 and contacted the Cultural Resource Program. Robert Betts and Paul Buck recorded the artifact and surveyed the adjacent area without finding additional cultural material. Rick Reanier and Stefanie Ludwig collected the lamp prior to treatment.

During 1989, survey in the Port Dick area identified an AHRS site (formerly known as SEL-186) recorded as a pre-contact shell midden (Mobley *et al.* 1990:158). In 1990, Robert Mack and Virginia Butler revisited the site and found it to be a natural shell scatter that appears to have been deposited by land otters, and the site was deleted from the AHRS. The SHPO has subsequently applied the site number SEL-186 to a nearby site found in 1990.

The Kodiak Area

In the Kodiak portion of the study area, upland parcels owned by the State of Alaska contain 87 sites, 47 of which were recorded during 1989 and 1990 (Appendix N). In addition, at least 141 of the other 227 AHRS sites recorded in the project area contain intertidal components.

Most of Shuyak Island at the north end of the Kodiak Archipelago falls within the Shuyak State Park. There were 25 AHRS sites recorded in the project area portion of the Shuyak Island coast, including seven recorded prior to the oil spill, 11 found during 1989, and seven during 1990. During 1990, five of the 25 sites were updated and five sites were mapped.

Artifacts were collected by Exxon investigators at two sites (AFG-081 and AFG-097) in 1989 (see Mobley *et al.* 1990:266-270). The three artifacts collected at AFG-081 include a tanged *ulu*, a retouched boulder spall, and a planing adze, tools that Workman and Workman (1990:266) interpret as evidence for the "presence of a late prehistoric Koniag component at this site." Twenty artifacts were collected from AFG-097, including several whole or fragmentary *ulus*, several planing adzes or adze preforms, a stemmed slate point, a small chipped stone biface, a hammerstone, and a notched stone. Based on the available data, Workman and Workman (1990:267) believe AFG-097 contains a Koniag component, and possibly Kachemak and Ocean Bay components.

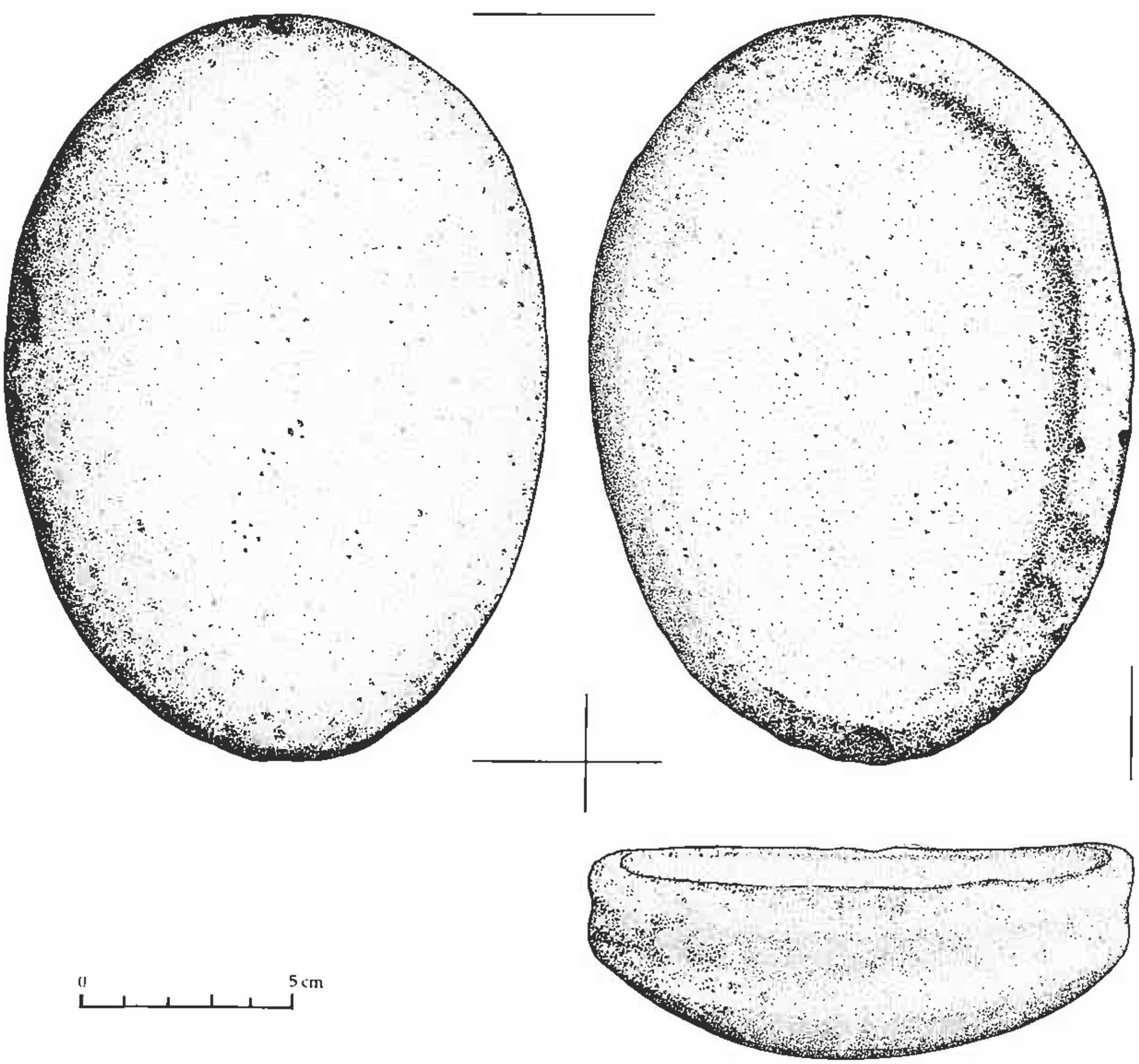
In 1989, Chris Wooley noted a hammerstone at high tide on a beach during SCAT survey in Shuyak State Park (AFG-098). In 1990, Bruce Ream and Morley Eldridge surveyed the area intensively at low tide and identified a large intertidal artifact and fire cracked rock scatter including a large ground slate point fragment with sawn serrations (Figure 54), slate *ulus*, a stemmed ground point, a red jasper biface, and numerous hammerstones. Ream and Eldridge mapped the site and did not collect the artifacts, but showed them to State of Alaska archaeologists who were nearby. AFG-098 also contains intact uplands deposits which were not sampled or systematically investigated, but the site contains either an Ocean Bay or Early Kachemak component based on the sawn slate point.

The sites within Shuyak State Park consist of an unconfirmed historic site, three historic structures, one historic shipwreck, 11 small housepit villages (including one probable fort site), six other middens, one pre-contact artifact scatter, and two pre-contact isolates.

Marmot Island is located on the remote outer coast at the northeast end of the Kodiak Archipelago. Four AHRS sites are recorded on the island; three of these (AFG-058, AFG-059, and AFG-091) had been placed on the AHRS based on historical

Figure 88 SEL-195 Lamp

Catalog Number:	49SEL-195-002 Lamp
Provenience:	Surface ITZ, isolated find
Description:	Oval outline. Sides slightly concave (grooved), bottom rounded. Shallow oval pecked depression with flat, slightly rounded bottom. Relatively thin rim. Shallow groove runs around entire perimeter slightly below top edge of rim. Top of rim rounded; battered in two locations (wave abrasion?). Very symmetrical, well made. Undecorated. Kachemak?
Material:	Gabbro, petroleum stained
Measurements:	L 17.02; W 12.79; T 4.2; bowl L 14.63; W 10.45; depth 0.76; Groove W 1.23; Wt. 1611.1
Remarks:	Collected by Ludwig and Reanier 5/19/90



[Sarah Moore Illustration]

records of the Alaska Commercial Company which depict barabaras on an 1893 map. One of these sites was located by Exxon archaeologists. In 1989, Charles Utermohle noted an eroding midden with shell, fire cracked rock, and sea mammal bone at the reported location of AFG-058. No surface depressions were identified but they may have been obscured by thick vegetation. Utermohle did not locate AFG-059, and AFG-091 was not visited by Exxon personnel. The fourth site (AFG-144) on Marmot Island was recorded by the late Richard Jordan during SCAT survey in 1989. Jordan noted an eroding shell midden at least 30 m long and about one meter deep. No housepits or diagnostic artifacts were observed at the site. Three of the Marmot Island sites reportedly contain post-contact components and at least two also appear to have been occupied before European contact. No artifacts or other samples were collected from Marmot Island sites by Exxon archaeologists during 1989 or 1990.

DNR properties within eight shoreline segments on west Raspberry Island have been documented by the project. Within this area, no AHRS sites had been recorded prior to the oil spill, and six new sites (AFG-132, AFG-137, AFG-138, AFG-139, AFG-142, and AFG-154) were found in 1989. All of these are pre-contact shell middens, including several housepit villages. Two of these sites were updated in 1990, including one for which a map of surface features was drawn. In 1989, a fragment of a large chipped slate biface preform was collected at AFG-132 (see Workman and Workman 1990:274).

The state also owns much of the Kupreanof Peninsula, encompassing most of the northeast shore of Viekoda Bay and the southwest shore of Kupreanof Strait. Discovery of one site by cleanup personnel resulted in the "Viekoda Bay Incident" (Mobley *et al.* 1990:143-144), including the disinterment of a prehistoric Koniag skeleton at KOD-427 by representatives of the Alaska State Troopers. KOD-427 and a second site (KOD-409) in Viekoda Bay were recorded by Charles Utermohle during monitoring. Prior to this, only one coastal site (KOD-186) had been recorded on state-owned lands along the shores of Kupreanof Peninsula. Given the high site density documented for adjacent areas, however, it is likely that additional sites exist in the area.

The Ugak Bay area contains 31 coastal sites recorded on the AHRS. Much of this coastline was flown in 1989 by Richard Jordan and Jon Erlandson, but since there was only very light oiling a limited amount of foot survey was conducted. Despite the sporadic nature of the Ugak Bay survey, nine new shell middens were recorded in 1989 including at least three small housepit villages. No project-related activity took place within Ugak Bay during the 1990 field season. As many as 26 of the sites along Ugak Bay appear to be located in areas administered by DNR, though several are in areas of mixed ownership and maps may not allow accurate identification of all landowners. The limited data available suggest that 21 of the sites contain pre-contact components, while seven appear to have been occupied during the Russian and/or American periods. The 26 DNR sites include three unconfirmed or reported site locations, 22 middens, and one historic structure - the Eagle Harbor Russian Orthodox Church. At least 12 of these sites are actively eroding. No artifacts or other samples were collected by Exxon archaeologists from Ugak Bay sites.

The north shore of Kiliuda Bay, located just south of Ugak Bay on the east side of Kodiak Island, is also administered largely by DNR. Kiliuda Bay contains 14 AHRS sites, 11 of which lie along the north shore. This is also an area where oiling was relatively light and survey was limited. Six of the 11 sites on the north shore of Kiliuda Bay were recorded prior to 1989. Five more were recorded by Erlandson during 1989 SCAT surveys. One of the largest village sites in Kiliuda Bay (KOD-077, Kiliuda I) was updated by Exxon archaeologists during 1989 and 1990 (Figure 89). According to AHRS files, KOD-077 is an historic Koniag village reported by Hrdlicka (1944:121) and excavated in 1961 by University of Wisconsin archaeologists (McHugh 1962:113-115; AHRS files). According to the AHRS site record, D. Clark noted post-contact materials in the one housepit tested. Erlandson visited the site in 1989 and collected four tools from the beach, which Workman and Workman (1990:276-277) interpret as potentially representing both Koniag and Kachemak occupations. Erlandson also described a dense midden up to 1.5 m deep eroding from the sea cliff, and observed whale, seal, sea otter, salmon, and cod bones, as well as mussel, cockle, sea urchin, and chiton shells. The site was visited by Exxon archaeologists twice in 1990. During one visit, Peter Bowers and James Gallison collected a charcoal and soil sample from a charcoal-rich lens exposed in the sea cliff ca. 45-50 cm below the ground surface and 35 cm above the base of the midden. Screening of this sample over 1 mm mesh recovered numerous whole and broken salmon vertebrae and several small herring vertebrae. Approximately five grams of charcoal were submitted for radiocarbon dating and produced an uncorrected C^{14} date of 280 ± 80 (Beta-42076), adjusted to 250 ± 80 by a C^{13}/C^{12} ratio of -26.7. Unfortunately, this date has multiple intercepts on the dendrocalibration curves (Stuiver *et al.* 1986) and statistically could fall anywhere within the past 430 years. Realistically, however, the sample must be at least 150 years old and it seems likely that KOD-077 spans the late pre-contact and post-contact periods. In 1990, Robert Betts and Paul Buck collected two artifacts from KOD-400, including a pecked/grooved cobble recovered during soil probing of an upland feature, and a stemmed

[P. Buck 24:28]

Figure 89 Housepits at KOD-077, Kodiak Island

Figure 90 KOD-400 Notched Cobble

Catalog Number: 49KOD-400-001 Pecked, Notched Cobble

Provenience: Soil Probe # 2 in Depression # 2, 12 CMBS

Description: Oval beach cobble with flattened oval cross section. Shallow pecked notches on two opposite lateral edges. Pecking does not extend onto flat sides of cobble. One end of cobble is slightly flattened but does not appear battered. No other cultural modification evident.

Material: Sandstone

Measurements: L 9.72; W at notches 7.91; T 3.78; Wt. 486.1

Remarks: Collected by Betts and Buck 8/24/90

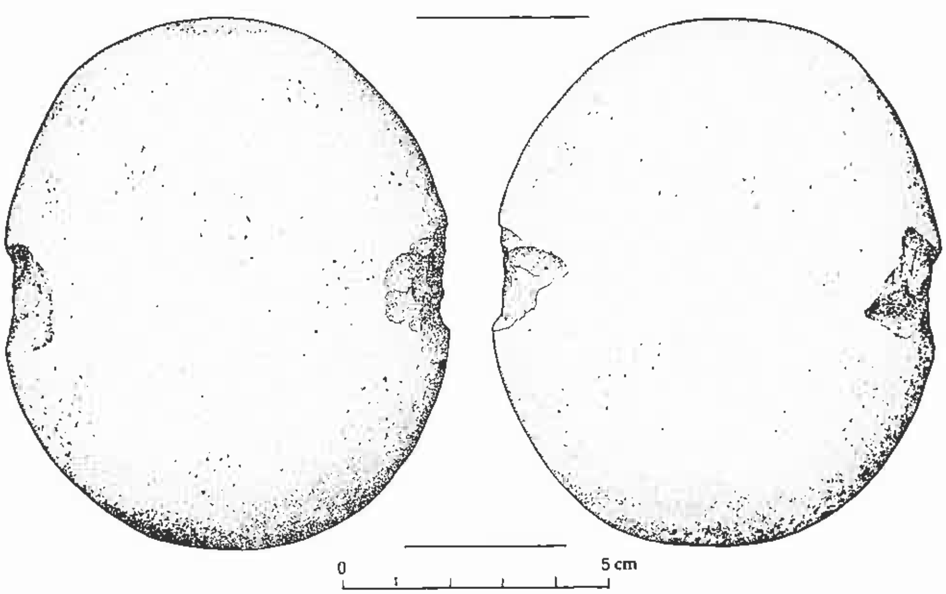
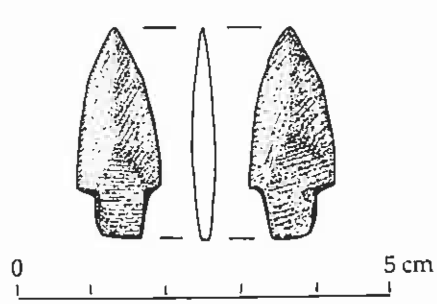


Figure 91 KOD-400 Stemmed Point

Catalog Number: 49KOD-400-002 Stemmed Point

Provenience: Surface, from 3m high bluff exposure below Depression #5

Description: Very small double-bladed ground point. Blade tapers to sharp point. Grinding striations at oblique angle to edge of blade and parallel to straight base on stem. Medial ridge on both sides ground to a flat facet at base. Square shoulders and straight base of stem exhibit striations from sawing. One corner of base is slightly rounded. Cross section at mid point of blade is sub-diamond, stem cross section is rectangular.



Material: Greenstone

Measurements: L 2.80; W at shoulders 1.17, W at stem 0.63; T 0.33; Wt. 1.3

Remarks: Collected by Betts and Buck 8/24/90

[Sarah Moore Illustration]

ground micropoint of greenstone collected from an eroding midden face (Figures 90, 91, Appendix N).

On the Trinity Islands at the south end of the Kodiak Archipelago, Exxon surveys were limited to four segments located on Tugidak Island. Within these segments, eight AHRS sites were known prior to 1989. Richard Jordan updated four of these (XTI-008, 054, 055, and 060) during 1989. No new sites were found on Tugidak Island and no artifacts or other samples were collected. All eight sites within the survey area are thought to have been occupied prior to European contact, and two contain post-contact components as well.

The Alaska Peninsula

Three sites located in segments surveyed on the Alaska Peninsula fall within properties selected for conveyance from Fish and Wildlife Service to the State of Alaska. One of these (UGA-043) is a major village located in the Wide Bay area. This multicomponent site contains at least 25 housepits, three of which were tested by Dumond (1987:129), who identified components dated to 250 ± 70 and 1880 ± 60 RYBP. According to Mobley *et al.* (1990:258), UGA-043 was eroding at the time of a SCAT survey on July 24, 1989 and during a post-cleanup assessment visit on August 26, 1989. UGA-043 was not revisited in 1990 and no artifacts or other samples were collected at the site by Exxon investigators.

Two possible housepit sites (SUT-017 and SUT-018) located in the Kujulik Bay area were recorded in 1989 by Don Abbott. No artifacts or other cultural materials were noted or collected at the two sites, and neither was revisited following the initial SCAT survey.

Chugach National Forest Lands

The USDA Forest Service administers major parts of the areas affected by the spill. These lands are managed by the Chugach National Forest and include large parts of the mainland and island areas of western Prince William Sound, as well as small unconveyed properties located on Afognak Island. Exxon surveys in Prince William Sound have nearly tripled (n=127) the number of AHRS sites in the Forest Service portion of the project area (Table 14, Appendix O). Forty-nine of these were recorded prior to the spill, 55 during the 1989 field season, and 23 more in 1990. In 1990, 64 sites were updated and 32 were mapped.

Of these 127 sites, at least 45 contain pre-contact components and at least 88 contain post-contact components, including at least nine that contain both. The 123 sites that could be assigned primary site types (four were unconfirmed or "reported" sites), included 59 (46%) historic structures, 15 (12%) historic isolates, five (4%) boat or shipwrecks, 20 (16%) rockshelters, eight (6%) pre-contact artifact scatters, ten (8%) middens, five (4%) pre-contact isolates, and one (1%) rock art site. The amount of spill-related activity within the Chugach National Forest resulted in the collection of considerable archaeological data. Two sites in particular illustrate the vast amount of information about the past available on Forest Service land in Prince William Sound.

SEW-435, an historic lighthouse complex, was initially recorded during 1989 SCAT fieldwork by Exxon archaeologist Charles Mobley and Forest Service archaeologist John Mattson (Figure 92). Site components visible from the shoreline include the remains of a pier, equipment shed, and a road cut. In 1990, Rick Reanier and Bruce Ream identified the remains of a military camp with small frame structures, several tent platforms, and two log bridges in the uplands. After discussions with Joe Leahy, Director of the Valdez Museum and an expert on Prince William Sound navigational history, it became apparent that the dock and camp were built for a lighthouse which was never installed, possibly because of the end of World War II. Comparison of a 1944 photograph taken just after the pier was built (Figure 93) with a recent photo (Figure 92) graphically illustrates the rate of site weathering and erosion in the region.

SEW-526 is a pre-contact site which contains preserved organic artifacts including a wooden splitting wedge (Figure 67), shaft fragments, and other wooden items bearing tool marks. Bruce Ream and Rick Reanier recorded the material eroding from the base of a raised relic peat deposit in 1990 and also noted a stone lamp, battered cobbles, fire cracked rock, and faunal material. The site undoubtedly contains valuable data on pre-contact woodworking and is likely to yield extraordinary information about Alutiiq life.

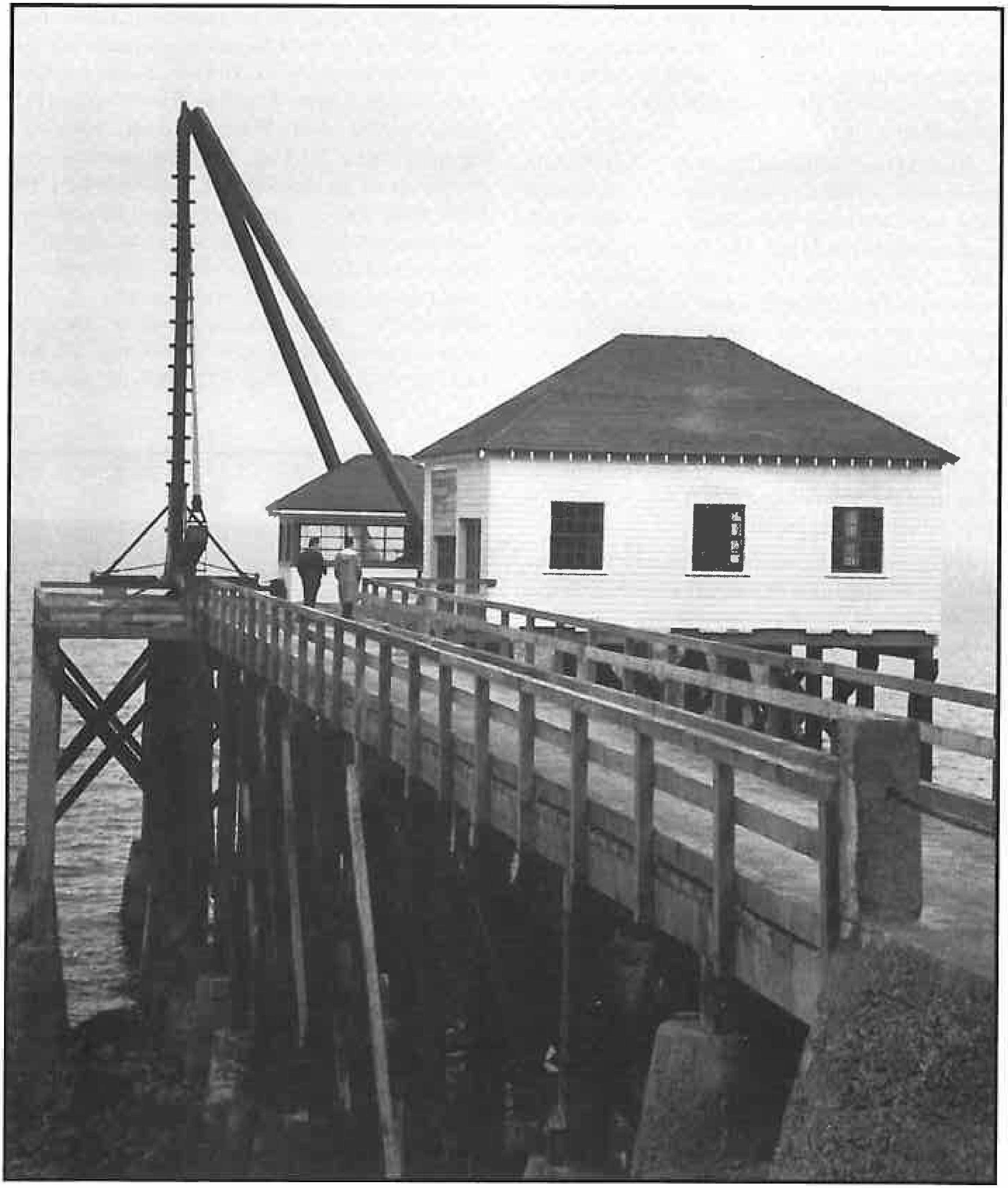
Artifacts were collected at seven Prince William Sound sites located on Forest Service lands, though most were retrieved from State of Alaska lands located below mean high tide. The artifacts recovered in 1989 have been described by Workman and Workman (1990:287-297). These include materials from two post-contact sites (SEW-494 and SEW-478) that appear to date to the American period. In 1990, a stone lamp found amid a scatter of intertidal artifacts was collected from a pre-contact site (SEW-440) (Figure 94). As noted in Chapter 5, slate flakes found in an intertidal test pit at SEW-488 initially were thought to be cultural, but closer examination revealed no cultural modification.

Radiocarbon samples were collected from erosional profiles at three Forest Service sites in Prince William Sound. Paul Buck, Jon Erlandson, and Madonna Moss collected a charcoal sample from a small concentration of charcoal and burned cobbles at SEW-471 (the Lotsa Otter Site), after profiling a cut bank confirmed the cultural nature of the materials. The charcoal and burned rocks were exposed along the beach cliff face between 125 and 150 cm below the surface of a low terrace covered with large trees. The apparent depth of the probable hearth feature suggested some antiquity for the site occupation. Analysis of a 5.8 g charcoal sample yielded an adjusted radiocarbon date of 130 ± 60 B.P. (Beta-42080). Dendrocalibration of this date (Stuiver and Becker 1986) results in multiple intercepts that indicate use of the feature sometime between A. D. 1650 and 1950.

In 1990, two C^{14} samples were collected by Rick Reanier and Stefanie Ludwig at SEW-430, a badly eroding stratified midden deposit (Figure 95) exposed in the mouth of a rockshelter in Prince William Sound. Sample #1 consisted of wood charcoal removed from a concentration of charcoal-rich sediment ca. 25-35 cm below the floor of the rockshelter and produced an uncorrected date of 700 ± 80 RYBP (Beta-42077). Sample #2 contained soil, wood charcoal, and marine shell taken from near the base of the midden exposure, ca. 55-65 cm below the floor of the shelter. Sample #2 was split into charcoal (1.2 g) and marine shell (20.6 g) fractions submitted separately for C^{14} dating. The small charcoal sample produced an uncorrected date of 3970 ± 150 RYBP (Beta-42078). The marine shell sample contained mussel (*Mytilus edulis*) and clam (*Protothaca staminea* and *Saxidomus giganteus*) fragments that produced an uncorrected date of 4480 ± 70 RYBP (Beta-42079). After dendrocalibration, the three dates suggest occupation of SEW-430 ca. 670 B.P. (A.D. 1280-1390), 4420 B.P. (2230-2470 B.C.), and ca.

[R. Reanier 19:14]

Figure 92 Modern view of pier at SEW-435

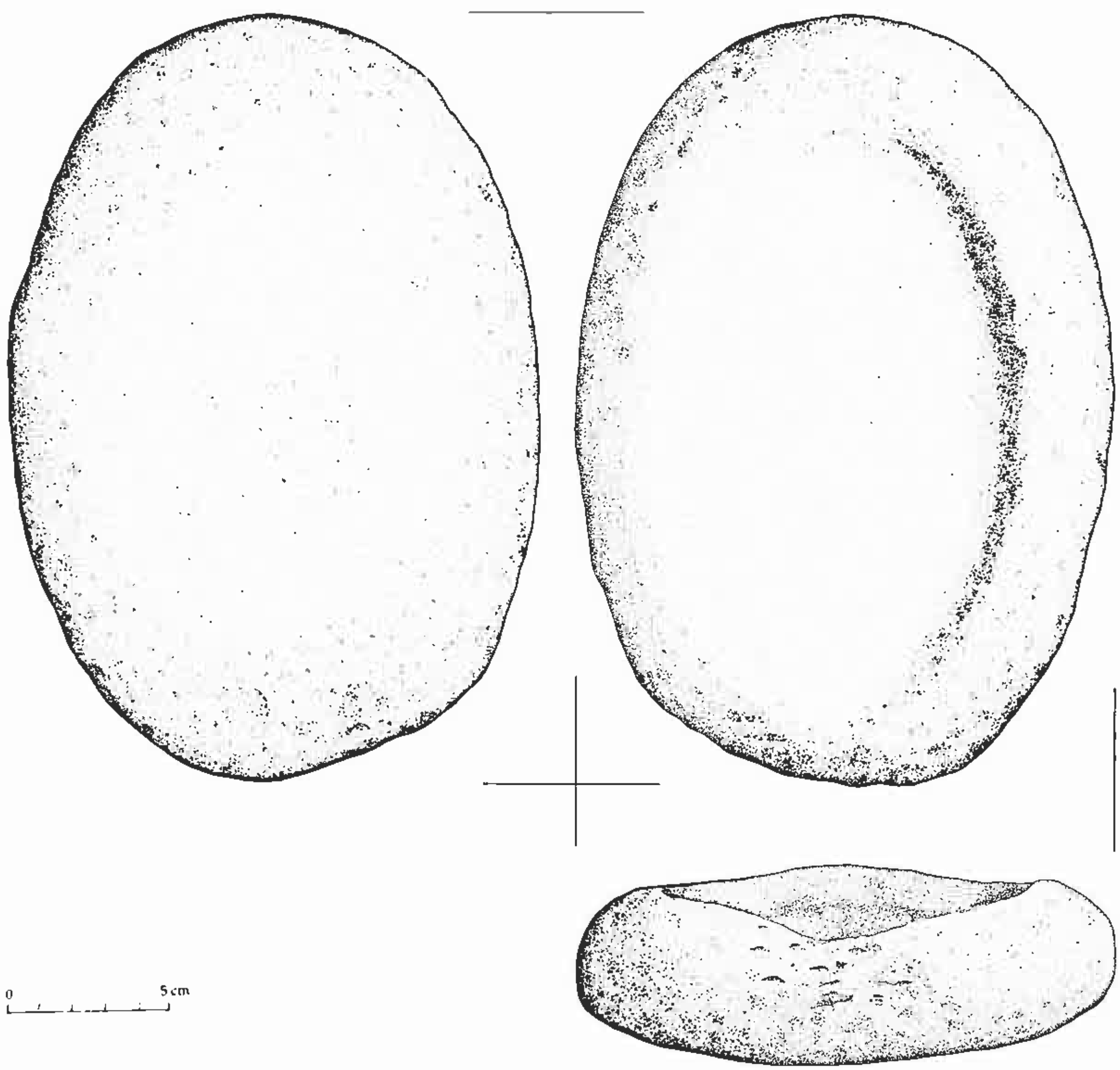


[Photo Courtesy of Joe Leahy]

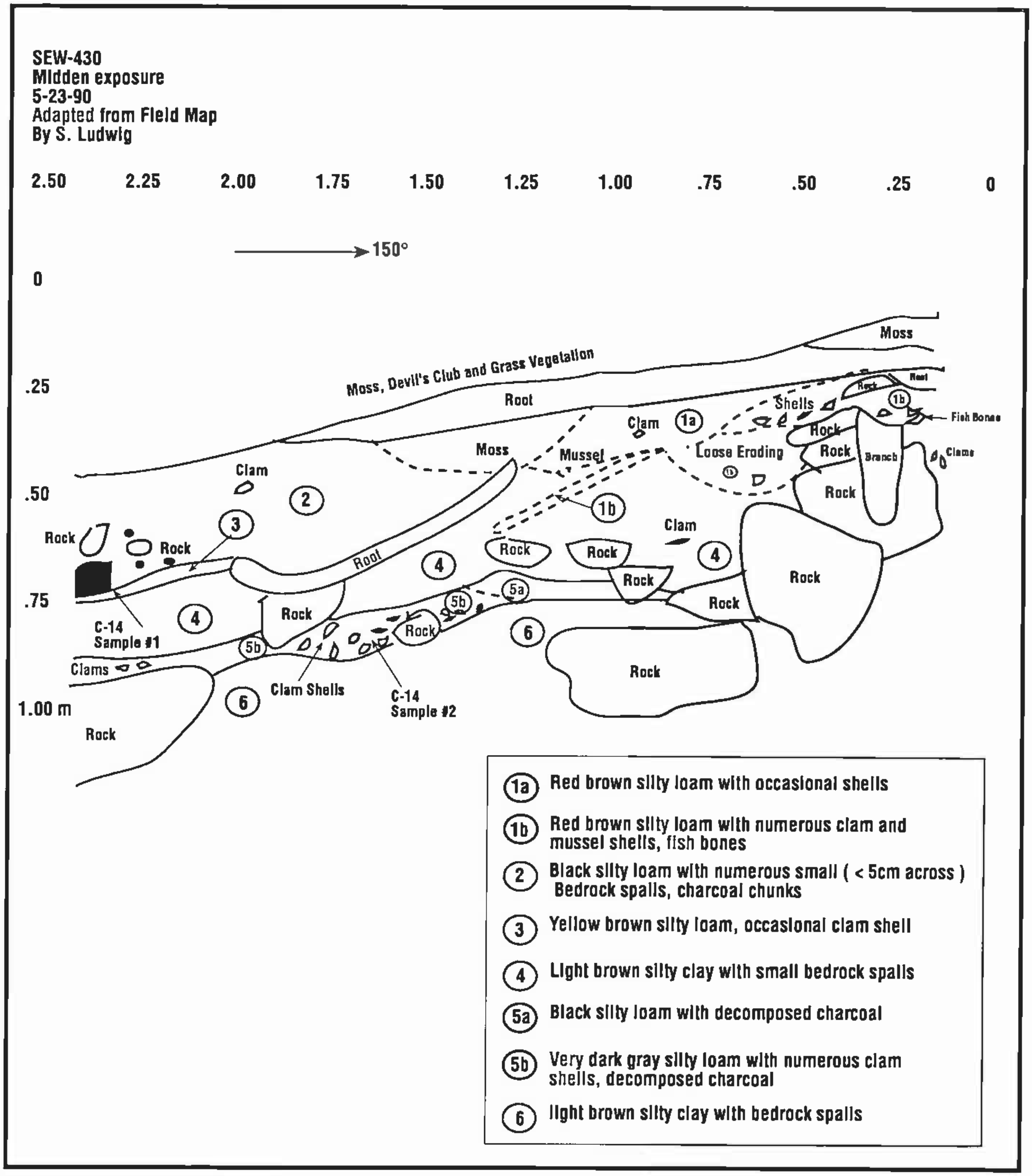
Figure 93 Pier at SEW-435 in 1944

Figure 94 SEW-440 Lamp

Catalog Number:	49SEW-440-001 Lamp
Provenience:	Mid-ITZ, below eroding midden
Description:	Oval outline, deep oval bowl shaped depression with flat bottom. Steep rounded interior angle to rim; one end of rim is flattened (spout?); thickness of rim greatest at opposite end. Not decorated. Numerous small barnacles.
Material:	Gabbro
Measurements:	L 23.7; W 16.2; T 5.75; bowl L 18.93; W 11.45; depth 2.01; Wt. 3732.5
Remarks:	Collected by Reanier and Ludwig (1990)



[Sarah Moore Illustration]



[adapted from field map by S. Ludwig and R. Reanier 5/23/90]

Figure 95 Profile of SEW-430, Prince William Sound

4840 B.P. (2850-3000 B.C.), respectively (Stuiver and Becker 1986; Stuiver *et al.* 1986). The dates confirm that multiple components exist at the site and extend the apparent antiquity of human occupation in Prince William Sound by as much as 600 years (Erlandson *et al.* 1991).

A date of nearly equal antiquity was produced by the C^{14} dating of marine shell fragments recovered in a shallow test pit which Jim Gallison and Pete Bowers excavated at SEW-517 (Figures 66, 80). This test pit produced small quantities of marine shell, charcoal, fish and mammal bone, including a piece of burned bone that appears to be clear evidence for human occupation of the shelter. The very small charcoal sample, collected from a 1 cm thick lens between 5 and 6 cm below the rockshelter surface was too small for conventional C^{14} dating and was sent to Zurich for dating via Accelerator Mass Spectrometry. It yielded a date of 3035 ± 55 RYBP. Analysis of a 10.1 g sample of mussel (*Mytilus sp.*) and chiton (*Cryptochiton stelleri, Katharina tunicata*) shells recovered between five and 12 cm below the surface produced an uncorrected date of 4220 ± 90 RYBP (Beta-42082), equal to ca. 4510 B.P. (2450-2690 B.C.) (Stuiver *et al.* 1986). An excavation larger than that within the scope of this project is needed at SEW-517 to confirm unequivocally the cultural origin of the shell and other constituents found during testing. Nonetheless, the dates from SEW-517 and SEW-430 demonstrate ancient use of Prince William Sound rockshelters, and may indicate that apparent low site density in Prince William Sound is a result of natural site destruction processes and survey bias, not lack of early occupation.

A sample of volcanic ash was collected by Peter Bowers from a non-archaeological stratified peat deposit identified along the southeast shore of Applegate Island in Prince William Sound. This sample came from a thin tephra layer identified 30-32 cm below the surface in a laminated peat deposit at least 70 cm thick. This is one of the few tephra localities reported for the Prince William Sound area and is probably associated with an eruption of Mt. Wrangell. According to Dr. James Beget at the University of Alaska Fairbanks, the Mt. Wrangell tephra appears to be older than ca. 2,000 B.P. (Table 12).

Table 14 AHRS Sites on USDA Forest Service Land Within the Project Area

Sites Known Prior to 1989	49
Sites Recorded in 1989	55
Sites Updated in 1989	21
Sites Recorded in 1990	23
Sites Updated in 1990	64
Total Sites on USDAFS Land in Project Area	**127**

Exxon activities on the Chugach National Forest's Afognak Island properties were limited. Four previously known AHRS sites were visited by Christopher Donta and Michael Yarborough in 1989, though one of these (AFG-038) was not relocated. The three others include a pre-contact midden (AFG-012), a midden with pre-contact and post-contact components (AFG-010), and an historic cabin (AFG-061). No artifacts or other samples were collected at any of the sites, though cultural materials have been reported in the intertidal zone in front of the three midden sites. All four sites lie outside of SCAT survey areas along beaches where no cleanup occurred. They were visited during Post-Cleanup Assessment to insure that no impacts occurred to important sites located near treated shorelines.

National Park Service Lands

National Park Service (NPS) lands within the project area include parts of the coastline of three separate parks: Kenai Fjords National Park on the Kenai Peninsula, Katmai National Park and Preserve, and Aniakchak National Monument and Preserve, both located on the Alaska Peninsula. Except for parts of Katmai National Park and Preserve (G. Clark 1968a; 1968b), archaeological research has been limited in these remote areas. Sixty-two AHRS sites have been recorded in NPS areas surveyed by Exxon contract archaeologists. Twenty-five of these were recorded prior to the oil spill, 27 in 1989, and 10 in 1990. This is an increase of more than 160% in the number of AHRS sites recorded on NPS lands within the project area (Table 15).

Kenai Fjords National Park

Kenai Fjords National Park extends along the outer coast of the Kenai Peninsula from the east side of the Aialik Peninsula to the west shore of Nuka Passage, including the west side of Resurrection Bay, Aialik Bay, Harris Bay, McCarty Fjord, and Nuka Bay (Figure 8). Many parcels in the park have been selected by the English Bay Corporation and the Port Graham Village Corporation under the provisions of the Alaska Native Claims Settlement Act.

Very little was known about either the archaeology or ethnohistory of the southern Kenai coast prior to 1989 (Mobley *et al.* 1990; Chapter 4), but Kenai Fjords National Park now has 25 AHRS sites located within one kilometer of the shore. Exxon archaeologists recorded seven new AHRS sites in the park in 1989 and 1990, and updated records for four previously known sites (Table 15). Another site (formerly known as SEL-205) recorded in 1989 (Mobley *et al.* 1990:159) was revisited in 1990 by Robert Mack and found to be non-cultural and has been deleted from the AHRS. The 1990 survey also updated, mapped, and videotaped five of the 11 AHRS sites in the Kenai Fjords portion of the project area. Several additional sites were recorded in this general area during surveys of the Pye and Chiswell islands, both administered by the Alaska Maritime National Wildlife Refuge (see US Fish and Wildlife Service).

Table 15 AHRS Sites on National Park Service Land Within the Project Area

Sites Known Prior to 1989	25
Sites Recorded in 1989	27
Sites Updated in 1989	18
Sites Recorded in 1990	10
Sites Updated in 1990	13
Total AHRS Sites on NPS Land in Project Area	**62**

Ten of the 11 AHRS sites in the Kenai Fjords National Park survey areas appear to have been occupied before European contact, and two show evidence for historic use (Appendix P). Three of the sites found by Mike Yarborough in 1989 during Exxon surveys (SEL-188, SEL-194, SEL-206) consist of lag deposits of artifacts in the intertidal zone, and two of these (SEL-188, SEL-194) have intact uplands deposits. The amount of damage caused to sites in this region by subsidence and subsequent erosion makes the remaining intact portions of these sites very meaningful, and Betts *et al.* (1991) poses research questions for future investigations of sites in the area.

Artifacts were collected from only one site in 1990, SEL-188, which was the subject of a joint study by National Park Service, Chugach Alaska Corporation, and Exxon archaeologists (Schaaf and Johnson 1990; Betts *et al.* 1991: Chapter 5). Eight artifacts were collected from the intertidal zone at SEL-188 during 1989 (Mobley *et al.* 1990:284-285) and are described in Workman and Workman (1990). The 1990 investigations at SEL-188 produced the oldest radiocarbon date (1350 ± 70) from the outer Kenai Peninsula (Table 18). Betts *et al.* (1991) analyzed the site in a regional context and discussed outer Kenai site distribution in relation to resource distributions. SEL-188 has been selected for conveyance by Port Graham Village Corporation and English Bay Corporation.

The eight other sites from project areas in Kenai Fjords National Park in the Seldovia (SEL) quadrangle have been selected by the Port Graham Village Corporation, and the two sites in the Blying Sound (XBS) quadrangle have been selected by the English Bay Corporation. One of these, (XBS-015), is a substantial housepit village with about 250 CMTs, which was originally noted by Bruce Ream in 1989 and mapped in 1990 by Virginia Butler and Robert Mack (Figure 96). It is located in the vicinity of XBS-014, a site from which Russian and American period artifacts (A.D. 1850-1900) were collected from a bulldozer scrape (Schaaf 1988). The existence of XBS-015 as well as the identification in 1989 of housepit features at the XBS-014 site by Exxon archaeologists Bruce Ream and Stefanie Ludwig substantiates Schaaf's speculation that XBS-014 "... is likely to contain a number of earlier, as yet undiscovered, components" (Schaaf 1988:23).

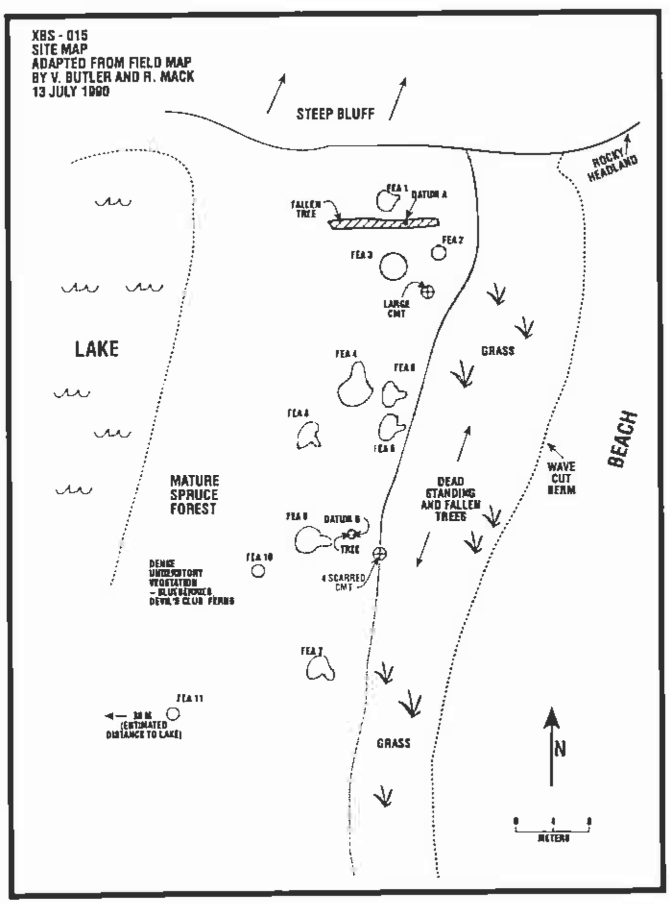
Katmai National Park and Preserve

This large park is located on the Alaska Peninsula, stretching along the Pacific coast from just north of Cape Douglas near the entrance to Cook Inlet to Cape Kubugakli opposite Kodiak Island.

The park encompasses the shorelines of Sukoi, Hallo, Kukak, Kaflia, Kuliak, Missak, Kinak, Amalik, Dakavak, Katmai, and Kashvik bays, along with several small islands (e.g., Takli Island) located offshore. Survey and excavation were conducted in the Kukak Bay area by University of Oregon archaeologists during the 1960s (see Dumond 1964, 1965, 1971; G. Clark 1977), research that established a basic chronology for the Pacific coast of the Alaska Peninsula that extends back almost 6,000 years (see also Dumond 1987). Other archaeological research within Katmai National Park has been sporadic. Prior to 1989, there were 29 AHRS sites within one kilometer of the Katmai National Park coastline, including 20 located in areas of project-related activity. During the 1989 field season, Exxon archaeologists recorded 20 new sites in these areas and substantially updated 15 more (Appendix P). In 1990, 10 new sites were recorded and eight previously recorded sites were updated. Site maps based on surface data were produced for eight of the sites recorded or updated in 1990. The activities of the Exxon Cultural Resource Program more than doubled the number of known AHRS sites in Katmai National Park.

Of the 50 sites in the project area, 12 contain historic components and 40 (possibly 41) appear to be pre-contact. These diverse sites probably span much of the known history of Katmai National Park. The post-contact sites include the remnants of the abandoned Alutiiq communities of Kukak and Katmai, several cabins, a scatter of historic artifacts found beneath the 1912 Katmai ash, and the remains of two fish canneries. Older sites include numerous shell middens (many with the remains of semi-subterranean houses), two possible defensive sites, cairns, artifact scatters, and isolated artifacts.

Together, these sites represent an invaluable and endangered resource spanning at least 6,000 years and encompass a variety of site types that can contribute important information on the nature of past human adaptations along the Alaska Peninsula's Pacific coast.

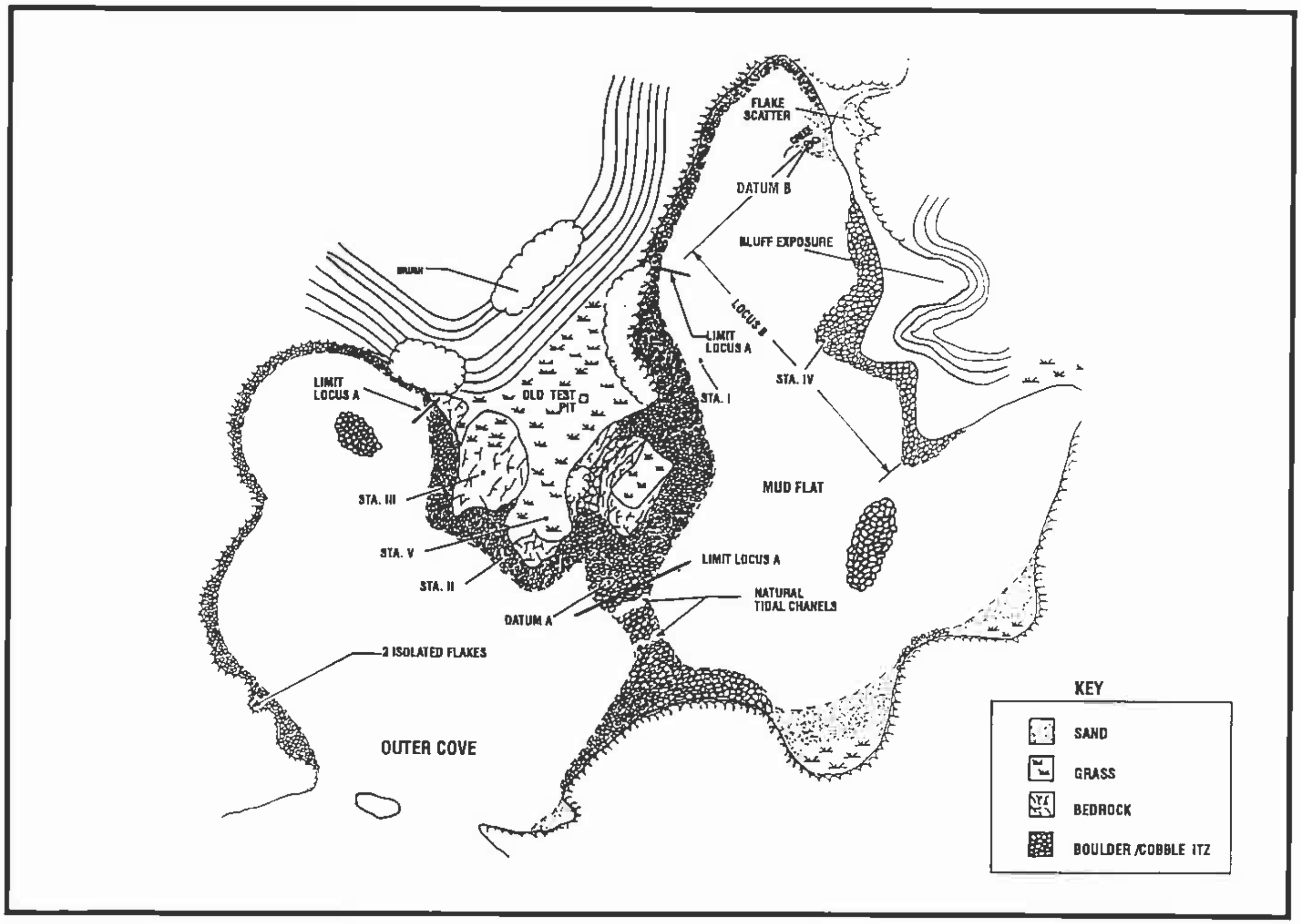


[adapted from field map by V. Butler and R. Mack 7/13/90]

Figure 96 Site map (XBS-015), outer Kenai Peninsula

Artifacts were collected during 1989 at three sites (AFG-117, XMK-022, and XMK-058) located within Katmai National Park (see Workman and Workman 1990:271, 297-299). Charles Utermohle collected two basalt bifaces (one fragment) and a large and possibly retouched "side-blow" flake at AFG-117. Two of the three artifacts were heavily patinated, leading Workman and Workman (1990:271) to propose a possible Ocean Bay I age for the site. Seventeen artifacts collected from XMK-022 by Richard Reanier and Charles Utermohle, including ground slate points and blades, a planing adze bit and preform, a lamp fragment, and a grooved cobble, suggest that this may be a multicomponent site occupied for a considerable time period (Workman and Workman 1990:297-8). Robert Betts and Paul Buck produced detailed site maps of XMK-022 in 1990 (Figures 97, 98). Seven artifacts collected from XMK-058, including ground slate *ulus*, a planing adze, and a notched pebble, suggest a Kachemak occupation for this site. Bruce Ream, Morley Eldridge, Jim Gallison, and Pete Bowers produced a detailed site map of XMK-058 while monitoring the site in 1990 (Figure 99).

No artifacts were collected from Katmai National Park properties during 1990, but three tephra samples were collected from stratified sediments along the Katmai coast. Pete Bowers collected two of these samples



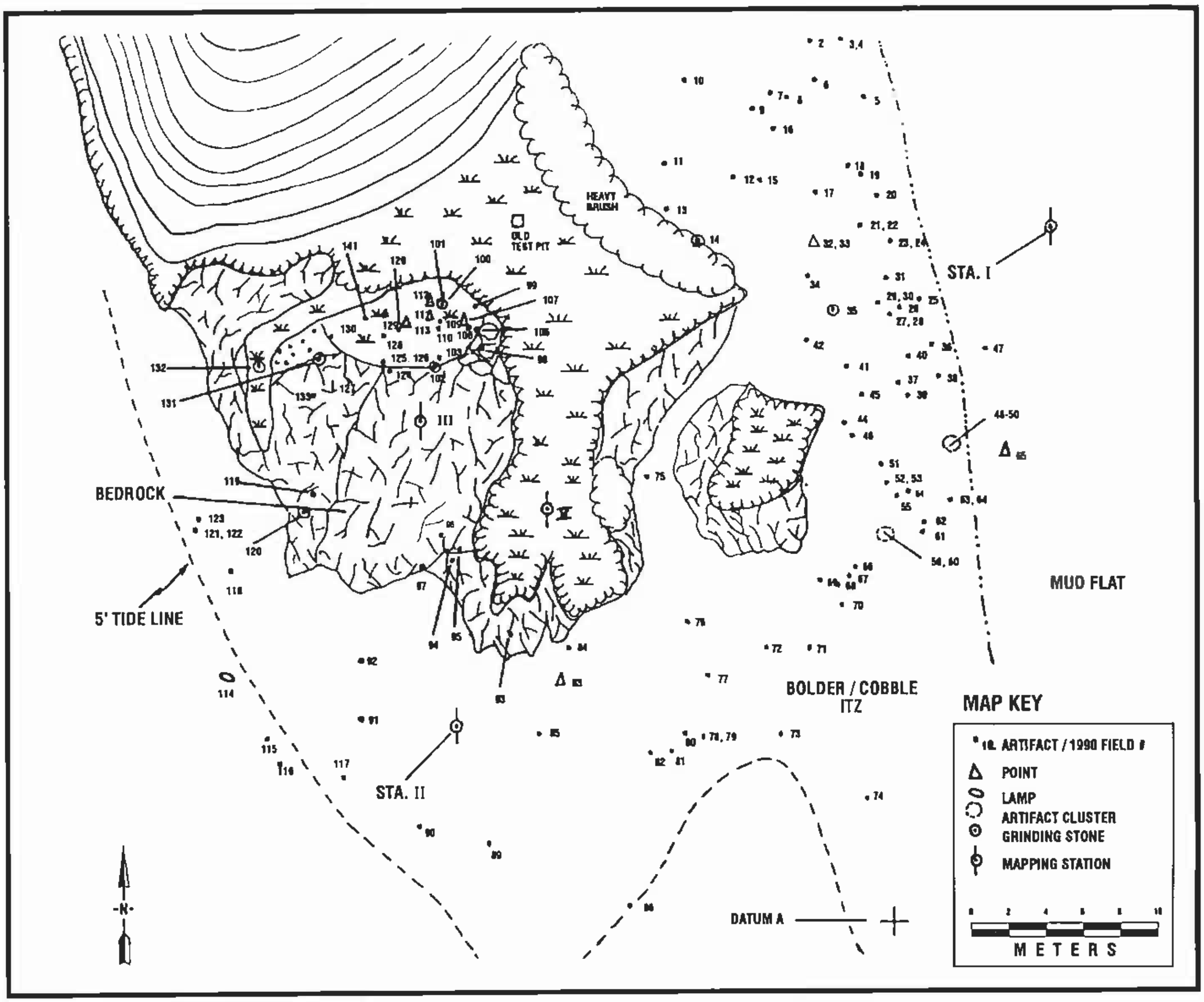
[adapted from field map by R. Betts and P. Buck 7/5/90]

Figure 97 Site map (XMK-022), Alaska Peninsula

from a non-archaeological locality on the north shore of Missak Bay, from the upper and lower portions (from 20-24 cm and 54-58 cm below surface, respectively) of a 60 cm thick tephra layer from the 1912 eruption of Novarupta. Morley Eldridge, Bruce Ream, and Michele Jesperson (NPS) collected the third sample from a volcanic ash layer buried within an eroding dune at archaeological site AFG-177. Here, stone artifacts (a slate *ulu* fragment, a ground slate point fragment, a contracting stem basalt point, and flakes) were observed both above and below the tephra layer, some associated with a buried soil located under the ash. All three tephra samples have been identified as having been produced by the 1912 eruption of Novarupta (Table 12).

Aniakchak National Monument and Preserve

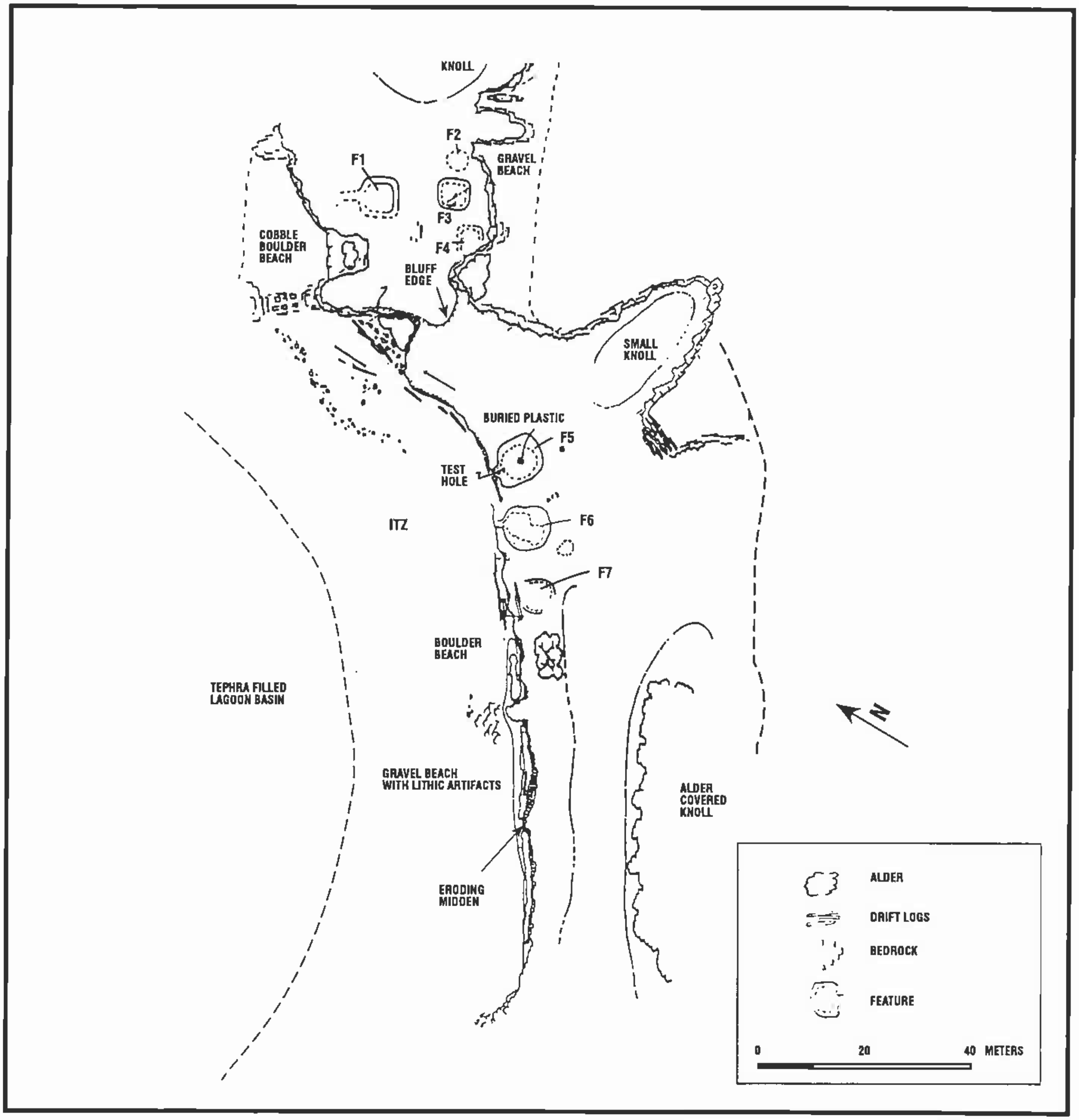
Aniakchak National Monument and Preserve is located at the southwest end of the project area and encompasses a section of the Pacific coast of the Alaska Peninsula from Amber Bay on the northeast to the Chignik area on the southwest (Figure 10).



[adapted from field map by R. Betts and P. Buck 7/5/90]

Figure 98 XMK-022 Locus A surface artifacts, Alaska Peninsula

Archaeological survey was conducted within the boundaries of the preserve in 1989, when portions of eight segments were examined. Areas in the park surveyed in 1989 encompass just over 61 linear km (38 mi) of shoreline, including the west half of Amber Bay, all of Cape Ayutka, all of Aniakchak Bay, and a small part of Kujulik Bay. Due to very light oiling, foot survey was sporadic and no archae-



[adapted from field map by B. Ream, M. Eldridge, J. Gallison, and P. Bowers 7/90]

Figure 99 Site map (XMK-058), Alaska Peninsula

ological sites were recorded or updated. Only one AHRS site (SUT-016) had been recorded previously within the area, a cluster of five post-contact semi-subterranean housepits with a possible pre-contact feature radiocarbon dated to 375 ± 40 RYBP (AHRS files). No additional data were recorded for SUT-016 during the Exxon survey. Robert Mack and Donald Abbott noted several areas of high archaeological potential in the area, but the areas were inaccessible by boat, located on older beach ridges outside the potential impact area, or contained no visual evidence of sites. Other Aniakchak shorelines delineated in field notes and on Cultural Resource Evaluation forms include extensive areas of steep and what appear to be uninhabitable shorelines.

Fish and Wildlife Service Lands

Lands administered by the Fish and Wildlife Service in the project area include peri-coastal portions of four wildlife refuges: Alaska Maritime National Wildlife Refuge, the Kodiak National Wildlife Refuge, Becharof National Wildlife Refuge on the Alaska Peninsula, and the Alaska Peninsula National Wildlife Refuge. There has been little previous archaeological research within these refuges (see Dumond 1987). As a result of Exxon field surveys, the number of AHRS sites recorded on Fish and Wildlife Service land in the project area has increased from 102 to 198 (Table 16).

Alaska Maritime National Wildlife Refuge

The Alaska Maritime National Wildlife Refuge includes hundreds of islands scattered along coastal Alaska. Archaeological investigations were conducted in three main portions of this refuge: the Pye and Chiswell Island groups located off the south coast of the Kenai Peninsula, the Barren Islands situated at the entrance to Cook Inlet, and Sutwik Island located off the Alaska Peninsula. The Chiswell, Pye, and Barren islands fall within the traditional territory of the Unegkurmiut who occupied the south coast of the Kenai Peninsula at the time of contact (see Chapter 4; McCartney 1988:39). Sutwik Island falls within the traditional territory of the Koniag.

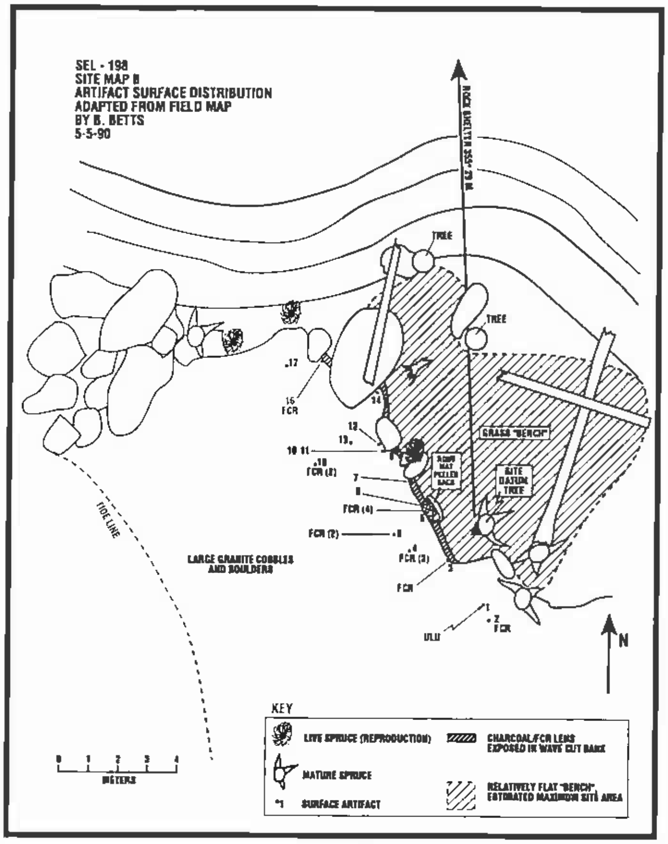
The Chiswell Islands are located at the entrance to Aialik Bay, south/southwest of the community of Seward. Virtually the entire steep and rugged coastline of the Chiswell Islands was surveyed by SCAT teams during 1989, although only a portion was covered by foot survey. There were no recorded AHRS sites on the Chiswells prior to 1989 when one new site (XBS-018), a pre-contact midden, was recorded by Michael Yarborough. No artifacts or other samples were collected on the Chiswell Islands by Exxon archaeologists (Appendix Q).

The Pye Islands form part of the east shore of Nuka Bay off the south coast of the Kenai Peninsula (Figure 8). They include Ragged, Rabbit, and Outer islands. Prior to 1989, there were no confirmed AHRS sites documented on the Pye Islands, though de Laguna (1956:35) noted a reported site in the area (see Betts *et al.* 1991). The Pye Islands are steep, rugged, and teeming with sea birds and sea mammals. Over 4,000 sea lions haul out seasonally on Outer Island (ADFG 1985b:17), and sites in this area are likely related to pre-contact exploitation of such abundant marine resources.

Large segments of the convoluted coastline of the Pye Islands were examined by Michael Yarborough in 1989 and by Paul Buck and Robert Betts during 1990. Six AHRS sites were recorded in 1989, and

Table 16 AHRS Sites on Fish and Wildlife Service Land Within the Project Area

Sites Known Prior to 1989	102
Sites Recorded in 1989	83
Sites Updated in 1989	51
Sites Recorded in 1990	13
Sites Updated in 1990	42
Total AHRS Sites on USFWS Land in Project Area	**198**



[adapted from field map by P. Buck and R. Betts 5/5/90]

Figure 100 Site map (SEL-198), outer Kenai Peninsula

three of these were updated during the 1990 field season (Appendix Q), including two (SEL-197 and SEL-198) that were mapped (Figure 100). Of these six sites, four appear to be pre-contact, including three intertidal scatters of fire cracked rock and other artifacts. Three sites contain historic components, including a road cut (SEL-203) and a set of stairs (SEL-202) that may be associated with World War II military activity. Only one artifact was collected by Exxon archaeologists on the Pye Islands, a ground slate projectile point from SEL-197. This point, described and illustrated in Workman and Workman (1990:287), is not temporally diagnostic. Paul Buck and Robert Betts noted a small rockshelter with sea lion remains on the floor in the uplands adjacent to the eroding midden at SEL-198 in 1990 (Figures 100, 101).

The Barren Islands lie at the mouth of Cook Inlet, between the tip of the Kenai Peninsula, Cape Douglas, and the north end of the Kodiak Archipelago (Figure 7). They include Ushagat Island, West Amatuli Island, and East Amatuli Island which were partially surveyed in 1989 and 1990, as well as several smaller islands (Sugarloaf, Sud, and Nord) and rocky islets that were not surveyed. Prior to 1989, three AHRS sites were known from the Barren Islands, two American period structures probably related to commercial fox farming and one pre-contact housepit site. One of the fox farms, AFG-039, was thoroughly documented by Jim Gallison and Pete Bowers in 1990 and contains great oral history potential if past users of the site can be identified and interviewed (Figures 102, 103).

Project-related survey on the Barren Islands was limited to the examination of roughly one-half of Ushagat Island's coast and only small segments of shoreline on East and West Amatuli islands. Despite the limited nature of the Barren Islands survey, seven new sites were recorded in 1989 and six more in 1990, bringing the total number of AHRS sites on the islands to 15, indicating substantial pre- and post-contact use of the area. The housepits at the three village sites on the Barren Islands are generally round to subrectangular in outline. More detailed site analysis is necessary to establish how sites on the Barren Islands relate to sites in adjacent regions of the outer Kenai Peninsula coast and Shuyak Island.

During 1990, 11 Barren Islands sites were updated, including seven that were mapped. Based on available data, eight of the 15 sites appear to have been occupied before contact (Appendix Q), including AFG-103, where Michael Yarborough noted at least nine oval housepits in 1989, and AFG-175, a village originally noted by Curt Wilson of USFWS where Gallison and Bowers mapped 10 housepits and several smaller depressions (Figure 104). Other old sites on the Barren Islands identified by project archaeologists include midden deposits (one with three possible house depressions), three stone artifact scatters, a fire cracked rock scatter, and an isolated core. The five new post-contact sites include two more structures which appear to be related to fox farming, the remains of two probable cabins, and a small structure of uncertain function which is also likely related to the fox farms. Only one artifact was collected on the Barren Islands, an isolated core recovered from a test pit excavated at AFG-106. Workman and Workman (1990:270) have suggested that this core may predate the Koniag period.

In 1990, Pete Bowers collected four tephra samples from stratified erosional exposures at two archaeological sites (AFG-104 and AFG-175). A sample of ash was collected at AFG-104 from a four centimeter thick tephra layer located between eight and 12 cm below the surface. A similar sample was collected from an identical depth at AFG-175. Dr. Beget identified both samples as originating from the 1912 Novarupta event on the Alaska Peninsula (Table 12).

Samples of two other thin tephra strata were recovered from an erosional face at AFG-175. The tephra strata were located just below the cultural layer at depths of 58-60 cm and 62-64 cm, and Beget correlated the samples with tephra produced during a large eruption of Mt. St. Augustine on the west side of Lower Cook Inlet about 750 B.P. (Table 12). Thus, a maximum age of 750 years can be established for AFG-175, the first chronological date for

[R. Betts 5:23]

Figure 101 Interior of small rockshelter at SEL-198, outer Kenai Peninsula (note sea lion mandible in foreground)

the Barren Islands. Occupation of the islands by Native people in the late pre-contact period fits the Alutiiq pattern of intensive use of semi-exposed shorelines adjacent to large concentrations of diverse resources such as sea mammals, sea bird colonies, shellfish, and bottom fish (see Chapters 4 and 7).

Limited reconnaissance took place on Sutwik Island during 1989. Only two AHRS sites are recorded on the island, one (SUT-001) a reported site that has never been confirmed by ground truthing. The other (SUT-020) was visited briefly in 1989 by Donald Abbott, who noted the presence of two apparent housepit depressions.

Kodiak National Wildlife Refuge

The Kodiak National Wildlife Refuge encompasses a number of coastal properties scattered around the Kodiak Archipelago including major upland landholdings on northwest Afognak Island and along Kodiak Island's northwest and southwest coasts. Major Fish and Wildlife Service tidelands areas encompass large stretches of the intertidal zone on Afognak Island. Forty-five sites are located in areas noted on Department of Interior landowner records as US Fish and Wildlife Service Tidelands. Thirty-seven sites in these segments were recorded before the spill, and eight were recorded in 1989.

[J. Gallison 7:26]

Figure 102 Historic cabin (AFG-039)

Much project-related archaeological activity took place on the northwest coast of Kodiak Island along the shorelines of Uganik Island, Uganik Bay, and Spiridon Bay. Large parts of this area have been surveyed previously (e.g., M. Yarborough 1978; Nowak 1978; Crowell 1986; Jordan and Knecht 1988), and many AHRS sites have been recorded. Nonetheless, during 1989 and 1990 Exxon archaeologists increased the number of AHRS sites within the survey areas in Kodiak National Wildlife Refuge by more than 93% (Appendix Q) and contributed new data on many more. Within areas of project activity, at least 149 archaeological sites are known to exist on upland and intertidal lands administered either wholly or in part by the Kodiak National Wildlife Refuge. Of these, 94 sites were recorded prior to the project, 48 during 1989, and seven during 1990 (Appendix Q), including a large housepit village KOD-434 originally reported by Curt Wilson of the Fish and Wildlife Service and subsequently mapped by Jim Gallison and Pete Bowers (Figure 105). Twenty-three sites also were updated in 1990, and maps were produced for 27 more.

In 1989, 23 artifacts were collected from eight sites in the Kodiak National Wildlife Refuge. Analysis of these artifacts led Workman and Workman (1990) to propose the presence of a pre-Koniag component at KOD-415, Kachemak components at AFG-122

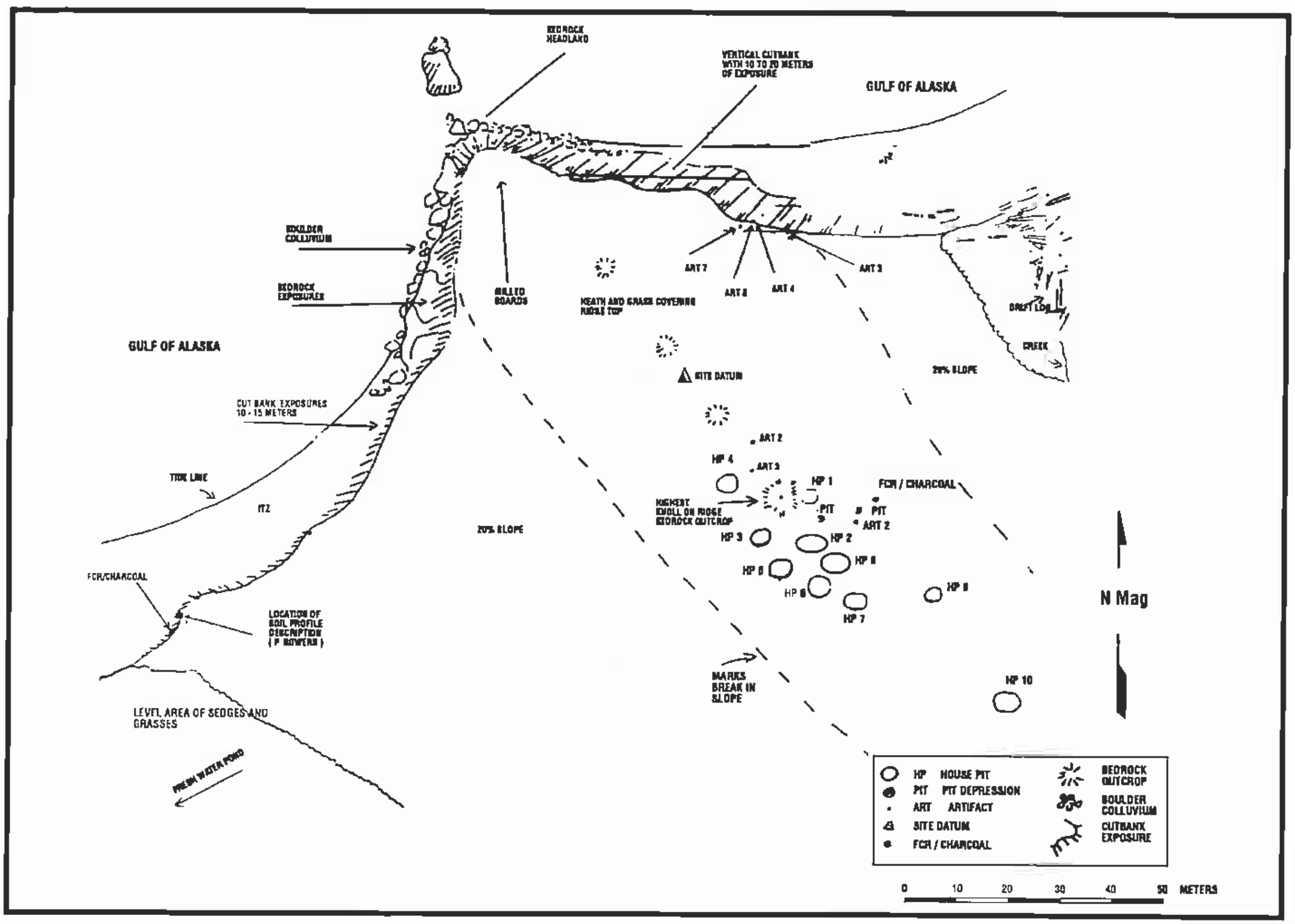
[J. Gallison 7:4]

Figure 103 Archaeologist Pete Bowers records fox pens (AFG-039)

and KOD-432, possible transitional Kachemak/Koniag components at AFG-028 and AFG-128, and Koniag components at AFG-026 and AFG-143. Three more artifacts, a stemmed point of ground slate (Figure 106), a pecked cobble fragment, (Figure 107) and a possible bone wedge fragment (Figure 108), were collected by Robert Betts and Paul Buck at KOD-432 in 1990. A wire-wound glass bead with red and white petal designs collected by Aron Crowell and Bruce Ream at KOD-223 in 1990 suggests that this Kachemak and pre-contact Koniag site also contains a mid-to-late 19th century Koniag component (Figure 109). Betts and Buck also collected a C^{14} sample in 1990 from a sea cliff profile at AFG-119. The sample of wood charcoal, removed from near the base of a 30 to 40 cm thick midden of fire cracked rock and charcoal, was dated to 1000 ± 80 RYBP (Beta-42074). After calibration, this suggests that site occupation began between about A. D. 980 and A. D. 1150.

Becharof National Wildlife Refuge

Becharof National Wildlife Refuge encompasses the Pacific coast of the Alaska Peninsula from Cape Kubugakli to Cape Igvak, including essentially the entire shorelines of Alinchak, Puale, Dry, Jute, and Portage bays. Nearly the entire length of this coastal stretch was surveyed, except for the Portage Bay coast. Within the 49 segments surveyed along



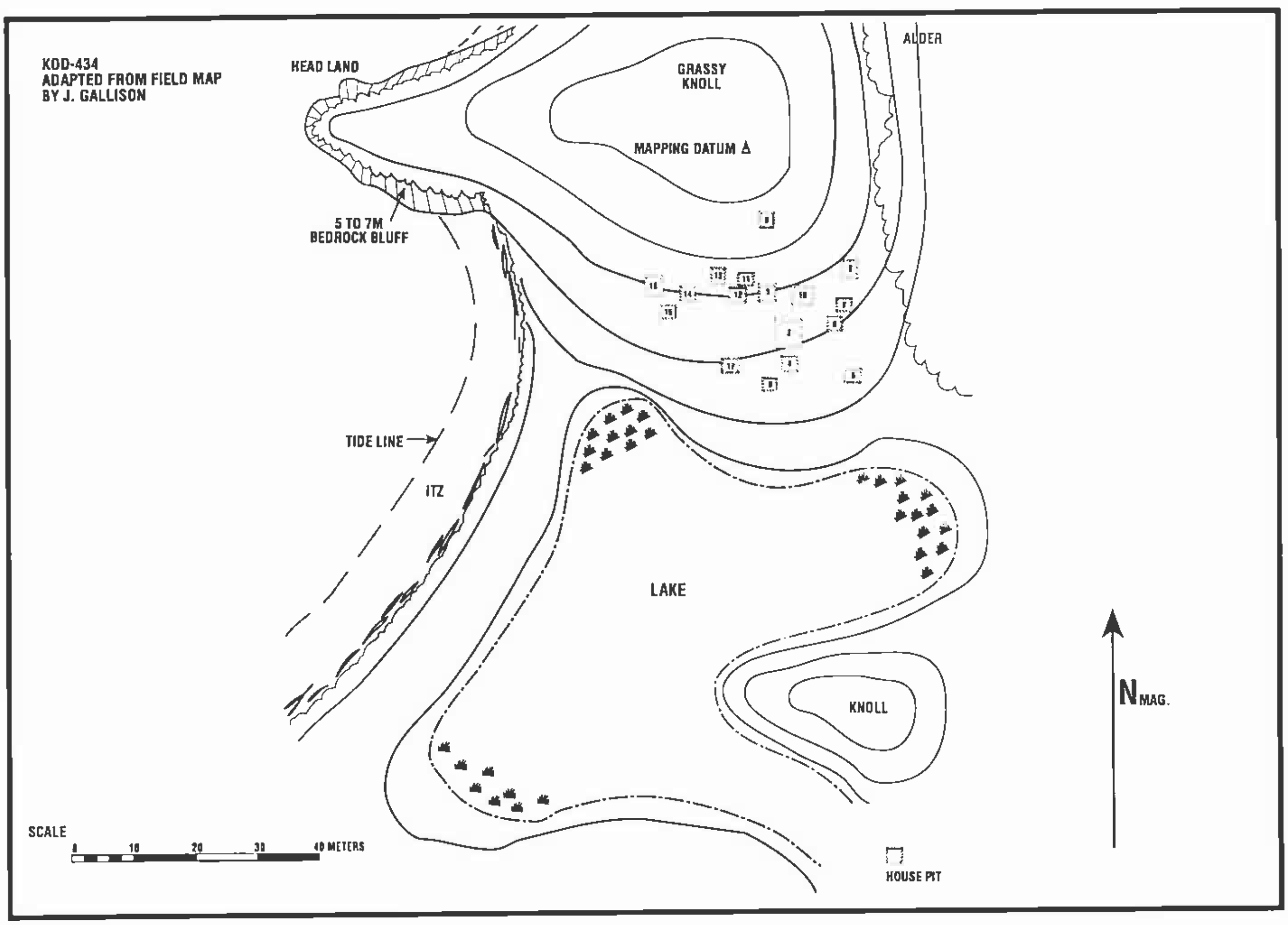
[adapted from field map by J. Gallison and P. Bowers 6/5/90]

Figure 104 Site map (AFG-175), outer Kenai Peninsula

the Becharof coast during 1989 and 1990, only five AHRS sites had been recorded prior to 1989. During 1989, 17 new sites were recorded, bringing the total number of AHRS sites to 22. In 1990, six of these sites were updated, including KAR-112 which was mapped by Robert Betts and Paul Buck (Figure 110).

The sites within the survey areas include nine historic structures, seven midden sites, three pre-contact artifact scatters, and three pre-contact isolates. Three of these sites include both pre- and post-contact components (Appendix Q).

During 1989, artifacts and other samples were collected at three sites (KAR-121, KAR-122, and KAR-132) located within Becharof National Wildlife Refuge. Jon Erlandson collected 17 artifacts from an eroding sea cliff at KAR-121 including an *ulu*, a planing adze preform, a ground slate point fragment, a basalt biface fragment, an incised slate slab, four large chert flake tools, and objects of native copper and jet. Based on their examination of the artifacts from KAR-121, Workman and Workman (1990:274) have suggested a lengthy occupation of the site, possibly including Ocean Bay II (Takli Birch) and Koniag components. The remnants of two hearths were identified eroding from the sea cliff and Erlandson collected a charcoal sample from one of these. Radiocarbon dating of this charcoal produced an uncorrected date of 900 ± 80 RYBP (Beta-42075). After correction for dendrocalibration, this date suggests that this part of the site most likely was occupied between about A. D. 1020



[adapted from field map by P. Bowers and J. Gallison 8/5/90]

Figure 105 Site map (KOD-434), Kodiak Island

and A. D. 1220, around the time of the Kachemak - Koniag transition. According to Workman and Workman (1990:275-276), neither a contracting stem chert point from KAR-132 nor two chert cores from KAR-122 were temporally diagnostic.

Alaska Peninsula National Wildlife Refuge

Located at the southwest margin of the project area, the Alaska Peninsula National Wildlife Refuge contains two extensive tracts of the Pacific coast that are separated by the Aniakchak National Monument and Preserve. Only the eastern tract, extending from Cape Igvak to Cape Kunmik, falls within the project area. This tract encompasses the entire shorelines of Wide Bay, Imuya Bay, Agripina Bay, Port Wrangell, Chiginagak Bay, Nakalilok Bay, and Yantarni Bay. Due to very light oiling, relatively little archaeological survey was conducted in the refuge. No AHRS sites had been recorded within the surveyed areas prior to 1989. Donald Abbott recorded three AHRS sites (SUT-017, SUT-018, and SUT-019) during 1989. Two of the three sites contain suspected pre-contact housepits. The third (SUT-019) is a historic cabin possibly dating to the 1920s. No artifacts or other collections were made at these sites, and none were revisited in 1990 (Appendix Q).

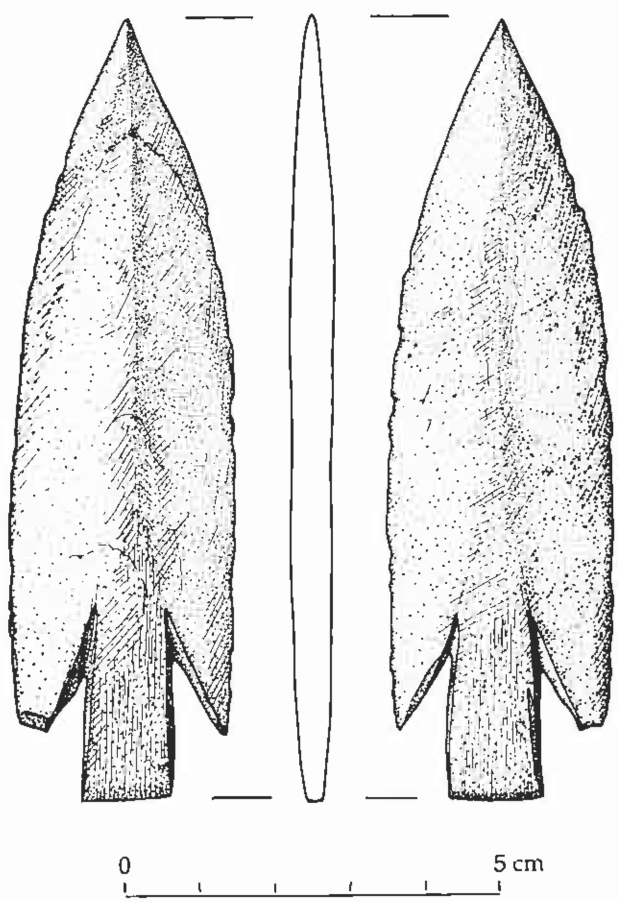
Summary

This chapter summarizes archaeological data collected and analyzed under the auspices of the Exxon Cultural Resource Program. New site information collected under permit from project area lands managed by the agencies has greatly expanded the amount of cultural resource data currently available for individual park and refuge units within the project area. The management and research values of previously recorded cultural resource sites in the region have been similarly enhanced by the collection and analysis of updated site information presented throughout this report and in the confidential volume.

The specific land managing units administered by the permitting agencies form arbitrary divisions of the overall project area, and as a result, the preceding description does not maximize the interpretive potential of the data. The data must be placed in a regional context and analyzed in relation to findings from the overall culture area in order to realize their interpretive potential in accordance with Secretary of Interior Standards and Guidelines. The following chapter analyzes Exxon's 1989 and 1990 data in relation to all site data from the Alutiiq culture area. We use archaeological survey data, information on natural resource distributions, and chronological inferences derived from radiocarbon dating and diagnostic artifacts and features to better understand the human history of the Alutiiq region.

Figure 106 KOD-432 Ground Slate Point

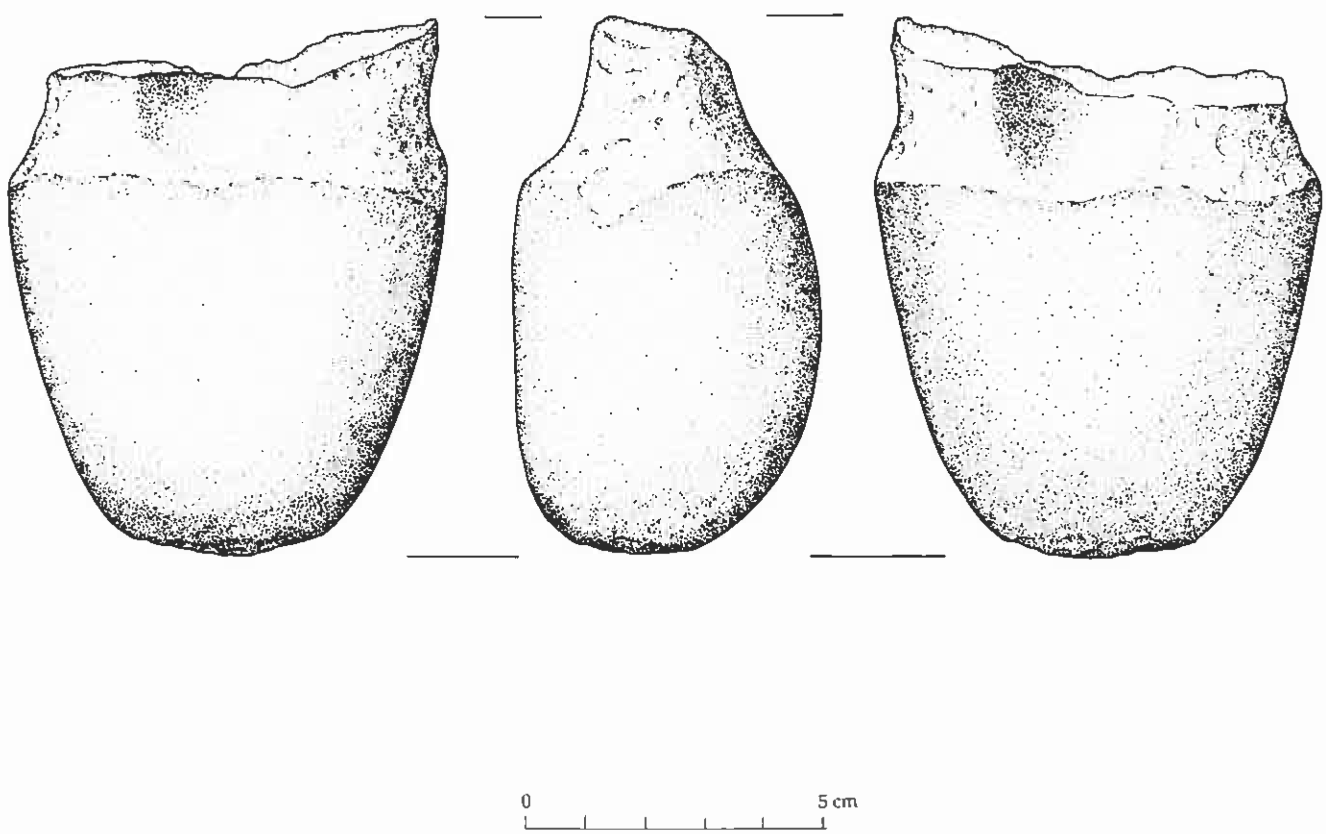
Catalog Number:	49KOD-432-002 Double-bladed Barbed Ground Point
Provenience:	Surface 022 degrees, 9.6 m from Mapping Stn #1
Description:	Large finely ground point. Parallel double-bladed edges converge to sharp tip. Sub-diamond cross section at tip becoming oval towards stem. Medial ridge on both sides of blade extends about half way down blade from tip where it is ground flat. Base cross section is sub-rectangular. Shaping striations are generally oblique to blade edge but coarse striations on both sides of stem are parallel to edge of stem. Barbs are deeply incised by sawing. Tip of one barb is missing. Edges of stem are parallel with straight base. Striations from sawing are present on sides and base of stem.
Material:	Slate
Measurements:	L 10.33, L of stem 1.91; W 3.05, W of stem at base 1.26; T 0.57; Wt. 21.8
Remarks:	Collected by Betts and Buck 8/25/90



[Sarah Moore Illustration]

Figure 107 KOD-432 Pecked, Battered Cobble

Catalog Number:	49KOD-432-003 Pecked, Battered Cobble
Provenience:	Surface ITZ, 066 degrees, 9.6 m from Mapping Stn#1
Description:	Fragment of beach cobble heavily battered at one end and shaped by pecking. End opposite battering appears to have been deeply grooved by pecking around entire circumference of cobble with deep depressions pecked from two opposite surfaces almost joining to form a hole. The cobble has been broken so that the cross section is hour-glass shaped.
Material:	Granite
Measurements:	L [7.77]; W 7.38, W at break 6.65; T 4.69, T at center of break 0.79; Wt. 461.0
Remarks:	Collected by Belts and Buck 8/25/90



[Sarah Moore Illustration]

Figure 108 KOD-432 Bone Wedge

Catalog Number:	49KOD-432-004 Ground Bone Wedge
Provenience:	Surface, 018 degrees, 4.2 m from Mapping Stn #1. In supra-tidal zone below shell midden exposure
Description:	Ground bone (rib) wedge with single bevel on dorsal surface. Grinding extends back 1.12 cm from convex working end. Sharp break at proximal end. Rounded sub-rectangular cross section. Sides rounded by grinding.
Material:	Bone, Whale rib (?)
Measurements:	L 6.94; W 3.4; Cord of working edge 2.93; T 1.17; Wt. 23.4
Remarks:	Collected by Betts and Buck 8/25/90

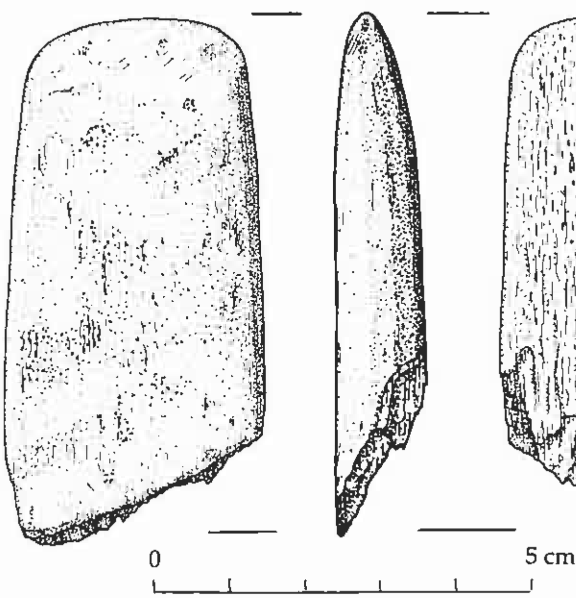
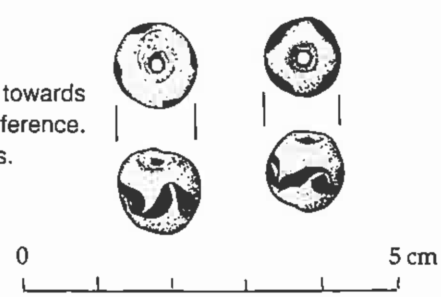
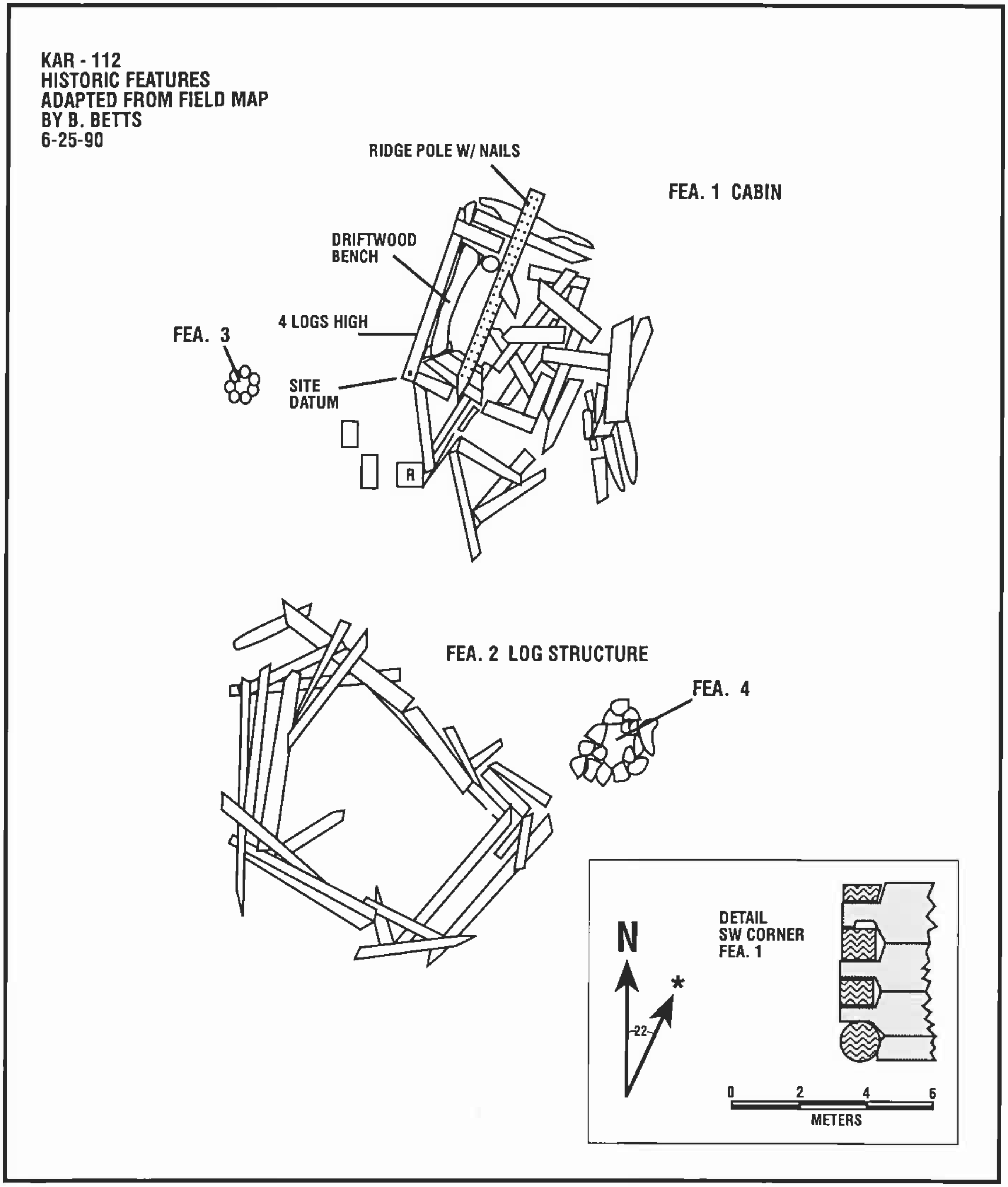


Figure 109 KOD-223 Trade Bead

Catalog Number:	49KOD-223-001 Glass Trade Bead
Provenience:	Surface, Area 1
Description:	Large milky white glass bead, largest diameter in middle, tapering towards ends. Red, interlocking design with white border around circumference. Straight, drilled hole. Damage from crushing apparent at both ends.
Material:	Glass
Measurements:	L 1.01; Diameter 1.11, hole dia 0.20; Wt. 1.9
Remarks:	Collected by Crowell and Ream 8/21/90



[Sarah Moore Illustration]



[adapted from field map by R. Betts and P. Buck 6/25/90]

Figure 110 Site map (KAR-112), Alaska Peninsula

CHAPTER 7

MARITIME SETTLEMENT AND CULTURAL ECOLOGY ON THE SOUTHCENTRAL ALASKA COAST

Environmental, historical, and archaeological data relevant to understanding the cultural ecology of past peoples of the southcentral Alaska coast have been reviewed in previous chapters, and the results of Exxon's 1989 and 1990 archaeological field investigations and laboratory research were summarized in Chapter 6. These new data are significant and interesting in their own right, but their value and ramifications are more apparent when viewed within a regional cultural, environmental, and ecological context.

This chapter combines site information collected by Exxon's Cultural Resource Program with data on all other coastal AHRS sites in the Alutiiq region and investigates the evidence for spatial and temporal variation in settlement and demography within the study area. Relationships between the distribution, density, and diversity of natural resources and archaeological sites within the Alutiiq region are explored using data on the distribution of key natural resources (salmon, sea birds, and pinnipeds) and AHRS sites located within one kilometer of the coast. Resource aggregations and archaeological sites have been plotted and their relationships analyzed using a Geographic Information System (GIS).

Anthropologists and archaeologists generally assume that distributions, densities, and diversities of available natural resources are directly related to hunter-gatherer population levels, settlement patterns, and subsistence strategies. This assumption likely holds true for the maritime cultures of the Gulf of Alaska, although specific cultural factors such as ethnic boundaries, organized trade or warfare, and changes in population density may cause deviations from simple models of resource and settlement abundance. A number of authors (W. Workman 1980b; Jordan and Knecht 1988; Dumond 1987; McCartney 1988; Crowell 1988; Erlandson *et al.* 1991; Yesner 1991; and others) have explored the relationships between resource availability and cultural adaptations among the prehistoric maritime peoples of southcentral Alaska. On a regional scale, however, few attempts have been made to synthesize detailed data on natural resource distributions and human adaptations for the Alutiiq region.

In this chapter we follow a philosophy summarized by Allen McCartney (1988:23):

> The general approach is to synthesize a maritime biome from present zoological, climatological, and geomorphological data and to characterize the recent maritime environments in which 18th-19th century natives lived. Further, this environmental synthesis is thought to be applicable to the last few thousand years as well. Obviously, climate, rates of geomorphological processes, and distributions of fauna have fluctuated over these periods, but such oscillations have probably been relatively minor. Of course, the farther back in time we look, the greater the discrepancies we could expect between present and past environmental conditions. However, the modern data are thought to be far superior to incomplete paleoclimatic, paleogeomorphological, and paleofaunal data that might be found, although these are obviously critical to the reconstruction of past environments. The regional approach used here at least permits us to make broad comparisons for the purpose of evaluating maritime adaptations.

Some cultural and environmental data critical to our analysis are reviewed in this chapter. In the following sections we: 1) review aspects of the cultural ecology of northern maritime hunter-gatherers; 2) present two models to help explain the dynamic nature of past human settlement in the Alutiiq region; 3) discuss some problems inherent in testing such models and summarize our analytical methods; 4) review the expectations of our cultural ecological models; 5) present the results of our analysis; and 6) raise some questions that may guide future efforts at similar analyses.

Northern Maritime Cultural Ecology

Our analysis was conducted within the theoretical framework of cultural ecology - the study of technological and organizational adaptations of human groups to the environments in which they live (Steward 1955). Hunter-gatherers (non-agricultural peoples who subsist by hunting, fishing, and gathering of animal and plant foods) have been the focus of cultural ecological research (Lee and Devore 1968; Jochim 1976, 1981; Winterhalder and Smith 1981; Bettinger 1980, 1991). A number of recent studies have addressed the cultural ecology of hunter-gatherers in temperate and subarctic coastal environments (Fitzhugh 1972, 1975; McCartney 1975, 1988; Schalk 1979; Yesner 1980; Ames 1981, 1985; Koyama and Thomas 1982; Richardson 1982; Sutton 1982; Nash 1983; Drucker 1983; Renouf 1984, 1989; Price and Brown 1985; Bailey and Parkington 1988; and others).

Within a range of northern adaptations from occasional to total dependence on maritime resources (Fitzhugh 1975), Alutiiq adaptations have been classified as a Modified Maritime strategy (McCartney 1988). Adaptations in this category exhibit some use of land resources but are primarily maritime in focus with specialized technology (boats, hunting weapons, fishing gear) for coastal exploitation (see Chapter 4). Within the Alutiiq region, the extent of maritime adaptation varies through space and time. Such variation developed as discrete populations adapted to local differences in environmental and cultural conditions.

Cultural ecological studies identify biological productivity, species diversity, and resource stability, predictability, and aggregation as significant aspects of coastal environments for human residents. Fitzhugh (1972) found that the abundance and predictability of maritime resources in Labrador supported higher population densities among prehistoric coastal peoples than among neighboring interior groups, a pattern also identified by Townsend (1980) for coastal Alaska. In Labrador, interior groups depended on caribou and other terrestrial species subject to sharp annual fluctuations in abundance. Yesner (1980) suggested that the advantages of marine resources are reflected worldwide by archaeological evidence for concentrated maritime hunter-gatherer populations.

Logistical settlement patterns, where individuals or task groups make short forays from residential villages to exploit specific resource locales, are well-suited to the exploitation of northern coastal ecosystems (Yesner 1980). A variety of high-yield locales (sea mammal haulouts and rookeries, seabird colonies, shellfish beds, etc.) can be harvested from coastal residential bases by taking advantage of the mobility of boat travel and the close spacing of coastal ecological zones (Figure 111).

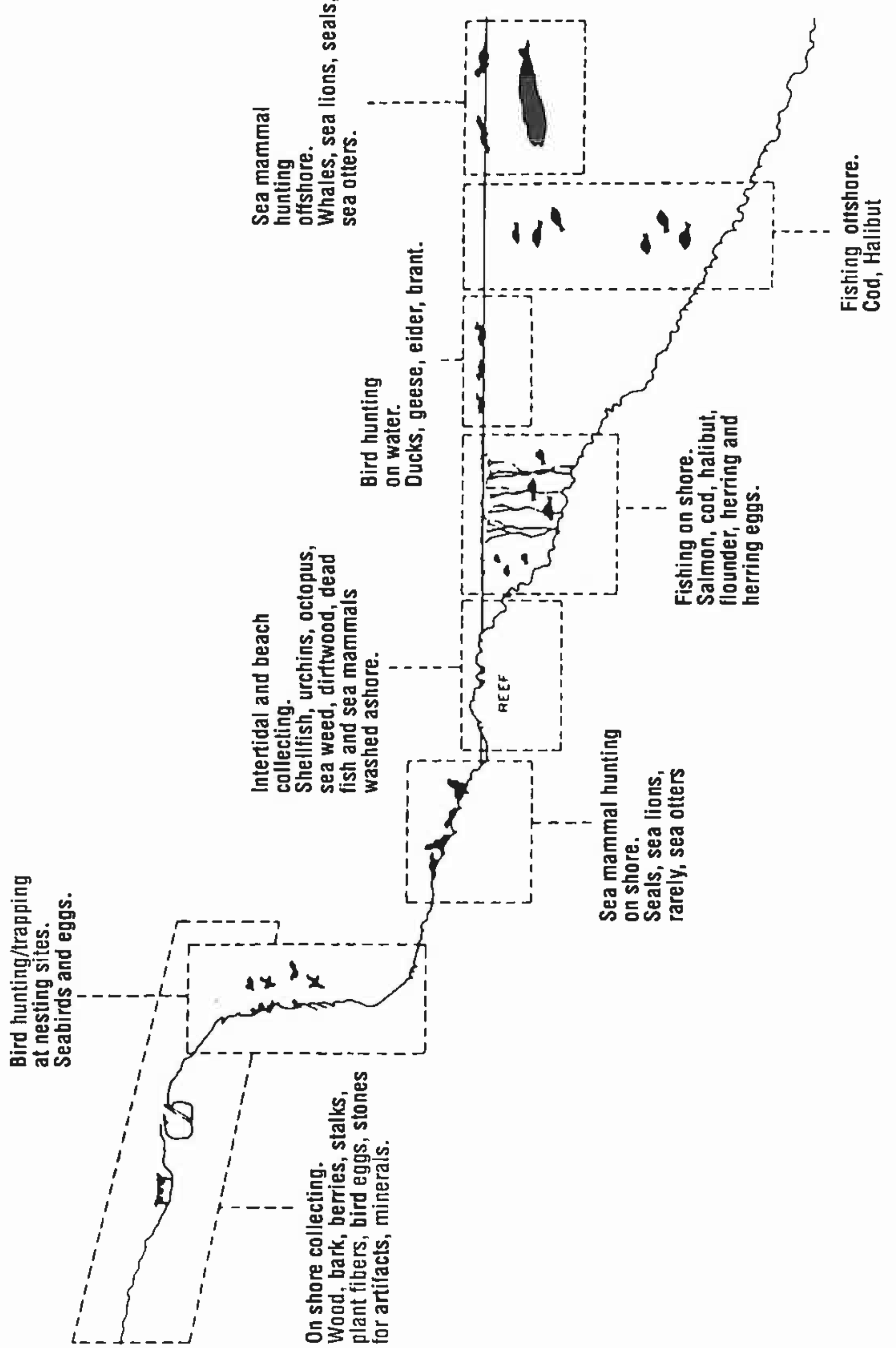
The northern seasonal cycle of high and low subsistence productivity reinforces central base settlement because of the need to store food for winter consumption. Large food stores and storage facilities discourage frequent moves (Chang 1965; Testart 1982). Under circumstances of maximum sedentism, the same residential and storage base may be occupied throughout the year by at least part of the population (Rowley-Conwy 1983; Renouf 1989). In other cases, greater distances between important resources mean that different base settlements will be occupied in different seasons. In many cases, strong territoriality and well-defined ownership of resource locales are associated with the logistical settlement systems of maritime hunter-gatherers (Richardson 1982).

Relationships between resource structure and socioeconomic organization also have been explored for coastal groups. Townsend's (1980) comparative study of North Pacific Rim societies from the Aleutians to the Northwest Coast showed that organizational complexity was consistently greater among coastal societies - including the Alutiiq - than their less sedentary inland neighbors. Complexity refers to the presence of specialized economic and political roles, combined with inequalities of status and privilege. Among the ranked societies of the North Pacific, complexity was reflected in strong inherited differences of social rank among families and between chiefs and commoners, in patterns of economic cooperation involving multi-family households and entire local groups, and in complex inter-group relationships based on reciprocal feasting, trade, and warfare.

Many explanations have been proposed for the development of complex societies of the resource-rich North Pacific coasts (Ames 1981, 1985; Drucker 1983; Matson 1983; and others). Fladmark (1975), for instance, proposed that specialization on salmon and shellfish harvesting began about 5,000 years ago, when such resources first became abundant. This specialization and abundance may have led to population growth and eventually to increased storage, sedentism, trade, and territorial claims by local groups over specific areas and resources. As populations grew, increasingly complex social systems may have emerged to organize diversified and seasonally compressed subsistence efforts. Many of the North Pacific's migratory and resident food resources (salmon, herring, sea bird colonies, certain sea mammals, etc.) are available for relatively short periods. To efficiently harvest and preserve these in large quantities, cooperation is required to produce and maintain tools and facilities (i.e., boats, nets, weirs, structures).

The unequal distribution of resources among local group territories has important archaeological implications. Local specializations, the development of extensive trade networks, and increased competition and warfare are all thought to have resulted from uneven resource distribution. There is evidence that local groups controlling the most productive resources tend to have larger populations and higher status within a given region, and ethnographic information from the Northwest Coast and Prince William Sound support this observation.

As an example, the amalgamation of formerly independent *Nuu-chah-nulth* (Nootka) local groups in Hesquiat Harbor on the west coast of Vancouver Island during the 1800s resulted in a redistribution of potlatch seats. Haggarty (1982:76) noted that the four highest-ranking of the 10 potlatch seats went to the *Kiqinath*, the most dominant of the four *Hesquiat* local groups, and the group with access to the greatest diversity of resources. Donald and Mitchell (1975) demonstrated that local group size and rank in Southern *Kwagulth* regional potlatch circles correlated highly with the salmon yield of rivers to which the groups historically held fishing rights. As noted earlier, Chugach groups which controlled the four most productive territories around the mouth of Prince William Sound hosted the Great Feast of the Dead in historic times (Hassen 1978:99). Positive correlations between group size, group rank, and resource productivity were based



[after McCartney 1977:78]

Figure 111 Composite profile of a Gulf of Alaska shoreline showing habitat locations of major subsistence resources

on a complex set of factors in which potlatching and other ceremonies seem to have played a role by distributing the food and displaying the wealth of host groups and attracting personnel from less well-endowed territories.

In archaeological terms, the implications of resource variation in a region of complex social development include the expectation of both greater occupational time depth, larger village size, and greater population densities in resource-rich zones (McCartney 1988). Both mean house size and variation in house size may be greater in more productive areas as large corporate households form around successful leaders.

Alutiiq Settlement Models

We propose two models to help clarify settlement patterns in the Alutiiq area. The first is an essentially static resource model based on expected relationships between food and other resource distributions and the density, location, and logistics of human settlement. The second is a demographic model that is developmental in nature, modifying the expectations of our resource model to include the effects of pre-contact population growth and population decline after contact. The two models are discussed separately below, along with their archaeological implications. Site data for the Alutiiq region then are used to test the models. The results are discussed for the general Alutiiq region and for the major areas within it: Prince William Sound, the southern Kenai coast, the Kodiak Archipelago, and the Pacific coast of the Alaska Peninsula.

Resource Model

In this model, resource distributions are the primary factors affecting settlement locations. Resource aggregations that can be exploited economically by humans serve as magnets for hunter-gatherer populations. Thus, the distribution, density, diversity, seasonal availability, and accessibility of resources strongly influence where hunter-gatherers choose to establish settlements. Where wide ranges of resources are not clustered within easy access of a single settlement, an annual subsistence cycle may include moves between settlements located in different environmental zones, each situated to maximize access to particular sets of resources.

We recognize that resource distributions do not always predict settlement location or intensity. In some areas, for instance, direct access to resources can be limited by rough seas, lack of shorelines suitable for landing and launching boats, the presence of hostile neighboring groups, and other factors. In other areas (steep slopes, swampy terrain, etc.), resources may be accessible where suitable landforms for human settlement are not.

Ethnohistoric data suggest that proximity to diverse and abundant resources was especially important for sites occupied during "winter" (late fall to early spring), when sea travel was limited by bad weather. Permanent or semi-permanent village locations were chosen for their access to a diverse range of resources (shellfish, sea mammals, seabirds, marine fish, etc.) within an easily accessible catchment, allowing the replenishment of food stores even when travel to more distant areas was impossible. At many winter villages, proximity to productive shellfish beds provided an important hedge against other resource shortfalls and a reliable source of fresh food in late winter and early spring after people had relied on stored goods for several months.

Resource diversity and availability generally are highest along convoluted shorelines that offer protected or semi-protected waters in outer bay areas, the mixed habitats around bay island systems, and outer coast locations sheltered by offshore islands. Consequently, most winter villages appear to have been built in these locations. The outer or middle portions of sheltered bays also effectively average the distance between outer coast habitats and seasonal inner bay resources (i.e., salmon), increasing the range of resources available to sedentary hunter-gatherers.

Three settlement alternatives for summer and early fall salmon exploitation were identified in

Chapter 4: fishing villages, fishing camps, and day-use fishing locations. Historic accounts suggest that many winter villages on Kodiak were abandoned in summer or fall in favor of fishing villages located in inner bays adjacent to productive salmon streams or rivers. For less productive streams, however, where fish were available for a more limited time, temporary camps may have been established. Prior to contact, many Kodiak winter villages may have been occupied year-round, especially those located in smaller bays where day-trips to salmon streams were possible.

In Prince William Sound, on the Kenai Peninsula, and on the Alaska Peninsula, most salmon runs were smaller, less diverse, and shorter. Here, salmon may have been exploited largely from temporary fish camps, where permanent structures were not built. In locations where productive salmon streams were rare or absent, summer satellite camps may have been established to exploit resources like pinnipeds, sea birds, and others.

In the Alutiiq area, it is not possible to determine the season or seasons a particular site was occupied without extensive excavations and detailed study of large faunal collections. Several predictions can be offered, however, based on available ethnographic and biological data. For example, because village sites were central bases from which individuals and subsistence task groups operated, they should be situated in areas of maximum resource diversity, abundance, and accessibility. Such areas are expected primarily in semi-protected environments along convoluted coastlines, away from the heads of bays and inlets. Major village sites also will occur in inner bay, riverine, or exposed outer coast locations, but only where salmon or sea mammals are very abundant. Otherwise, such "secondary" areas should be marked by camps without evidence of substantial permanent structures.

Temporary camps should be found primarily in areas with a lower diversity of major subsistence resources, since their placement would have been determined by proximity to single resources rather than by access to a diverse resource set. Such camps may be associated with seasonal resource concentrations that do not offer sufficient overall density or diversity to attract village settlement. These might include salmon streams of low to moderate productivity, smaller pinniped haulouts and sea bird colonies, and areas adjacent to sea mammal migrations or marine fishing grounds that are seasonal in nature (halibut or cod banks, herring spawning areas, etc.).

Based on our expectation that larger local groups would have been located in resource-rich zones, high resource indices should correlate positively with large settlement size (number of housepits, midden size, depth, and density, etc.) or high local population density. Generally, resource abundance and site density (number of sites per kilometer of shoreline) should also correlate, since resource-rich areas would have attracted more settlement and supported larger human populations.

Demographic Model

The resource model described above assumes relatively stable environmental conditions and human population densities. As a synchronic model based on ethnohistoric data, it fails to account for the effects of population fluctuations through time. Assuming the region was occupied initially by a relatively small founding population (or populations) sometime between about 8,000 and 11,000 years ago, significant growth obviously occurred to account for the high population levels of the late prehistoric period. As discussed above, a dramatic decline in Alutiiq populations occurred after Euroamerican contact and may have begun even before sustained contact began in the 1780s. Population growth and decline both have important implications for the logistics of hunter-gatherer adaptations in the Alutiiq area.

As the initial colonists of the southcentral Alaska coast rapidly became familiar with their new environment, they would have settled around the most productive (for human use of resources) and secure habitats. Except for the common assumption that early migrants into the New World were mobile, there is little reason to think early coastal groups would not have been relatively sedentary. With access to seaworthy boats, for example, the initial colonists of Kodiak would have had their pick of many settlement locations that would have provided abundant and sustained sources of food.

As populations grew, however, villages would fission periodically with new settlements established in areas of somewhat lower productivity. In some of these areas, growing populations might exceed the carrying capacity of locally available resources, necessitating travel to more distant resource locations and the establishment of a seasonal round incorporating satellite camps. Eventually, expanding populations would fill all productive niches for human settlement, a situation anthropologists refer to as territorial or environmental "circumscription." This filling-in process would progressively reduce the size of local group territories and in many cases restrict the diversity of resources available. This would lead to intense exploitation of certain key resources and perhaps to the truncation of the cycle of seasonal movement where it existed. Ultimately, some local groups eventually might have access only to outer shores, while the territories of others would straddle both outer coast and inner bay habitats, while still others might be confined to inner bays.

The most populous and highest ranking groups probably occupied areas of highest resource diversity and productivity. According to this scenario, the sedentism of local groups might vary through space and time, based on environmental and cultural variables. Regionally, subsistence probably diversified through time, although local groups may have become increasingly specialized. It is generally agreed that population growth, territorial circumscription, and resource stress also led to greater cultural complexity as specialization and intensification resulted in more trade, social regulations, inequality, competition, and warfare (Jordan 1988a).

The later stages of this process have been documented on parts of the Northwest Coast, where archaeological evidence presents a picture of very dense settlement during the late prehistoric period. On the west coast of Vancouver Island, local group territories at contact appear to have encompassed limited parts of the coastal environment, with most groups occupying a single village all year (Haggarty 1982). Tribal and confederation levels of political integration linked Nootkan local groups and provided the framework for an exchange economy that overcame the resource limitations of small local group territories.

A similar situation may have existed among the Tlingit in southeast Alaska, where Moss (1989) found little difference in the faunal refuse from late prehistoric sites identified ethnographically as functionally distinct components (villages, fish camps, and forts) in a seasonal round. Here, many salmon fishing camps identified by elders have shallow occupational deposits that appear to have little time depth. The sites may only have seen substantial occupation during the historic period, suggesting that the Tlingit may have been more sedentary prior to European contact, after which abandonment of many villages required much longer trips to traditionally owned salmon streams. With greater distance to such resource camps, day-trips were no longer feasible, fish camps were occupied for longer periods, and more substantial structures were built at many sites that had been day-use locations or temporary camps prior to contact. As outboard motors became widely available in the 1900s, day-trips to distant resource locations became feasible and substantial structures at most distant camps were abandoned.

Population growth and environmental infilling should be indicated in the archaeological record by an increasing number of housepit villages through time and the appearance of smaller, fissioned settlements in locations with lower resource abundance and diversity. Where resource distributions have remained stable for long periods of time, such "secondary" village sites should be smaller, with fewer occupational components, and generally more recent than large multicomponent village sites. Testing these predictions should be most effective in the Kodiak area, which had the highest population density in the Alutiiq region and where the archaeological record appears to be most representative. Kachemak village sites on Kodiak, for example, should be fewer in number than Koniag villages, but have higher average resource values within their catchment areas.

Another prediction, not testable with survey data alone, is that many villages in later pre-contact times were occupied throughout much of the year, with less seasonal movement than observed ethnographically. Late pre-contact settlements should contain diversified faunal and artifactual assemblages suggestive of year-round occupation, increased amounts of non-local food remains and raw materials obtained through trade or ceremonial exchange, and greater evidence for task or craft specialization.

For Kodiak, descriptions of a Koniag seasonal round recorded during the late 1700s and early 1800s appear to contradict some of these predictions. Movement between seasonal settlements is evident throughout the Alutiiq region, but especially on Kodiak where population density was highest. Some evidence suggests, however, that 25% or more of the Koniag population may have died by the 1790s when the first observations were recorded by Billings, Sauer, and others (see Chapter 4). This decline is likely to have been accompanied by village abandonments and massive social and economic upheaval. Thus, many of the seasonal movements described for the late 1700s and early 1800s may not have occurred prior to contact when population and settlement density were at their highest levels.

The Alutiiq seasonal round recorded by historic observers, and generally assumed to be a continuation of pre-contact practices, may have been a post-contact adaptation to reduced population densities. This notion is based on comparison with Northwest Coast developments, where relatively sedentary settlement patterns were modified after contact to include intensive sea otter hunting and summer trade with European ships (Inglis and Haggarty 1987; Wooley and Haggarty 1989; Moss 1990). Following rapid Native population decline during the early years of contact (1776-1810), the remnants of formerly independent groups on the Northwest Coast merged at "amalgamation villages" under powerful trading chiefs who controlled access to the sea otter trade. After further disease epidemics and economic collapse brought on by the near-extinction of sea otters, these groups shifted to a relatively mobile settlement pattern that included seasonal use of settlements formerly occupied year-round. This altered pattern appears to have been a common Native adaptation to the effects of foreign contact and mistakenly has been used by many archaeologists to reconstruct the late prehistoric seasonal round of Northwest Coast groups.

It should be emphasized that aspects of European contact with the Alutiiq differed from developments on the Northwest Coast. On Kodiak and the Alaska Peninsula, there was a rapid shift from limited contact to Russian control within a few years of Shelikov's arrival in 1784. Independent and competitive trade between the Koniag and the Russians or other European traders never developed to any great extent, because the Russians came as resident colonizers, brought few trade goods, and dominated the Koniag through military and political means. Nonetheless, population reduction clearly led to village abandonment and eventual coalescence into progressively fewer permanently occupied villages under Russian and then American administration. Thus, parallels should be evident between contact-era changes in the settlement patterns of the Alutiiq and the Tlingit, who also came under Russian administration and dominance.

In Prince William Sound, competitive sea otter trading with English, Spanish, Russian, and American ships took place prior to the establishment of a Russian monopoly in 1796. Movement of a declining Chugach population into outer coast aggregation villages may have occurred following the Northwest Coast pattern, possibly supplementing the wealth and prestige of outer coast groups.

Historical and archaeological records clearly indicate that the number of post-contact Alutiiq settlements has been greatly reduced from the large number of Late period sites. In the archaeological record, we should find evidence for the rapid abandonment of many Chugach and Koniag villages, and large amalgamation villages should appear near Russian settlements and artels, or (in Prince William Sound) in locations situated to take advantage of trade with European vessels. Northwest Coast post-contact amalgamation villages contain central residential areas of older midden deposits, along with residential "wings" dating strictly to the historic period, and similar post-contact site structures may be observable in the Alutiiq region. Changes in house size during the post-contact era due to depopulation and kin group fragmentation also may be evident archaeologically.

Our demographic settlement model modifies the resource model to include historic and demographic factors. It is a complementary, not an alternative or competing approach. After discussing some problems and methods involved in testing such models, we will examine the available resource and settlement evidence with both perspectives in mind.

Factors Affecting Analysis of Archaeological Settlement Patterns

Several potential problems should be considered before applying our settlement models to the archaeological record. Critical areas of concern are issues of paleoenvironmental continuity, differential site loss due to changing sea levels and erosion, problems with the use of modern resource distribution data, and weaknesses in the current archaeological data base.

Paleoenvironmental Continuity

In Chapter 3, we reviewed data on the paleogeography of the Alutiiq region since the late Pleistocene. On a regional level, the evidence generally suggests that climates and (presumably) major faunal resources have been relatively stable for the past 4,000 to 5,000 years. Relatively minor cycles of glacial advance and retreat have occurred, and coniferous forest spread through Prince William Sound about 4,000 years ago and across northern Kodiak during the last 1,000 years. These changes probably had little effect on the general productivity or distribution of most *marine* resources, however, which were the basis of the coastal economies of the Alutiiq region for at least the last 7,000 years.

Because of the nature of the regional archaeological record, our analysis focuses mostly on sites occupied within the last 3,500 years (from Kachemak to post-contact times). This is a period when environmental change probably has had little effect on settlement patterns, except in some inner fjord areas of Prince William Sound and the Kenai Peninsula where Neoglacial advances affected some resource distributions and settlements. The few known sites from earlier periods are discussed, but provide insufficient data on which to base general conclusions about early (i.e., Ocean Bay) settlement patterns.

Site Preservation

Environmental factors directly affect the preservation of the archaeological record. Complex Holocene sea level changes have occurred in the Gulf of Alaska, with considerable variation due to local differences in eustatic, isostatic, and tectonic histories. Fluctuations in relative sea level have submerged some sites, destroyed others through erosion, and moved still others into unsurveyed backshore areas. Together, such processes may be responsible for major gaps in the archaeological record of the region.

Throughout the Alutiiq region, for example, there is a lack of well-substantiated coastal sites older than about 6,500 years. In Prince William Sound, few sites are known to predate about 2,000 years ago, although recent research has extended the chronology to about 4000 B.P. (Yarborough and Yarborough 1991; Erlandson *et al.* 1991). Such gaps obscure long-term demographic patterns of regional population and settlement changes. Focusing on the more recent archaeological phases of the Alutiiq region reduces the significance of site preservation biases. It also limits our ability to examine the early phases of our demographic settlement model, however, since a great deal of infilling already appears to have occurred by Kachemak times (see Jordan and Knecht 1988: Figure 2).

Preservational problems associated with subsidence, erosion, and uplift can be equally difficult to address. In a region heavily affected by the 1964 earthquake, we are fortunate to have early regional surveys (e.g., de Laguna 1975, 1956; Hrdlicka 1944), written accounts by early European visitors, and Alutiiq oral histories that provide some data on sites now submerged or destroyed. Considering the extent of subsidence in much of the region, many archaeological surveys have underemphasized the intertidal zone where a variety of intact sites (fish weirs, canoe runs, subsided villages, etc.) and secondary cultural deposits (erosional remnants) may be found. Exxon's shoreline surveys have identified intact sites in the intertidal zone, as well as many intertidal artifact scatters that appear to be erosional remnants of former villages and campsites. Detailed data on site structure and content are not available for intertidal lag deposits, but data on size, age, and function can be gleaned from many. Thus, the project's shoreline survey data partially corrects for biases in the archaeological record caused by sea level changes and erosion.

Resource Data

A major question is how accurately current resource distributions and abundance reflect past conditions, and how useful they are in predicting settlement and subsistence patterns of the past. Some taxa (salmon, whales, sea otters) have been reduced severely by commercial exploitation, others have declined due to other ecological disruptions (decimation of seabird colonies and waterfowl by introduced foxes), and the distributions of others (pink salmon in Prince William Sound) have been changed and even enhanced through hatchery construction and other human means. For this study, we assume the **spatial distributions** of most faunal resources have remained more or less constant through time, though **population levels** may have changed. We also assume that the general and relative productivity of key subsistence resources have remained roughly comparable between the major areas (i.e., Prince William Sound vs. the Kodiak Archipelago) of the Alutiiq region. Finally, our analysis focuses on variations in resource diversity, rather than on available meat quantities or other absolute measures. Consequently, late Holocene changes in the local abundance of certain key resources should have only minor effects on our analysis.

Our analysis also uses data on a limited range of resources: harbor seal and sea lion rookeries and haulout areas (ADFG 1985a, 1985b), seabird colonies (Sowles *et al.* 1978), and salmon streams by species (ADFG n.d.). Unfortunately, only general unquantified distributional data are available for shellfish, bottomfish, herring, fur seals, whales, and land mammals. The lack of data for shellfish, bottomfish, and sea mammals, all of which were major contributors to Alutiiq subsistence in many areas, is an analytical weakness that must be remedied prior to making more powerful predictions about Alutiiq paleodemography.

Archaeological Data

Our analysis drew upon data from the AHRS and Exxon's 1989 and 1990 cultural resource surveys and site records. Despite extensive coverage of the region, many gaps remain and survey intensity was variable. Varying resolution and accuracy of AHRS and site survey data had to be accommodated in data coding and interpretation.

Comparisons of regional site density (number of sites per kilometer of coastline) suffer from the problem of uneven survey intensity, particularly in the recording of smaller, less conspicuous sites. Recording, excavation, and dating of relatively large and rich sites generally has been favored by archaeologists. Exxon's 1989 and 1990 surveys identified a number of smaller and less conspicuous sites, even in areas that previously had been surveyed systematically. Although such sites often contain fewer artifacts and other classes of data, they are poorly documented aspects of Alutiiq subsistence and settlement that should be integrated into future research. We limited our detailed analyses to housepit village sites and large (100 m long) sites because they are represented better than other site types in the data base.

Methods of Analysis

Our analysis includes an examination of 1) variability in site densities between areas within the Alutiiq region; 2) spatial variation in the distribution of site types; 3) temporal trends in the number of Native sites (by culture period and C^{14} dates); 4) general relationships between resource distributions and site locations; and 5) several more detailed case studies that amplify some of the concepts discussed.

A data base using Paradox software initially was created to summarize data on the age, primary site type, and secondary attributes of all coastal sites in the oil spill area. After the 1990 field season, the data base was expanded to include all 1,295 coastal sites listed on the AHRS for the Alutiiq region.

In constructing a regional data base from AHRS records, we tried to select attributes relevant to examining variation in adaptations among maritime hunter-gatherers. Confronted with the inherent limitations of the data, we settled on primary site type, secondary site attributes, site size, and cultural affiliation. Classifying sites by primary type masks some variation, since it weights primary functions more heavily than secondary functions. To compensate for this, secondary attributes were used to identify variation in primary site types: the presence or absence of midden, burials, or rock art in rockshelters, for instance. Site size data include the number and size of housepits observed and the horizontal and vertical extent of each site. Highly variable AHRS data on cultural affiliation were merged into regional categories of Ocean Bay (Early), Kachemak (Middle), and Alutiiq (Late). Resource scores were recorded in the data base for 328 of the 337 housepit villages and other large sites included in the analysis.

Problems arose in coding data from AHRS records of varying quality. Many AHRS sites are unconfirmed locations recorded from sketchy historical or ethnographic data. We classified these simply as "reported sites" about which little is known. The quality of field survey data also varies and interpretations of site size, depth, contents, and age based on survey alone are incomplete and subjective. Despite such problems, systematically collected survey data are increasingly available and have great potential for examining regional settlement patterns.

Site Types

Midden sites include villages, camps, and locations. Village sites were defined by the presence of housepits and categorized by the number of surface housepits as either small (1-5), medium (6-10), or large (>10). Sites more than 100 m long for which no housepit data were available were segregated into a separate category of "large site." For midden sites, secondary attributes include the presence of stone tools and tool-making debris, animal bones, marine shell, fire cracked rock, burials, and other (non-house) depressions. Small middens lacking housepits probably are the remains of either camps (temporary occupation sites lacking substantial structures) or locations (special use sites such as butchering locales).

We define *artifact scatters* as sites lacking a matrix of cultural (anthropogenic) soil. Most of these are lag deposits; erosional remnants of villages, camps, or locations now found in the intertidal zone; dune blowouts; or other redeposited contexts. Stone artifacts and fire cracked rock are the most common constituents of artifact scatters, although faunal remains are present in some. *Isolates* are single finds lacking site matrix, including single stone tools, burials, flakes, or fire cracked rock. *Rockshelters* often contain burial remains, rock art, or middens, which have been listed as secondary attributes for this site type. *Structures* include fish traps (wooden and stone weirs) and rock cairns. *Rock art*, including paintings (pictographs) and carvings (petroglyphs), and *reported site* (unconfirmed by an archaeologist) are the other primary site types.

Resource Variables

Resource profiles for circular catchment areas one kilometer (.62 mi) and 10 km (6.2 mi) in diameter were compiled for 328 of the village or large sites in the study region (resource data for nine of the 337 sites was lacking). One-kilometer catchments were intended to measure the resources (and habitats) available within the immediate site vicinity, while 10 km catchments approximated the resources available within the range of a day-trip by boat. Circular catchments are a simplistic way to identify site exploitation territories (see Bleed *et al.* 1989 for a more realistic approximation). In fact, the size of Gulf of Alaska site catchments probably varied by season (winter vs. summer), by site location (inner bay vs. outer coast), and for individual members of society (male vs. female, young vs. old). The large number of sites in our sample, however, necessitated the use of generalized and simplified catchment measures.

As discussed earlier, only the locations of major harbor seal concentrations, sea lion haulouts and rookeries, bird colonies, and salmon streams were available on Exxon's GIS, and maps of these resource distributions and archaeological sites were produced. One and 10 km circles were centered on each site, and all resource locales within the circle were counted. Resource scores based on "species-occurrence" were computed for each site. If, for example, three sea lion haulouts were present within 10 km of a site, a sea lion score of three was recorded for that site catchment. Salmon occurrences were broken down by species (pink, chum, sockeye, coho, chinook) when computing scores. Since salmon escapement data were not available, a site catchment with one stream and three salmon species was given a salmon score of three, while a catchment with two streams of two species each was given a score of four. These are crude measures of resource abundance, but the number of salmon species in a stream generally correlates with two important variables: the size of the total salmon run and the length of time salmon are available for exploitation.

Total resource scores were computed by totalling all resource scores for each catchment area. The **total resource score** is a combined indicator of quantity and diversity. If, for example, one seabird colony (not ranked by species or number of birds), a sea lion haulout, and a stream with three species of salmon were present within a site catchment, a resource diversity score of five was recorded for that site.

Site locations also were classified by four gross environmental zones: exposed, semi-protected, protected, and riverine zones corresponding roughly to outer coast, outer bay, inner bay, and interior riverine habitats. Boundaries separating inner and outer bay zones were drawn (somewhat subjectively) with the idea of separating high energy exposed outer coast locations from semi-protected outer bay (the outer 1/3 to 1/2 of most bays, excluding all branching inlets) locations, from the fully protected waters found farther inside most bays. In these classifications, site microenvironments were not considered because they are almost always protected locations in coves or lagoons or behind bars, islets, or reefs. The interior riverine assignment applies only to several large village sites located along the interior rivers on Kodiak.

The limitations of the available data and the methods we designed to accommodate them restrict the specificity of comparisons between resource diversity and productivity vs. settlement location, size, and function. The species-occurrence data fails, for example, to compensate adequately for differences between the huge salmon runs of the Karluk River and hundreds of streams with small or medium-sized runs of only one or two species. To some extent, the spatial distribution of certain key resources is captured by the measures used, along with the varying resource profiles of outer coast, outer bay, inner bay, and riverine zones.

Without specific data for key resources (whales, shellfish, bottomfish, herring, etc.), and without quantitative data for other resources (salmon, pinnipeds, sea bird colonies), our analysis of relationships between resource distributions, site locations, and site size is exploratory. The lack of distributional data on bottomfish and migratory whales, for instance, means that the data are biased in favor of sites located near salmon streams - generally found in semi-protected and protected environments. Future analyses might be improved by ranked semi-quantitative resource scores based on the estimated number of animals present at seabird colonies, pinniped haulouts, etc. Rough estimates of shellfishing and bottomfishing productivity might be compiled by measuring the length (linear kilometers) of shoreline, extent of kelp beds, and area of shallow water habitats present within individual site catchments (see McCartney 1977). As more and better quantitative data become available, more sophisticated settlement analyses should be possible.

Results

Summarizing the expectations developed from our resource and demographic settlement models, we predict:

1) On both regional and local scales, areas of high resource diversity and productivity will correlate with older sites, higher site densities, and greater numbers of large and multicomponent sites. These factors will reflect the priority of settlement in high productivity areas and the higher population densities supported by high diversity and abundance.
2) The earliest settlements will be dispersed relatively widely, but found in areas of high resource diversity and productivity.
3) Through time, increasing numbers of sites will be found in resource zones of secondary productivity. Increasing population prior to European contact will result in increases in the number and size of settlements and in greater exploitation pressures on local resources.
4) As territories became increasingly circumscribed, site catchments contracted and subsistence intensification occurred, with increased specialization, craft production, trade, competition, and social complexity through time.
5) After contact, rapid depopulation damaged the social and economic fabric of Alutiiq society, caused the abandonment of many villages, increased the distance of surviving families from traditional resource territories, and caused more lengthy seasonal dispersal and the construction of more substantial residential facilities at former resource camps.
6) In some cases, post-contact amalgamation villages may be located in proximity to Russian settlements or in outer coast areas of Prince William Sound where competitive trade with Russian, English, and Spanish ships would have been facilitated.

The types of data needed to test such predictions are only now becoming widely available and considerably more information will be needed before conclusions can be drawn with confidence. Obviously, not all these predictions can be tested with data on resource and site distributions alone. Identifying trade, craft specialization, and other evidence for cultural complexity in the archaeological record requires excavated assemblages from sites and, in many cases, specialized analyses of artifactual materials.

Data now available suggest that economic specialization and exchange networks have increased through time, but considerably more information is needed from additional sites. Regional patterns of human population growth and decline are more identifiable with the available data, but we are limited to exploratory analyses and tentative conclusions by the lack of detailed information for most parts of the Alutiiq region. As we shall see, the available survey data are best suited to testing correlations between broad patterns of resource variations, prehistoric site distributions, and population densities.

Spatial Variation in Site Densities

It has long been clear that the Kodiak Archipelago contains significantly higher densities of prehistoric sites than Prince William Sound. Are these differences due to local variation in subsidence and erosion, to the differential intensity of archaeological research, to regional variation in population densities, or to a combination of these factors? Birket-Smith (1953:179) and de Laguna (1956) suggested that the low density of archaeological sites in Prince William Sound is at least partly due to subsidence and erosion. De Laguna (1956:255-257) also summarized early historic data suggesting dramatically higher population densities on Kodiak than in Prince William Sound. Townsend (1980:151) estimated that 8,000 people occupied the Kodiak area prior to contact, compared to only 2,000 for the Chugach area, including the south Kenai coast. Oswalt (1967a) estimated that prehistoric population densities on Kodiak Island were twice that of Prince William Sound. A Chugach migration tale quoted in Johnson (1984:1) noted the attractiveness of Kodiak Island's abundant resources to early Native populations.

If research on early historic population densities in adjacent regions (e.g., Inglis and Haggarty 1987; Moss 1989:25-26) can be extrapolated to the Alutiiq area, these population estimates may be far too conservative and may not account for dramatic population decline before and shortly after initial contact. Richard Knecht (pers. comm. 1991), for instance, believes as many as 30,000 Koniag may have occupied the Kodiak Archipelago and the Alaska Peninsula just prior to Russian contact. After seeing the extremely high density of pre-contact Koniag sites in the Kodiak area, and judging from the large size, great depth, and midden density of many of these sites, it is hard not to conclude that the Koniag were more populous than many historical and anthropological estimates.

Without providing quantitative estimates of prehistoric population sizes, our study confirms the perception that the density of prehistoric sites varies significantly across the Alutiiq region. In our sample, the Kodiak area has 2.6 times as many early Native sites per kilometer of coast as the Alaska Peninsula, 3.4 times the density of the Kenai Peninsula's south coast, and 4.7 times the density of Prince William Sound shorelines (Mobley *et al.* 1990:175). Is it coincidence that Townsend's estimated population ratio of 4 to 1 for Kodiak vs. Prince William Sound and the southern Kenai Peninsula corresponds closely with our site density figures for the same areas? Some variation in site density undoubtedly is due to differential site visibility caused by uplift, subsidence, glaciation, and erosion, but several factors suggest that the figures also reflect real differences in population density. First, the disproportionate number of large sites on Kodiak suggests greater population densities (Table 17). Second, the 1989 and 1990 Exxon surveys helped even out differences in the intensity of archaeological survey across the Alutiiq area. Finally, as mentioned earlier, our extensive surveys of Prince William Sound and Kenai Peninsula intertidal zones recorded many lag deposits of stone tools and fire cracked rock, controlling for some of the havoc caused by subsidence and erosion.

There appears to be little doubt that the reason for the differential site and population densities within the Alutiiq region is primarily environmental. Virtually the entire coast of the Gulf of Alaska is endowed with diverse and abundant marine resources, but these are not distributed evenly and were not equally accessible to maritime hunter-gatherers. Jordan and Knecht (1988:229) described Kodiak's prehistoric residents as suffering from an "embarrassment of riches" with convoluted shorelines teeming with shellfish, numerous sea bird colonies scattered throughout the archipelago, large populations of both resident and migratory sea mammals (harbor seal, sea lion, fur seals, sea otters, porpoises, dolphins, and several types of whales), and immense populations of halibut, cod, rockfish, herring, flounder, and other marine fish. Salmon and other anadromous fish annually migrate up "virtually every river and stream on the island," though none is surpassed by the shallow Karluk River which may have contained salmon runs exceeding 10,000,000 fish (of all five species) prior to historic overexploitation (Jordan and Knecht 1988:229).

Some simple calculations help to put the salmon runs of the Karluk River into an anthropological perspective. If just 10% (1,000,000 fish) of the Karluk's pre-contact salmon run was harvested by the

Koniag annually, the average edible meat yield (3.87 kg) for individuals of five salmon species (see Stratton and Chisum 1986:155) would be about 3,870,000 kg (8.5 million pounds) of salmon flesh per year. This would provide a population of 25,000 people (3 to 4 times historical estimates for the Koniag) with 155 kg (340 lbs) of salmon meat per person per year. This is equal to more than 90 gm of protein per day (twice the modern recommended daily allowance) for every man, woman, and child. The same salmon harvest could meet the complete energy requirements (2,500 calories per day) of approximately 7,000 people for an entire year.

Granted, this is a very hypothetical reconstruction, but it illustrates the potential productivity of just one resource at one location on Kodiak. The identification of roughly 300 prehistoric Koniag housepits along Karluk Lagoon, Karluk River, and Karluk Lake leaves no doubt this resource was exploited intensively. Salmon also were abundant elsewhere on Kodiak, along with a wealth of other resources. The potential annual harvest of whales and other sea mammals may have been well over 1,000,000 kg, for instance, and such figures may have been approached by shellfish and bottomfish, as well. The key to supporting a dense human population on Kodiak may not have been the potential productivity of any single seasonal resource, but the seasonal and annual availability of several very productive resources. Trade networks, kin-based social relationships, political alliances, and ceremonial exchange probably helped redistribute these and other products of Koniag labor throughout the archipelago and the Alutiiq region, further guarding against lean times in any given area.

The Alaska Peninsula, Kenai Peninsula, and Prince William Sound also have areas of high resource productivity, diversity, and aggregation, but their overall stability and diversity do not appear to approach that of Kodiak Island. The tectonic and glacial instability of the Kenai and Prince William Sound areas, for instance, may have disrupted resource distributions and human populations periodically. Other environmental factors also contribute to the lower prehistoric site densities in these areas. For the outer Kenai coast, these include a high proportion of exposed and steep shorelines, and the historic (late 1800s?) deglaciation of several major bays where evidence of prehistoric occupation has been erased. Recent retreat of tidewater glaciers may be a factor in parts of Prince William Sound, as well, but these areas make up a small percentage of the sound's total coastline.

Spatial Variation in Site Types

Many site types are common to both the Alutiiq region and the Northwest Coast, the result of environmental similarities, extensive cultural interaction, and similar patterns of settlement, subsistence, and society. Large villages, defensive sites, fish camps, fish weirs, other small subsistence camps, burial sites, and rock art localities are all common to this broad area. In the Alutiiq region, recorded defensive sites, fish weirs, and rock art sites are not common enough to isolate meaningful spatial or temporal patterns. Due to favorable geological conditions, virtually all rockshelter sites are found in Prince William Sound. A pattern identified in 1989 (Mobley *et al.* 1990) was the relatively small number of middens and housepit villages in Prince William Sound, where they made up only 16% of the classifiable pre-contact sites, compared to between 57% and 92% of the sites recorded in other areas.

In the larger sample now available, middens are defined more broadly as any site with occupational refuse in an intact sedimentary matrix. Consequently, differences in the relative abundance of middens are partially a function of variable proportions of primary vs. redeposited sites. Middens comprise 94% of the prehistoric sites on Kodiak, 71% of those on the Alaska Peninsula, 67% of those on the south Kenai coast, but only 35% of the prehistoric sites in Prince William Sound. Actually, this figure is a bit misleading, since middens are found in 15 of Prince William Sound's 39 recorded rockshelters, which increases the percentage of middens in Prince William Sound to 45% of the sample. This relatively low frequency may be a result of intense tectonic activity and subsequent

Table 17 Pre-Contact Alutiiq Region Housepit Villages

	Number of Villages				Number of Housepits		
	lg	med	sm	lg site	Range	Mean	Median
PWS	0	1	4	0	1-7	3.2	3.5
Kenai*	2	5	10	0	1-20	5.8	4.5
AK Pen	4	4	16	1	1-89	9.5	3.6
Kodiak	31	42	183	34	1-132	5.8	3.1
Total	**37**	**52**	**213**	**35**			

* Includes the Barren Islands.

site erosion in Prince William Sound which has left many artifact scatters in the intertidal zone.

The differential distribution of village sites is perhaps more meaningful. Among the 337 prehistoric AHRS sites in the Alutiiq area for which size data are available, 37 are large villages (more than 10 housepits), 52 are medium villages (between six and 10 housepits), 213 are small villages (five or fewer housepits), and 35 are large sites with no housepits noted but middens at least 100 m long. Of these sites, 290 (or 86%) are located on the Kodiak Archipelago, 25 (or 7%) on the Alaska Peninsula, 17 (5%) on the outer Kenai coast, and five (1%) in Prince William Sound (Table 17).

Despite the presence of many large villages on Kodiak, the number of small villages (72%) reduces the mean and median number of housepits per site, the latter to the lowest level of any of the four Alutiiq subareas (Table 17). This may support the infilling model of settlement, since current evidence suggests that Kodiak has been occupied the longest and that population growth has been the most dramatic - resulting in additional village fissioning into secondary resource zones.

Temporal Trends in Alutiiq Demography

Temporal patterns in the distribution of sites also can be seen in the archaeological record. Though not without problems (Erlandson 1988b:382-383), one way to examine temporal trends in demography is to view C^{14} dated sites as points in space and time, examining their spatial and temporal distribution for evidence of changes in settlement patterns (e.g., Moss 1989; Moss *et al.* 1989) and population (e.g., Rick 1987; Erlandson 1988b; Glassow *et al.* 1988). There are too few dates from different site types in the Alutiiq area to look for temporal shifts in settlement, but it is worth noting that Madonna Moss (1989) and her colleagues (Moss *et al.* 1989, 1990; Erlandson *et al.* 1991) have found that large villages, fish weirs, and defensive sites appear to have a differential antiquity in southeast Alaska, reflecting changes in settlement and subsistence. Three possible Prince William Sound forts dated by BIA archaeologists (Dotter 1988a; R. Kent 1990 pers. comm.) seem to fit the southeast Alaskan pattern of relatively late fort use and may indicate a similar pattern of intensified warfare late in prehistory. Other similarities in settlement patterns between the two regions may become apparent as more data become available.

To look for evidence of population change through time, 155 radiocarbon dates were compiled from all Alutiiq area sites (Table 18). These were broken into "components" which include all dates from sites that fall within a 500 year interval. Collapsing the data in this manner avoids biases caused by single sites with large suites of C^{14} dates. By this

Table 18 C^{14} Dates From Gulf of Alaska Archaeological Sites

Site #	Uncorrected C14 Date	Lab #	Cultural Affiliation	Primary Reference
Prince William Sound and the Outer Kenai Peninsula				
ANC-589	460 ± 70	Beta-18573	Chugach?	Dotter 1988a
COR-001	1727 ± 105	P-192	Palugvik I	D Clark 1984a
"	1753 ± 105	P-174	"	"
"	2265 ± 112	P-173	"	Dotter 1988a
COR-038	610 ± 70	Beta-23369	Chugach	Dotter 1988a
"	670 ± 120	Beta-23370		"
COR-080	385 ± 100	WSU-2240	Chugach	Dotter 1988a
COR-081	460 ± 90	WSU-2239	Chugach	Dotter 1988a
COR-319	350 ± 60	Beta-23380	Chugach fort?	Dotter 1988a
COR-326	170 ± 80	Beta-23379	Chugach	Dotter 1988a
SEL-188	560 ± 50	Beta-39476	Late prehistoric	Schaaf & Johnson 1990
"	620 ± 50	Beta-39475	Late prehistoric	"
"	700 ± 90	Beta-39478	Late prehistoric	"
"	710 ± 50	Beta-39477	Late prehistoric	"
"	1350 ± 70	Beta-39479	Transitional?	"
FS-289	126 ± 1.3?	WSU-1249	Historic	Dotter 1988a
SEW-056	110 ± 90	WSU-3938	Chugach	Yarborough and
"	200 ± 90	WSU-3914	Chugach	Yarborough 1991
"	295 ± 90	WSU-3913	Chugach	"
"	590 ± 60	Beta-30558	Palugvik	"
"	830 ± 65	WSU-3940	Palugvik	"
"	960 ± 60	WSU-3915	Palugvik	"
"	1020 ± 60	WSU-3911	Palugvik	"
"	1400 ± 70	WSU-3937	Palugvik	"
"	1510 ± 120	WSU-3941	Palugvik	"
"	2000 ± 110	Beta-28804	Palugvik	"
"	2310 ± 60	WSU-3939	Palugvik	"
"	2370 ± 70	WSU-3916	Palugvik	"
"	3380 ± 100	WSU-3936	Uqciuvit	"
"	3810 ± 90	WSU-3912	Uqciuvit	"
SEW-066	200 ± 60	Beta-23374	Chugach	Dotter 1988a
SEW-076	300 ± 80	Beta-23375	Chugach	Dotter 1988a
SEW-080/	190 ± 70	Beta-23372	Chugach	Dotter 1988a
081/082	310 ± 50	Beta-23378	"	"
"	340 ± 80	Beta-23371	"	Dotter 1988a
"	550 ± 80	Beta-23373	"	Dotter 1988a
SEW-292	95 ± 65	WSU-2913	Chugach	Dotter 1988a
"	315 ± 65	WSU-2911	"	"
"	695 ± 40	WSU-2910	"	"
SEW-330	220 ± 80	Beta-23377	Chugach	Dotter 1988a
SEW-349	530 ± 80	Beta-23381	Chugach fort?	Dotter 1988a
"	1090 ± 70	Beta-23366	"	"
SEW-355	530 ± 80	Beta-23381?	Chugach	"
SEW-356	300 ± 60	Beta-23368	Chugach	Kent 1990 p.c.

Table 18 C^{14} Dates From Gulf of Alaska Archaeological Sites (cont'd)

Site #	Uncorrected C^{14} Date	Lab #	Cultural Affiliation	Primary Reference
SEW-430	700 ± 80	Beta-42077	Chugach?	This volume
"	3970 ± 150	Beta-42078	Ocean Bay?	"
"	4440 ± 70	Beta-42079	Ocean Bay?	"
SEW-471	160 ± 60	Beta-42080	Chugach	This volume
SEW-517	3035 + 55	Beta-42081	Kachemak?	This volume
"	4220 ± 90	Beta-42082	Ocean Bay?	"
SEW-548	440 ± 80	Beta-23376	Chugach fort?	Dotter 1988a
VAL-253	300 ± 50	Beta-23365	Chugach	Dotter 1988a
XBS-020	140 ± 60	Beta-23383	Chugach	Dotter 1988a
"	320 ± 50	Beta-23382	"	"
"				
Kodiak Area				
AFG-005	620 ± 70	Beta-42073	Koniag	This volume
AFG-008	4150 ± 200	Gak-3802	Ocean Bay I/II	D Clark 1984a
"	5750 ± 240	Gak-3801	Ocean Bay I	"
AFG-011	3890 ± 110	Gak-3803	Ocean Bay II	D Clark 1984b
"	4200 ± 140	Gak-3804	"	"
"	4480 ± 130	S-1419	"	"
"	480 ± 160	S-1418	"	"
AFG-119	1000 ± 80	Beta-42074	Kachemak/Koniag?	This volume
KAR-001	290 ± 60	Beta-15014	Koniag	Knecht, p.c. 1991
"	410 ± 80		Koniag	"
"	480 ± 80	Beta-15015	Early Koniag	Jordan 1987
"	630 ± 50		Koniag	Knecht, p.c. 1991
"	740 ± 80	Beta-15016	Kachemak/Koniag	Jordan 1987
"	780 ± 60			Knecht, p.c. 1991
KAR-029	450 ± 70	Beta-23767	Koniag	Knecht, p.c. 1991
"	620 ± 50	Beta-23769	Koniag	"
"	850 ±	Beta-23768	Koniag	"
"	970 ±	Beta-23765	Koniag?	"
"	1000 ± 100	Beta-23766	Koniag?	"
"	1290 ± 80	Beta-23771	Kachemak	"
"	1310 ± 70	Beta-23770	Kachemak	"
KAR-031	980 ± 60	Beta-15691		Knecht, p.c. 1991
"	2010 ± 70	Beta-8946	Late Kachemak	Jordan & Knecht 1988
"	2540 ± 60	Beta-8945	Kachemak?	Knecht, p.c. 1991
"	4900 ± 100	Beta-11245	Ocean Bay	Knecht, p.c. 1991
KAR-039	2650 ±		Kachemak	Jordan 1983
KOD-026	298 ± 44	P-1049	Koniag	D Clark 1984a
KOD-043	600 ± 100	B-836	Koniag	D Clark 1984a
KOD-044	910 ± 60	Beta-20122	Late Kachemak	Jordan 1991
"	1110 ± 100	B-835	Kachemak	D Clark 1984a
"	1890 ± 90	Beta-20553	Early Kachemak	Jordan 1991
"	2033 ± 52	P-1057	Kachemak III	D Clark 1984a
"	7790 ± 620	Beta-20123	Paleoarctic?	Jordan 1991
KOD-077	280 ± 80	Beta-42076	Koniag	This volume
KOD-083	1119 ± 49	P-1043		D Clark 1984a
"	2028 ± 55	P-1042	Kachemak III	"

Table 18 C^{14} Dates From Gulf of Alaska Archaeological Sites (cont'd)

Site #	Uncorrected C^{14} Date	Lab #	Cultural Affiliation	Primary Reference
"	391 ± 48	P-1045	"	"
KOD-100	937 ± 49	P-1041	Early Koniag	D Clark 1984a
"	3263 ± 61	P-1039	Kachemak I/II	"
"	4700 ± 70	P-1038	Ocean Bay	Knecht, p.c. 1991
KOD-101	353 ± 44	P-1048	Koniag	D Clark 1984a
"	393 ± 40	P-1047	Koniag	"
KOD-119	3925 ± 65	P-1036	Ocean Bay II	D Clark 1984a
"	5503 ± 78	P-1034	Ocean Bay I	"
KOD-145	460 ± 50	Beta-25601	Late Kachemak	Steffian 1991b
"	1130 ± 70	Beta-34281	Late Kachemak	"
"	1140 ± 90	Beta-25603	"	"
"	1270 ± 100	Beta-34283	"	"
"	1310 ± 70	Beta-25602	"	"
"	1320 ± 70	Beta-34282	"	"
KOD-157	100 ± 90	Beta-20128	Historic Koniag	Crowell, p.c.,1991
KOD-172	2075 ±	UGa-?	Kachemak	Nowak 1978:38
"	2180 ±	UGa-?	Kachemak	"
KOD-224	1080 ± 90	UGa-2823	Kachemak	Nowak 1978:27
"	3130 ± 85	UGa-2820	"	D. Clark 1984a
"	3365 ± 70	UGa-2822	"	"
"	5065 ± 135	UGa-1931	Ocean Bay I	"
KOD-224	6220 ± 70	DIC-1236	Ocean Bay I	"
KOD-235	1170 ± 60	UGa-1935	Kachemak	Nowak 1978
KOD-324	2700 ± 90	Beta-14497		R. Knecht, p.c. 1991
"	3520 ± 60	Beta-8186	Ocean Bay II	"
"	3630 ± 80	Beta-14499?	Ocean Bay II	R. Knecht, p.c. 1991
"	3850 ± 270	Beta-14499?	Ocean Bay II	"
"	3920 ± 150	Beta-3920	Ocean Bay II	"
"	4620 ± 110	Beta-14501	Ocean Bay I	"
"	6620 ± 60	Beta-8185	Ocean Bay I	"
KOD-336	Modern	Beta-20127	Historic Koniag	Crowell, p.c. 1991
KOD-363	3850 ± 80	Beta-43135	Ocean Bay II	Hausler-Knecht 1991
"	3860 ± 90	Beta-43134	Ocean Bay II	"
"	4310 ± 60	Beta-26230	Ocean Bay II	"
"	5030 ± 250	GX-14674	Ocean Bay I	"
"	6180 ± 305	GX-14673	Ocean Bay I	"
KOD-449	4300 ±		Ocean Bay II	R. Knecht, p.c. 1991
XTI-032	4023 ± 63	P-1050	Ocean Bay	Workman 1966
XTI-052	200 ± 50	Beta-7325	Koniag	R. Knecht, p.c. 1991
"	750 ± 80	Beta-7326	"	"
Alaska Peninsula: Southeast Coast				
CHK-007	2130 ± 90	SI-2706		Dumond 1987:51
"	2165 ± 70	SI-2707		"
CHK-011	545 ± 60	SI-2708		"
KAR-121	900 ± 80	Beta-42075	Koniag?	This volume
SUT-003	780 ± 70	Beta-19784	Norton	Dumond 1987

TABLE 18 C^{14} Dates From Gulf of Alaska Archaeological Sites (cont'd)

Site #	Uncorrected C^{14} Date	Lab #	Cultural Affiliation	Primary Reference
"	1830 ± 60	Beta-19783		"
SUT-016	375 ±		Historic Eskimo	AHRS files
UGA-043	250 ± 70	Beta-19785		Dumond 1987
"	1880 ± 60	Beta-19786		"
UGA-054	740 ± 60	Beta-19790	Thule	Dumond 1987
XMK-006a	5830 ± 120	I-1945	Takli Alder	Dumond 1971
XMK-006	775 ± 95	I-505	Mound Phase	D Clark 1984a
"	775 ± 110	I-1636	"	"
"	1075 ± 100	I-1638	Beach Phase	"
"	1450 ± 130	I-1637		"
"	1460 ± 95	I-1944		"
XMK-018	2810 ± 100	I-3733	"	G. Clark 1974
"	2910 ± 105	I-1941	"	"
"	4110 ± 160	I-1639	Takli Birch	Dumond 1971
"	5650 ± 115	I-1940	Takli Alder	"
XMK-020	1680 ± 100	I-1942	Cottonwood	Dumond 1971
"	3470 ± 110	I-1943	Takli Birch	"
XMK-046	1075 ± 100	I-1638	Beach Phase	Dumond 1971
"	1450 ± 130	I-1637	"	"
"	1460 ± 95	I-1944	"	"

* Compiled from D. Clark (1984:a143-145), Dotter (1988a), Dumond (1987), Yarborough and Yarborough (1991), the AHRS, this volume, and other sources.

process, 111 C^{14} components were defined for the study area, including 54 on Kodiak, 36 from Prince William Sound, 18 on the Alaska Peninsula, and three from the Kenai Peninsula's south coast (Table 18). Taken at face value, the distribution of C^{14} components by chronological period indicates a gradual increase through time, with one (1%) possible Paleoarctic component, 26 (23%) Ocean Bay components (12 Ocean Bay I, 14 Ocean Bay II), 33 (30%) Kachemak components, and 51 (46%) Alutiiq components (Table 19).

Unfortunately, the length of the C^{14} chronology in each of our four areas varies, and the number of dates in some areas (i.e., the Kenai Peninsula) is limited. Furthermore, due to changes in the C^{14} content of the earth's atmosphere during the past 400 years, C^{14} dating is not accurate for the historic era. Excluding the historic era, the gradual increase in the number of archaeological components through time probably reflects a combination of population growth and the differential preservation of older sites. A general increase in the number and size of sites through time has been noted by Jordan and Knecht (1988) and other regional surveys on Kodiak Island (e.g., Mobley *et al.* 1990:179).

We also combined our C^{14} data with the larger (and more tentative) AHRS data base, which includes chronological inferences from housepit style and diagnostic artifacts, to look for evidence of population fluctuations through time. Classifying the data into Paleoarctic, Ocean Bay, Kachemak, and Alutiiq periods, the number of sites again gradually increases through time. Among pre-contact AHRS sites with cultural affiliations listed, we identified 410 "components," including one possible Paleoarctic (0.2%), 26 (6%) Ocean Bay, 115 (28%)

Table 19 C14-Dated Early Gulf of Alaska Pacific Coast Components by 500 Year Interval*

		Alutiiq		Kachemak					Ocean Bay II		Ocean Bay I					Paleoarctic		
		** 0-499	500-999	1000-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-4499	4500-4999	5000-5499	5500-5999	6000-6499	6500-6999	7000-7499	7500-7999	Total
Prince William	#	17	7	2	2	2	-	2	2	2	-	-	-	-	-	-	-	36
Sound	%	47	19	6	6	6	-	6	6	6	-	-	-	-	-	-	-	100
Kenai	#	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Peninsula	%	33	33	33	-	-	-	-	-	-	-	-	-	-	-	-	-	100
Kodiak	#	10	8	6	1	4	3	2	4	5	3	2	2	2	1	-	1	54
Archipelago	%	19	15	11	2	7	6	4	8	10	6	4	4	4	2	-	2	100
Alaska	#	2	5	2	3	1	1	1	-	1	-	-	2	-	-	-	-	18
Peninsula	%	11	26	11	17	5	5	5	-	5	-	-	11	-	-	-	-	100
Regional Total	#	30	21	11	6	7	4	5	6	8	3	2	4	2	1	-	1	111
	%	27	19	10	5	6	4	5	5	7	3	2	4	2	1	-	1	100

* Compiled from Table 18; all dates within a 500 year interval at each site are defined as one component.
** Uncorrected Radiocarbon Years B.P.

Kachemak, and 269 (66%) Alutiiq occupations. An increase in sites through time is expected due to differential preservation and identifiability, but the magnitude of the increase is impressive given that the Paleoarctic period may span 2,500 years or more, Ocean Bay at least 3,000 years, Kachemak about 2,500 years, and Alutiiq 1,000 years or less. Adjusted for the variable length of each period, there is less than one known component for each millennium of the Paleoarctic period, nine for each Ocean Bay millennium, 46 for Kachemak, and 269 for Alutiiq. These corrected values equal 0.4%, 3%, 14%, and 83% of the total.

Furthermore, the available data suggest that house size generally increases through time, at least on Kodiak (Jordan and Knecht 1988; Figures 57,58). This, too, supports the notion of dramatically increased population densities through time.

Our chronological analysis has been aided by 10 new C^{14} dates from the Alutiiq area (Table 11), including two rockshelters in Prince William Sound tentatively dated to over 4,000 years (see Chapter 6). Yarborough and Yarborough's (1991) work at Uqciuvit extended the Prince William Sound chronology to about 3800 B.P., and our dates for SEW-430 and SEW-517 may extend the sequence another 600 years. The identification of these ancient sites suggests that the dearth of early sites in Prince William Sound may result as much from limited research as from subsidence and erosion.

Resource Variables and Village Site Locations

Our analysis of site locations and resource distributions focuses on the 302 housepit village sites and 35 other large sites recorded in the Alutiiq area. This sample includes 37 sites with more than 10 housepits, 52 sites with between six and 10 housepits, 213 sites with five or fewer housepits, and 35 middens 100 m or more long for which no housepit data are available (Table 17). As discussed above, a large proportion of the village sites are on Kodiak, with increasingly smaller samples from the Alaska Peninsula, the outer Kenai Peninsula, and Prince William Sound.

All 337 sites in the sample include at least one pre-contact component, although a number of these cannot be assigned to any specific time period. Fifty-one are thought to contain multiple pre-contact components and 43 appear to contain both pre-contact and post-contact components (Appendix R). This allows possible changes in site resource profiles over time to be examined in testing our demographic settlement model. The 337 site sample includes 315 components that have been attributed to a particular time period, including 10 Ocean

Bay (3%), 81 Kachemak (26%), 181 Alutiiq (57%), and 43 post-contact Alutiiq (14%) components. The temporal distributions of prehistoric sites in this sample are roughly equal to the temporal breakdown for the entire pre-contact site sample. Within this sample, however, resource data were available for only eight Ocean Bay, 69 Kachemak, 166 pre-contact Alutiiq, and 40 post-contact components.

Table 20 presents data on the environmental context of all 337 sites, including data on different site types, time periods, and areas within the Alutiiq region. The distribution of all housepit village and other large sites by environmental zones includes 152 (45%) in protected areas, 123 (36%) on semi-protected shorelines, 59 (18%) on exposed coastlines or offshore islands, and 3 (1%) along the Karluk River. Considerable areal variation is evident, however, in the percentage of village sites found in each habitat. Four of the five (80%) sites in Prince William Sound were found in protected habitats, for instance, compared to 50% of the large Kodiak sample, 18% on the south Kenai coast, and only 4% on the Alaska Peninsula. Survey biases undoubtedly affect these results to some degree. Many of the small village sites were identified during extensive surveys of bays on the west coast of Kodiak Island by Nowak (1978), M. Yarborough (1978), and Crowell (1986). Since the Karluk River is the only major drainage on Kodiak that has been surveyed systematically, the number of riverine sites also must be underestimated in the regional sample.

Curiously, 33 (94%) of the large sites (100 m or more long, but no housepits recorded) are in exposed or semi-protected areas, but 17 (46%) of the large housepit village sites are in protected environment. We initially thought that the large sites may represent large seasonal camps without housepits. However, a closer examination of the large site

Table 20 Distribution of Housepit Villages and Large Sites by Environmental Zone, Site Type, Time Period, and Area

Type, Period, or Area	Exposed		Semi-protected		Protected		Riverine	
	#	%	#	%	#	%	#	%
All sites	59	18%	123	36%	152	45%	3	1%
Lg Vlg	6	16%	13	35%	17	46%	1	3%
Lg Site	13	37%	20	57%	2	6%	-	-
Med Vlg	7	13%	26	50%	17	33%	2	4%
Sm Vlg	33	15%	64	30%	116	54%	-	-
Ocean Bay	1	10%	4	40%	4	40%	1	10%
Kachemak	10	12%	27	33%	42	52%	3	3%
Alutiiq	29	16%	58	32%	91	50%	4	2%
Historic	9	22%	17	39%	17	39%	-	-
PWS	-	-	1	20%	4	80%	-	-
Kenai	5	29%	9	53%	3	18%	-	-
Kodiak	45	16%	98	33%	144	50%	3	1%
AK Pen	9	36%	15	60%	1	4%	-	-

records reveals that this site category contains village sites which have been altered by erosion, construction of garden plots and other historic structures, as well as sites whose surface features were never recorded. When large sites and large village sites are combined, however, only 19 (26%) are in protected habitats, compared to 17 (33%) of the medium village sites, and 116 (54%) of the small village sites. This supports the notion that outer bay environments, which generally provide access to a variety of food resources, support a disproportionate number of large sites. Though our data show no obvious increase in inner bay settlement through time, the increasing percentages of medium and small villages located in such areas may support our infilling model of settlement.

There is a gradual increase in the percentage of village and large sites located on exposed coasts through time, beginning with 10% of the Ocean Bay sites and culminating in 22% of the post-contact sites. This, too, may support our infilling settlement model, with increasing populations spilling over into outer coast areas where the diversity and accessibility of resources generally decline. An historic emphasis on outer coast village locations may be due not to population growth, but to changes in Alutiiq economies after contact. At first glance, a decrease in the number of post-contact components in protected inner bay environments seems to contradict our prediction that more permanent settlement in such areas increased after the dramatic demographic and economic changes of the contact era. Because they exclude Alutiiq sites occupied only after contact, however, the data in Table 20 cannot be used for detailed examinations of settlement changes during the Russian period. Furthermore, the survey data available at this time may include many housepit sites with unidentified post-contact components.

As discussed earlier, differences in the environmental distribution of late pre-contact and post-contact village sites could be due to settlement

Table 21 Average Total Resource Scores for Native Site Types by Period and Area within the Alutiiq Region*

Period or Area	#	Large Village	Large Sites	Medium Village	Small Village	Total
Total	328	15.1	21.3	15.4	17.7	
Ocean Bay	8	14.5	15.5	24.5	12.5	16.75
Kachemak	69	11.7	19.8	15.3	13.5	14.10
Alutiiq	166	14.8	22.7	15.6	16.6	16.70
Historic	40	15.7	14.8	13.5	15.3	15.03
PWS	3	-	-	26.0	20.0	22.00
Kenai	17	8.0	-	10.2	15.3	13.35
Kodiak	285	16.0	21.7	16.1	18.1	17.82
AK Pen	23	15.3	10.0	11.5	13.0	13.78

* For 10 km circular catchments; sample includes only those sites for which resource data is available.

changes after European diseases ravaged the Alutiiq. Along with enforced servitude, such depopulation resulted in severe social, political, and economic disruption and likely caused the aggregation of formerly discrete village populations, the expansion of local group territories, and shifts in seasonal round and settlement. Additional field research, including some planned or underway, will be required before the patterns of historic changes in Alutiiq settlement and subsistence are clear.

Average total resource scores for various village and large site types are summarized by time period and area within the Alutiiq region in Table 21 (and Appendix R). Except for what may be anomalously high scores for a very small sample of Prince William Sound sites, average resource scores for all site types are highest in the Kodiak area. This generally supports the biological evidence for higher resource diversity and abundance on Kodiak.

Through time, average total resource scores vary between 16.75 for the eight Ocean Bay sites for which resource data are available, 14.1 for 69 Kachemak sites, 16.7 for 166 pre-contact Alutiiq sites, and 15.03 for 40 post-contact Alutiiq sites. Our infilling model predicted average resource scores would decline through time, as expanding populations moved into areas of secondary resource productivity, diversity, and accessibility. As predicted, the highest average total resource score is found among Ocean Bay sites and declines significantly for Kachemak components. After that, however, the average resource score for Alutiiq sites increases to nearly the level of Ocean Bay sites. While this appears to contradict our infilling model, the figures are flawed because they are based on uniform 10 km catchments for all time periods. This results in multiple overlapping catchments later in time, particularly for the closely-spaced Koniag sites that dominate the sample (see Jordan and Knecht 1988). Thus, they fail to account for shrinking resource territories which must have accompanied the large increase in the number of village sites documented through time.

Table 22 presents average resource scores for each major class of fauna for which data are available, with the data organized by environmental zone for each major component. Data are provided separately for Ocean Bay, Kachemak, and Alutiiq period components, for sites that contain components from all three time periods, and for those with both Kachemak and Alutiiq components. The scores for multicomponent sites include data from sites listed previously for the three individual time periods. The values support one prediction of our demographic settlement model: locations that were most productive and reliable for human subsistence are those most likely to contain multicomponent sites that reflect relatively early and sustained occupations. This appears to be borne out by the high average total resource score (18.0) for five sites with Ocean Bay, Kachemak, and Alutiiq components. These five sites have higher average total resource scores than the larger site samples for any one of the three time periods. Although the sample is small, it is also interesting that all five sites are in semi-protected (60%) or protected environments (40%), with none on exposed coasts or in riverine settings. They also have very high scores for salmon, which contribute an average of 67% of the total average resource scores. From a distributional standpoint, it is interesting that during all time periods, semi-protected site locations provide roughly comparable (and sometimes higher) average salmon scores than sites in protected environments. This emphasizes that settlement in many outer bay areas does not significantly reduce access to salmon, an issue we will discuss later.

Table 23 presents average resource scores and percentages for salmon, seal, sea lion, and sea bird aggregations found within one kilometer "local" site catchments. The data are organized by site type and environmental zone. The average scores are a crude measure of potential resource productivity, while percentage values measure potential resource diversity. The figures for these local site catchments should most closely estimate the faunal resources (among those ranked) that attracted human settlement. They should also minimize problems related to the overlapping catchments typical of the late prehistoric period on Kodiak.

Table 22 Average Resource Scores for Sites by Period*

	Salmon	Sea Lion	Seal	Birds	BCD*	Total
Ocean Bay (n=8)						
exposed (n=1)	4.00 36%	1.00 9%	2.00 18%	4.00 36%	7.00	11.00
semi-protected (n=4)	10.50 70%	.25 2%	1.25 8%	3.00 20%	4.50	15.00
protected (n=3)	11.70 56%	- -	2.30 11%	7.00 33%	9.30	21.00
riverine (n=0)	-	-	-	-	-	-
all sites (n=8)	10.13 60%	.25 1%	1.75 10%	4.63 28%	6.63	16.75
Kachemak (n=69)						
exposed (n=7)	6.10 41%	.29 2%	2.86 19%	5.71 38%	8.86	15.00
semi-protected (n=23)	9.26 53%	.35 2%	2.70 16%	5.13 29%	8.17	17.43
protected (n=37)	7.94 64%	- -	1.81 15%	2.62 21%	4.43	12.37
riverine (n=2)	5.00 100%	- -	- -	- -	-	5.0
all sites (n=69)	8.12 58%	.15 1%	2.16 15%	3.70 26%	6.00	14.1
Alutiiq (n=166)						
exposed (n=23)	5.65 39%	.57 4%	2.87 20%	5.39 37%	8.82	14.47
semi-protected (n=55)	9.50 33%	.33 3%	3.40 17%	6.51 64%	10.2	19.73
protected (n=85)	10.01 63%	.20 1%	2.12 13%	3.60 23%	5.81	15.86
riverine (n=3)	4.33 93%	- -	- -	.33 7%	.33	4.67
all sites (n=166)	9.15 55%	.20 1%	2.64 16%	4.75 28%	7.60	16.70

* For 10 km catchments; BCD = non-salmon resource scores.

Table 22 Average Resource Scores for Sites by Period* (cont'd)

	Salmon	Sea Lion	Seal	Birds	BCD*	Total
Ocean Bay/Kachemak/Alutiiq (n=5)						
exposed (n=0)	-	-	-	-	-	-
semi-protected (n=3)	10.00 73%	.33 2%	1.0 7%	2.33 17%	3.66	13.66
protected (n=2)	14.00 57%	- -	1.5 6%	9.00 18%	10.5	24.50
riverine (n=0)	-	-	-	-	-	-
all sites (n=5)	11.60 64%	.20 1%	1.2 7%	5.00 28%	6.4	18.0
Kachemak/Alutiiq (n=41)						
exposed (n=4)	5.75 39%	.25 2%	2.00 14%	6.75 45%	9.0	14.75
semi-protected (n=14)	8.64 52%	.36 2%	2.79 17%	4.86 29%	8.0	16.64
protected (n=21)	8.14 64%	- -	1.66 13%	2.90 23%	4.57	12.71
riverine (n=2)	5.0 100%	- -	- -	- -	-	5.0
all sites (n=41)	7.93 57%	.15 1%	2.00 14%	3.80 28%	5.95	13.87
Historic (n=40)						
exposed (n=7)	5.71 48%	.03 1%	3.86 33%	2.14 18%	6.14	11.86
semi-protected (n=17)	7.71 57%	.12 1%	1.88 14%	3.82 28%	5.82	13.5
protected (n=16)	12.06 67%	- -	2.19 12%	3.69 21%	5.87	17.93
riverine (n=0)	-	-	-	-	-	-
all sites (n=40)	9.10 60%	.08 1%	2.35 16%	3.50 23%	5.93	15.03

* For 10 km catchments; BCD = non-salmon resource scores.

The results of our analysis support a general relationship between resource productivity and site size, with large villages and large sites having the highest resource scores, followed by medium and small village sites. As expected, the one kilometer catchment scores show that sites in riverine and inner bay environments generally have access to productive salmon streams, while sites on exposed shorelines are close to sea lion haulouts and seal concentrations. Comparatively balanced resource profiles for exposed shoreline sites, which generally include access to some salmon, suggest that locations offering diverse sets of resources were selected where possible. In such locations, shellfishing and bottomfishing are often less productive, so sea mammals and birds may be especially important. Overall, the average total resource scores for the local catchments do not vary greatly, fluctuating around a mean of 1.7.

Table 23 Average Scores and Average Percentages of Resource Scores within 1 km of all Sites

	Salmon	**Sea Lion**	**Seal**	**Birds**	**BCD***	**Total**
Lg Vlg						
Avg.	1.43	-	.38	.38	.76	2.2
%	66%	-	17%	17%		
Med Vlg						
Avg	1.00	-	.31	.25	.56	1.6
%	64%	-	20%	16%		
Sm Vlg						
Avg	1.00	.02	.30	.26	.58	1.6
%	63%	1%	19%	17%		
Lg Site						
Avg	1.30	.03	.27	.37	.70	2.0
%	66%	2%	13%	19%		
Exposed						
Avg	.70	.08	.51	.40	.98	1.68
%	42%	4%	30%	24%		
Semi-protected						
Avg	.99	.01	.27	.34	.62	1.61
%	60%	1%	18%	21%		
Protected						
Avg	1.23	-	.27	.20	.47	1.71
%	72%	-	16%	12%		
Riverine						
Avg	2.33	-	-	-	-	2.33
%	100%	-	-	-		
Total Avg	**1.07**	**.01**	**.31**	**.28**	**.60**	**1.7**
Total %	**64%**	**1%**	**18%**	**17%**		

*BCD = scores excluding salmon.

In Table 24, the same classes of data are presented for larger and more generalized 10 km site catchments. Again, salmon scores are high for sites in protected and semi-protected habitats. Where riverine habitats had the highest average salmon scores among the smaller site catchments, they are now the lowest of our four environmental zones. Even though the productivity of the Karluk River fishery is underestimated by these figures, the significantly higher resource scores for all three marine habitats illustrate the much greater diversity of resources available along the coast. Generally, seal haulouts or other concentrations are distributed relatively evenly among all coastal zones, but sea lion scores increase significantly and progressively from protected habitats to exposed coastlines.

In fact, sea lion scores are consistently low throughout the study area, probably because of the exposed and inaccessible nature of the major rookeries. Only sites near the Barren Islands haulouts and rookeries had consistently high sea lion scores. A larger resource catchment would probably be a

Table 24 Average Scores and Average Percentages of Resource Scores within 10 km of all Sites

	Salmon	Sea Lion	Seal	Bird	BCD*	Total
Lg Vlg						
Avg	7.90	.13	2.94	4.11	7.2	15.1
%	53%	1%	19%	27%		
Med Vlg						
Avg	8.25	.31	2.52	4.31	7.1	15.4
%	54%	2%	16%	28%		
Sm Vlg						
Avg	9.51	.29	2.54	5.32	8.1	17.7
%	54%	2%	14%	30%		
Lg Site						
Avg	10.93	.27	3.20	6.93	10.4	21.3
%	52%	1%	16%	31%		
Exposed						
Avg	5.75	.85	2.98	5.47	9.30	15.0
%	38%	6%	20%	36%		
Semi-protected						
Avg	9.66	.31	2.70	6.12	9.13	18.8
%	51%	2%	14%	33%		
Protected						
Avg	10.28	.04	2.52	4.38	6.94	17.2
%	61%	-	16%	23%		
Riverine						
Avg	4.33	-	-	.33	.33	4.66
%	92%	-	-	8%		
Total Avg	**9.26**	**.27**	**2.64**	**5.17**	**8.08**	**17.3**
Total %	**53%**	**2%**	**15%**	**30%**		

*BCD = scores excluding salmon.

more appropriate measure of access to sea lion haulouts and rookeries, since most are outside the 10 km radius of major sites.

Sea bird scores are unexpectedly high within 10 km of the protected sites. This may be due in part to the large number of sites located in protected habitats in the Afognak and Shuyak island area that are within 10 km of many relatively small sea bird colonies. A review of resource scores within one kilometer of all sites (Table 23) indicates that sites on exposed and semi-protected shorelines are situated closer to bird colonies than sites in protected areas. Had our analysis been refined to give more weight to large sea bird colonies, the 10 km bird scores for exposed and semi-protected sites near the large colonies would have been substantially higher.

As expected, combined non-salmon resource totals increase substantially in exposed and semi-protected zones, confirming that sites in these zones have access to a variety of resources. These totals probably would be even more impressive if bottomfish, migratory whales, and shellfish - major subsistence resources available within these zones - were included (Figures 112, 113, 114). Other than a single bird colony, the two riverine sites have no major resources available except salmon.

For the resources measured, the data in Table 24 suggest that sites in protected habitats had access to a potential resource mix that averaged 61% salmon, 16% seal, and 23% sea birds. In contrast, exposed sites had access to resources averaging 38% salmon, 20% seals, 6% sea lions, and 36% sea birds. While these are rough estimates or rankings of potential resource abundance and diversity for only four key resources, they may provide some insight into the general differences expected in various habitat types within the Alutiiq area. Moreover, site-specific resource profiles presented in Appendix R provide a standard with which archaeologists analyzing faunal assemblages can assess the validity of our modeling.

The high average salmon scores for many semi-protected site locations suggest that the occupants of many of these villages were within easy day-use range of productive salmon streams. There would be little impetus for the owners of streams within our hypothetical catchments to establish substantial summer villages separate from their winter residences. As discussed earlier, most large villages appear to have been concentrated in semi-protected locations where resource diversity and productivity were relatively high, marine resources were relatively accessible, and travel to a variety of habitats (outer coast, outer bay, and inner bay) could be accomplished from one residential base.

In summary, some aspects of our resource and demographic models for settlement in the Alutiiq area are supported by our resource data, while others were not. It may be that our data, dominated as they are by relatively recent Kachemak and Koniag sites of the Kodiak area, do not conform to some expectations of the demographic model because much of the hypothesized infilling occurred prior to Kachemak times (see the Kenai case study below). Other factors that limit the resolution of our analysis include: 1) the non-quantitative nature of our resource data, which focuses on diversity rather than overall productivity; 2) the lack of data for critical resources such as whales, shellfish, and bottomfish; 3) cumulative environmental changes between Ocean Bay and Alutiiq times, which may bias the resource data we have; 4) the large size (10 km) of our catchment areas, which causes overlapping site exploitation territories for many closely spaced sites of the last 2,500 years; and 5) social factors, such as the territorial claims of competing neighboring groups, which can overcome even the strongest attractions presented by abundant resources.

Despite these limitations, we believe our demographic and resource models are viable options for future interpretations of better and more complete data. Ideally, predictions based on better resource data should be tested with systematically collected subsurface samples of faunal and artifactual remains. Excavation data can help refine our models and may provide clues to the function and seasonality of site occupations, and the role of specialization and trade in local economies. Ultimately, as anomalies between resource distributions and settlement locations are identified, they may aid in distinguishing prehistoric social territories and ethnic boundaries.

[R. Jordan 4:16]

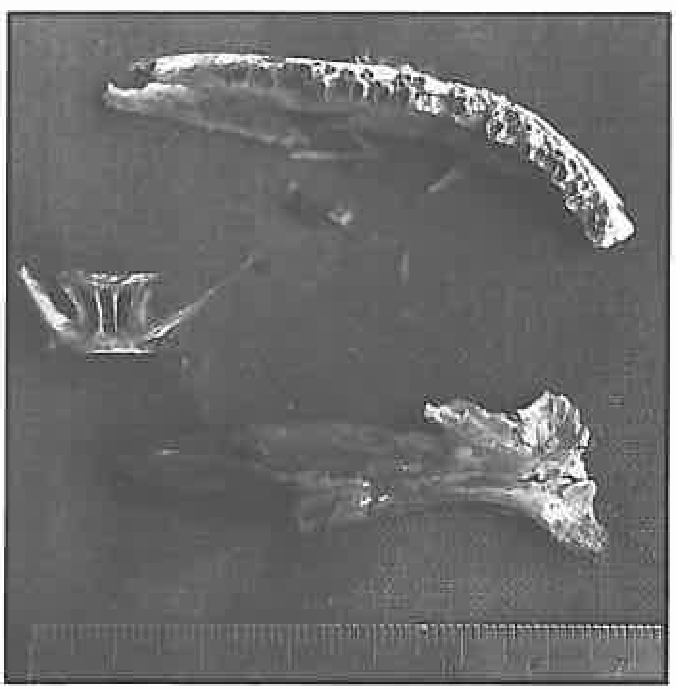
Figure 112 Whale vertebrae in eroded site (KOD-385), Kodiak area

Three Case Studies

Some of the concepts discussed above, including the notion that Alutiiq populations responded significantly to differential resource distributions, can be illustrated with examples of regional settlement patterns. Evidence for subsistence variation in areas of the comparatively well-studied Kodiak region was discussed in Chapter 4 (see also Jordan 1988a; Yesner 1989); therefore, our case studies focus on aspects of the coastal archaeological record for Prince William Sound, the outer Kenai Peninsula, and the Pacific coast of the Alaska Peninsula.

Prince William Sound

The limited archaeological research conducted in Prince William Sound to date has identified site components indicative of a growing, sedentary population adapted to the marine environment of Prince William Sound for over 4,000 years (see Chapter 4). Analysis of faunal remains from the



[R. Reanier 8:31]

Figure 113 Fish bones from eroding midden (SEW-430), Prince William Sound

[P. Buck 21:6]

Figure 114 Shellfish remains in eroding midden (AFG-148), Kodiak area

Palugvik Site (de Laguna 1956:49-52) and the Uqciuvit Site (Yarborough and Yarborough 1991:219) indicates a heavy reliance on sea mammals. De Laguna surmised that the sea furnished the majority of the food secured by the people at Palugvik (de Laguna 1956:49), and this generalization also applies to Uqciuvit.

It is difficult to examine specific relationships between the distribution, density, and diversity of natural resources and archaeological sites in Prince William Sound because of the altered nature of many of the sites, the limited faunal data, and the current lack of detailed analysis of the uplift and subsidence of the region's shorelines. Nevertheless, the numerous intertidal artifact scatters (13), rockshelter sites (14), and sites with organic artifact preservation (2) identified in Prince William Sound by the Cultural Resource Program provide primary archaeological data for future analysis of the nature of human adaptations to the area's maritime environment.

Table 25 Environmental Context of Prince William Sound Intertidal Artifact Sites Identified or Updated by Cultural Resource Program, 1989/1990

Site	Site Type	Environmental Context
SEW-019*	Former village, ITZ artifacts	semi-protected
SEW-068*	ITZ artifacts[1], fishtrap	semi-protected
SEW-072*	ITZ artifacts	exposed
SEW-076*	ITZ artifacts, upland midden	exposed
SEW-077*	ITZ artifacts	semi-protected
SEW-241*	ITZ artifacts	semi-protected
SEW-436	Rockshelter, ITZ artifacts	exposed
SEW-440	Upland midden, ITZ artifacts	semi-protected
SEW-444	ITZ artifacts, peat	semi-protected
SEW-445	ITZ artifacts, peat	semi-protected
SEW-488a	Upland midden, ITZ artifacts	semi-protected
SEW-488b	ITZ artifacts	semi-protected
SEW-491	ITZ artifacts	exposed
SEW-500	ITZ artifact	exposed
SEW-502	ITZ artifacts, fishtrap	protected
SEW-513	ITZ artifacts	semi-protected
SEW-526	ITZ artifacts[1]	protected
SEW-538	ITZ artifacts	exposed
SEW-542	ITZ artifacts	protected

* Previously existing site updated by Cultural Resource Program.

[1] wet site

In 1989 and 1990, two extensive intertidal artifact scatters, SEW-072 (more than 80 m in length) and SEW-538 (40 m in length) were identified on the east side of Knight Island Passage (SEW-072 had been reported to de Laguna in the 1930s but never visited). Both sites are situated on relatively small pocket beaches on exposed shorelines and consist of ground and chipped stone artifacts amid pavements of fire cracked rock. A former village site which figures prominently in Chugach legends (SEW-071) is in the general vicinity, as are burial caves which formerly contained mummified human remains.

Stone lamps, hammerstones, abraders, and native copper implements have been noted at SEW-072 in addition to over two dozen splitting adzes. Any faunal remains and light artifacts which may have been at the site appear to have been washed away. SEW-538 consists of a scatter of hammerstones, cores, adzes, a biface, and a notched cobble. Both sites are of unknown age and function, although Workman and Workman (1990:288) note that the SEW-072 material ". . . suggests a specialized site where splitting adzes were manufactured (and/or used) on a large scale" and that the copper implements should date a component of the site to about A.D. 1000. The large amount of fire cracked rock at the sites may indicate prolonged or intense use, but this is speculative.

The shoreline in the general area is convoluted, dotted with offshore islands, and deeply indented with large bays. The Knight Island Passage area is a major harbor seal concentration area (ADFG 1985b:5), and a favorite feeding ground of humpback whales (Townsend and Heneman 1989:92). One small sea bird rookery is in the area, and small anadromous fish streams are present at the heads of nearby large bays. The location of these sites on exposed or semi-protected shorelines in proximity to sea mammal concentrations is consistent with the settlement pattern noted earlier as typical of the Alutiiq region. In addition, other intertidal artifact scatters identified during the project are generally located in similar environmental contexts (Table 25). It is not known if these sites are the remains of settlements, camps, or other activity areas, however.

It is also difficult to discern how SEW-072 and SEW-538 relate to other sites in the region, (not to mention how the sites fit into a larger environmental pattern), because of the fragmentary nature of the sites, the lack of dated assemblages in the area, and the complicated series of subsidence and uplift events which have altered the region's shorelines. These obstacles inhibit testing specific settlement pattern theories, but at the very least these site remnants indicate areas of past use and/or settlement and, if they contain diagnostic artifacts, indicate general site age. Their potential to contribute information regarding the cultural ecology of the area will be realized only after more extensive archaeological survey, dating, faunal analysis, and geological modeling in Prince William Sound establish a fuller context for their interpretation.

On the other end of the preservation spectrum, two sites with preserved organic artifacts identified by Cultural Resource Program archaeologists have enormous potential to furnish information normally lost due to natural decomposition. Numerous scarred trees (CMTs), preserved wooden artifacts, worked wood and detritus, and stone tools (SEW-526) near the mouth of a salmon stream (Figure 67) in a protected environment offer an unusual opportunity to investigate the remains of what appears to be a woodworking activity area or possibly a fish camp. SEW-526 is the first "wet" site reported in Prince William Sound, and investigations of such sites have the potential to identify new aspects of pre-contact human adaptations in Prince William Sound. SEW-068 is another wet site which contains preserved wood and fiber artifacts eroding from an intertidal peat deposit (Figure 75, 82). The site is in a semi-exposed environment on Knight Island Passage and has exceptional potential to produce organic artifacts, faunal data, and information on artifact manufacturing and use. Dating the deposits may help clarify relationships between cultural and tectonic sequences in Prince William Sound.

The fact that so many sites in Prince William Sound have been disturbed by subsidence and erosion increases the potential significance of the remaining upland and preserved intertidal sites. It is likely that whole classes of sites in the sound have been destroyed, and future research should attempt to establish pre-contact site density based on analysis of the remaining rockshelters, defensive sites, and intertidal site remnants. The importance of intact deposits in an area where so many sites have been destroyed naturally over the years makes survey, testing, and salvage of eroding upland and intertidal sites imperative. Further testing and analysis of faunal elements from a rapidly eroding 4,000 year old rockshelter midden at SEW-430 (Figures 94, 113) for example, is an obvious source of additional faunal information pertinent to human adaptations in Prince William Sound.

Continued site survey and dating, analysis of faunal elements salvaged from eroding sites, and the establishment of subsidence and uplift rates for Prince William Sound shorelines are prerequisites for analyzing relationships between settlements and resources in Prince William Sound.

Outer Kenai Peninsula

Occupied at the time of European contact by the Unegkurmuit (outer Kenai Peninsula Alutiiq), the outer coast of the Kenai Peninsula is rarely mentioned in early historical accounts, and has received little attention from ethnographers and archaeologists. Consequently, site surveys related to the spill cleanup have been a major source of new information on the prehistoric and historic settlement of the area. As part of joint Exxon and NPS studies at SEL-188, Betts *et al.* (1991) summarized the archaeological record of the area. The study includes an analysis of the distribution of modern subsistence resources and Alutiiq settlements on the outer coast of the Kenai Peninsula, from which much of the following discussion is drawn.

The outer Kenai coastline is relatively convoluted, though not as complex as the shores of Kodiak and Prince William Sound. The generally south and southeast facing coast is also relatively steep and exposed, though protected and semi-protected habitats are found in some bays or passages with more indented shorelines. Due to the steep topography and high elevations, massive icefields have accumulated in the mountains. These feed numerous glaciers that reach or approach tidewater today and were even more extensive until relatively recently (see below).

It seems likely that this steep topography, the preponderance of exposed coastline, the number of tidewater glaciers, and the magnitude of sediment-laden runoff from peri-coastal glaciers all combine to limit the overall productivity and availability of shellfish, salmon, and bottomfish in the intertidal and nearshore habitats of the outer Kenai coast. Such resource limitations may have restricted the population of maritime peoples who occupied the area before and after European contact. As noted earlier, the density of Alutiiq archaeological sites along the outer Kenai coast is less than one-third (ca. 30%) of that documented for our Kodiak study area.

Both the number and density of archaeological sites have been affected by recent changes in the configuration of the outer Kenai coast. As Hamilton and Rice (1989:22) have shown, glaciers have retreated substantially in many bays and fjords in the last 100 years, opening new areas to settlement and drastically changing some local environments. In Northwestern Fjord, for instance, Northwestern Glacier has retreated almost 15 km in less than 100 years (Figure 23). The advance of this glacier almost certainly destroyed any older archaeological sites in its path, while its recent retreat has exposed many kilometers of new shoreline to colonization by flora and fauna, including humans. Clearly, glacial retreats and advances on the outer Kenai coast have had major impacts on historic and prehistoric distributions of resources and human settlements, especially in inner and middle bay areas most susceptible to glacial events.

Currently, 79 archaeological sites have been recorded within one kilometer of the outer Kenai coast, including the Barrens and other island groups. Prior to our 1989 and 1990 surveys, archaeological investigations in the area had been limited, partly because the potential for past human occupa-

Table 26 Outer Kenai Coast Housepit Villages

AHRS #	Housepit #	Housepit Size*	Remarks	Source
XBS-020	15 (est.)	11m x 10m	30 "depressions," number of housepits unclear. C^{14} dates 140 ± 60, 320 ± 50	Dotter 1988a:8
SEL-119	15	N/A	Seventeen smaller depressions also noted	McMahan and Holmes (1987:20)
SEL-129	10	10m x 8m	10 "multi-celled" housepits; seven smaller depressions	Exxon Files, AHRS
AFG-175	10	4m x 4m	Two other depressions, lithic artifacts, midden in test pit	Exxon Files, AHRS
AFG-103	8	12m x 8m	Charcoal and FCR in test pit	Exxon Files, AHRS
XBS-015	8	3m x 3m	Three smaller depressions also reported	Exxon Files, AHRS
SEL-172	6	N/A	Field sketch indicates 6 or 7 housepits + other depressions	Shields (1983:14)
XBS-014	5	2m x 2m	Two other depressions reported near historic artifact scatter	Exxon Files, Schaaf (1988)
AFG-087	2	4m x 4m	Additional small square pit reported	AHRS
AFG-105	3	3m dia.	Midden in test, round depressions	Exxon Files, AHRS
SEL-178	2	5m x 5m	Artifacts on beach below site, additional pit noted	Exxon Files, AHRS
SEL-211	2	6.5m x 6m	Two "smaller" depressions also reported	Exxon Files, AHRS
SEL-223	2	7.5m x 6m	Untested depressions on private land	Exxon Files, AHRS
SEL-207	1	2m x 2m	Three other pits partly obscured by fallen timber	Exxon Files, AHRS
SEL-208	1	N/A	CMTs noted, depression untested	Exxon Files, AHRS
SEL-209	1	2m x 2m	Second possible pit at edge of glacial outwash was covered by drowned spruce	Exxon Files, AHRS

(* Housepit size is estimate of largest depression)

tion in mainland areas was thought to be low due to the intensity of past glaciation (NPS 1984:29-30). The available data suggest that 47 (59%) of the AHRS sites are prehistoric and 35 (44%) are historic, including three that have both pre- and post-contact components. Our discussion focuses on the prehistoric sites with adequate levels of documentation, especially the 16 sites where housepits were noted (Table 26) and the 15 small middens or artifact scatters where no housepits were noted (Table 27).

As was the case with the larger Alutiiq data base, resource scores for harbor seal, sea lion, seabird,

Table 27 Other Middens or Artifact Scatters of the Outer Kenai Coast

AHRS #	Site Size*	Remarks	Source
SEL-130	28 m^2	Pre- and post-contact intertidal artifacts - no upland features	McMahan and Holmes 1987:22
SEL-179	30 m^2	Upland midden (extent undetermined), intertidal artifacts	Exxon Files, AHRS
SEL-181	1000 m^2	Defensive site with midden and intertidal artifacts	Exxon Files, AHRS
SEL-186	N/A	Upland midden	Exxon Files, AHRS
SEL-188	3400 m^2	Upland midden, intertidal artifacts	Exxon Files, AHRS
SEL-194	550 m^2	Charcoal lens in eroding cutbank, intertidal artifacts	Exxon Files, AHRS
SEL-195	N/A	Intertidal artifacts including Kachemak stone lamp	Exxon Files, AHRS
SEL-197	80 m^2	Intertidal artifacts	Exxon Files, AHRS
SEL-198	100 m^2	Upland midden, small rockshelter with midden, intertidal artifacts	Exxon Files, AHRS
SEL-206	500 m^2	Intertidal artifacts	Exxon Files, AHRS
SEL-215	1200 m^2	Intertidal artifacts	Exxon Files, AHRS
SEL-216	1250 m^2	Intertidal artifacts	Exxon Files, AHRS
SEL-217	100 m^2	Intertidal artifacts	Exxon Files, AHRS
SEL-218	N/A	Isolated intertidal artifact	Exxon Files, AHRS
SEL-228	N/A	Upland midden, intertidal FCR Possible historic village of Kagilik	AHRS

* Site Sizes approximate

and salmon concentrations were computed for one and 10 km circular catchments around these 31 sites. The sites also were classified by major environmental zone: 1) exposed outer coast or island areas, 2) semi-protected outer bay areas, 3) protected inner bay areas, and 4) riverine areas. Finally, the sites were divided into four classes: sites with more than 10 housepits (large villages), those with between six and 10 housepits (medium villages), sites with five or fewer housepits (small villages), and middens or intertidal scatters lacking house depressions (other sites).

Resource scores for 10 km catchments around each of the sites are presented in Table 28, along with averages for each major class of site. As predicted earlier, sites away from the heads of bays generally have higher resource scores (excepting salmon), reflecting the greater diversity of marine resources available in their catchments. Surprisingly, medium villages have higher average seal, sea lion, and bird scores than the large villages. One of the large villages (XBS-020) appears somewhat anomalous, however. XBS-020, whose occupation may span the late prehistoric to historic transition, is located near a terminal moraine in a fjord marked by major recent glacial retreat. Prior to this retreat, XBS-020 may have been located adjacent to pinniped haulouts near a calving tidewater glacier. One of the medium villages, SEL-129, is also anomalous. It is situated on one of the few flat strategic

Table 28 Outer Kenai Coast Site Resource Scores, Averages, and Percentages

Site	Site Class	Env. Zone	Salmon	Sea Lion	Seal	Bird	TOTAL
SEL-119	Large village	Semi-protected	8	0	0	3	11
XBS-020	Large village	Semi-protected	1	0	1	3	5
AFG-103	Medium village	Exposed	0	5	3	5	13
AFG-175	Medium village	Exposed	0	5	3	5	13
SEL-003	Medium village	Semi-protected	5	0	0	0	5
SEL-129	Medium village	Semi-protected	3	1	0	4	8
XBS-015	Medium village	Semi-protected	4	0	2	6	12
AFG-087	Small village	Exposed	0	3	3	5	11
AFG-105	Small village	Exposed	0	5	3	5	13
SEL-172	Small village	Semi-protected	8	0	1	3	12
SEL-178	Small village	Protected	16	0	2	2	20
SEL-207	Small village	Protected	14	0	1	3	18
SEL-208	Small village	Semi-protected	14	1	2	3	20
SEL-209	Small village	Protected	9	0	0	5	14
SEL-211	Small village	Semi-protected	16	1	1	5	23
SEL-223	Small village	Exposed	8	3	2	3	16
XBS-014	Small village	Semi-protected	4	1	2	6	13
SEL-130	Other site	Semi-protected	9	0	1	4	14
SEL-179	Other site	Protected	14	0	2	2	18
SEL-181	Other site	Semi-protected	15	0	1	3	19
SEL-186	Other site	Semi-protected	21	0	1	4	26
SEL-188	Other site	Semi-protected	5	1	0	6	12
SEL-194	Other site	Semi-protected	6	0	0	6	12
SEL-195	Other site	Protected	14	0	2	3	19
SEL-197	Other site	Semi-protected	7	1	0	4	12
SEL-198	Other site	Exposed	0	2	0	6	8
SEL-206	Other site	Protected	6	0	0	6	12
SEL-215	Other site	Semi-protected	8	1	1	4	14
SEL-216	Other site	Semi-protected	8	1	1	4	14
SEL-217	Other site	Semi-protected	8	1	1	5	15
SEL-218	Other site	Semi-protected	8	1	1	5	15
SEL-228	Other site	Exposed	3	0	0	3	6
Large Village Resource Avg (Avg %)			4.5 (46%)	0 (0%)	.5 (10%)	3.0 (44%)	
Medium Village Resource Avg (Avg %)			1.8 (18%)	2.8 (22%)	2.0 (16%)	5.0 (44%)	
Small Village Resource Avg (Avg %)			8.9 (50%)	1.4 (10%)	1.8 (12%)	4.0 (27%)	
Other Site Resource Avg (Avg %)			8.8 (56%)	.5 (05%)	.7 (04%)	4.3 (35%)	
Exposed Site Resource Avg (Avg %)			1.5 (25%)	1.0 (13%)	0 (0%)	3.0 (63%)	
Semi-protected Site Resource Avg (Avg %)			10.3 (62%)	.6 (04%)	.9 (05%)	5.0 (28%)	
Protected Site Resource Avg (Avg %)			8.67 (59%)	0 (0%)	.67 (04%)	6.0 (37%)	

peninsulas on the outer Kenai coast, and its location may be related to the site's defensive aspect and access to migratory whales and other sea mammals.

Large and medium village sites generally are characterized by high sea lion and seal scores, but low salmon scores. Higher average salmon scores for small villages suggest that many such sites are located closer to salmon spawning streams, as expected if population expansion made habitation areas with lower resource diversity attractive. Alternatively, the smaller village sites near salmon streams may have been seasonal camps, as has been suggested for early post-contact settlement on Kodiak.

Generally, resource scores for middens and artifact scatters lacking housepits are similar to those for small villages. These are located near salmon streams and bird rookeries, but usually are further than 10 km from significant seal or sea lion haulouts or rookeries. Such resource distributions suggest that these sites may have been resource-specific camps now represented by small upland middens or artifact scatters in the intertidal zone. Given the ongoing subsidence of much of this coast, many of the intertidal scatters may be erosional lag deposits like the one that fronts the midden at SEL-188 (Betts *et al.* 1991). Some originally may have been deposited on the beach, however, where overturned boats or small lean-to structures sheltered seasonal camps (de Laguna 1956:59).

Data on the average resource scores for site catchments in various environmental zones suggest that sites on offshore islands and outer bays have access to a wider diversity of resources than inner bay sites. Settlements located in exposed and semi-protected environments have access to a variety of sea mammals and birds, and probably to more shellfish, bottomfish, and whales, as well. As expected, salmon scores are relatively high for inner bays and show a downward trend for outer bays and offshore islands. Given modern resource distributions and past glacial fluctuations, it should not be surprising that major pre-contact sites are concentrated in semi-protected and outer coast zones where a variety of resources can be harvested with relatively little travel.

In summary, a preliminary analysis of resource and site distributions supports the notion that Alutiiq settlement patterns mirror the diversity and productivity of key food resources within the natural environment. The data may also support a model of progressive infilling as populations of the outer Kenai coast grew. This model predicts that the first (and eventually the largest) villages established would be situated in areas of highest resource productivity and diversity. As populations grew and villages fissioned, "daughter" villages would be established in locations of secondary productivity. The better correspondence between Kenai resource distributions and human settlement may be due to the relatively shallow time depth of the known sites, the wider dispersal of key resource locales, and the lower productivity and lesser dietary importance of alternative resources like shellfish. Currently, so little information is available on the age and contents of prehistoric sites of the outer Kenai coast, however, that these ideas cannot be tested effectively. As additional data become available, it should be possible to reassess the validity of our model. With more and better data on the productivity of major food resources, the distribution of archaeological sites, and the nature of specific site economies, it may be possible to identify anomalous site or non-site locations and relate these to contested territorial boundaries between social groups. SEL-129, a medium village characterized by rather low resource scores, is an interesting example of disparities between resource distributions and site locations that may be related to social friction or competition for resources.

The Alaska Peninsula

With an intermediate position between both ecological and social frontiers, the Alaska Peninsula has long been a focus of culture historical and cultural ecological studies by archaeologists (G. Clark 1977; Dumond 1969, 1974; Yesner 1985; McCartney 1988; and others). The Pacific coast of the peninsula, with immediate access to marine and terrestrial resources, and within reach of interior lakes, caribou herds, and other resources of the Bering Sea coast, makes an interesting contrast to the more maritime areas of the Alutiiq region. Comparisons to the Kodiak area just across Shelikof Strait are especially apt, since both areas were occupied by the Koniag at the time of European contact.

Even focusing on the Pacific coast of the Alaska Peninsula alone, there is intriguing evidence for variation in human adaptations between different bays and drainages, even those located very near one another. Some areas like Hallo Bay and Portage Bay provide relatively low and easily traversed passes through the Aleutian Range, for instance, while many others do not. Dumond (1977) noted that variation in the intensity of marine vs. land mammal use in the faunal assemblages from archaeological sites of Kukak and Amalik bays may be related to such differential access to interior and Bering Sea habitats.

Our experience suggests that environmental variation along the Pacific coast of the Alaska Peninsula results in dramatic variability in the intensity (and possibly the antiquity) of human settlement. Such variation can be illustrated by examining differences in the ecology and archaeology of three local areas: Amalik Bay, Puale Bay, and the coast south of Cape Douglas.

In 1987, Dumond analyzed the distributions of certain key food resources and archaeological sites for four National Wildlife Refuges on the Alaska Peninsula. His study encompassed areas of the Pacific coast, the interior, and the Bering Sea coast. Dumond's model weighted sea mammal hunting and salmon fishing heavily, with little emphasis on other resources. Dumond (1987:97-98) predicted that Pacific coast:

> . . . sites will be found in the vicinity of major sea mammal haulout or breeding areas. There the sites will be positioned so as to allow a strategic view of the coastal area, but also so as to receive some protection from storms and from the open surf. . . . only the most productive of the Pacific coastal salmon streams will have traces of heavy human occupation; these streams are those that receive runs of several salmon species, including runs of sockeye.

Based on the presence of abundant harbor seals and a major sea lion rookery near the north side of Puale Bay's entrance, Dumond (1987:72) predicted that Puale Bay and the area immediately to the north should contain a significant amount of archaeological remains.

Puale Bay

Puale Bay is about 14.5 km wide at its mouth and a maximum of about 13 km long, encompassing roughly 150 km^2 of marine habitat. Despite its size, Puale Bay contains only about 41 linear km of shoreline and few islands or reefs protect it from storm waves out of the south and southwest, or from wind swells crossing Shelikof Strait from the east. Much of the shoreline of Puale Bay, particularly the north and east shores, consists of relatively high energy sand, gravel, cobble, and boulder beaches nearly devoid of shellfish or other edible intertidal organisms (Figure 115). A number of small (one and two species) salmon streams dissect the shoreline, with a composite salmon score of 10 for all the stream mouths that enter the bay. Roughly 11,500 sea birds have been noted in four colonies located within the confines of the bay (Sowles *et al.* 1978:Map 35). The major resource available in the area appears to be a sea lion haulout on a point at the northeast end of the bay. According to Calkins and Pitcher (1983:477-8), over 15,000 sea lions were counted here in 1976 and the haulout is used throughout the year. Dumond (1987:72) notes that harbor seals also frequent this point.

Virtually no ground survey had been done in Puale Bay prior to 1989 and no prehistoric AHRS sites were known to exist (see Dumond 1987:142). During 1989 and 1990, nearly the entire coastline of the bay was walked by Exxon archaeologists and five probable prehistoric sites were located. As Dumond predicted, a substantial village site (KAR-121; ca. 80 m long, possibly with structural remains and multiple components) was noted near the sea lion haulout. Yet despite relatively intensive and systematic survey of Puale Bay shorelines, this is the only substantial prehistoric site found. Even including three sites found somewhat northeast of

Puale Bay, all other known sites in the area consist of isolated artifacts, small and very low density artifact scatters, or lone housepits of uncertain prehistoric origin.

Despite the presence of a major year-round pinniped haulout and several salmon streams, prehistoric settlement of Puale Bay appears to have been light. As Dumond predicted, relatively careful surveys around the mouths of at least two salmon streams on the north shore showed no obvious signs of human settlement, either prehistoric or historic. The lack of more substantial human settlement in Puale Bay appears to be due to the lack of a more diverse resource base, including substantial shellfish beds which can buffer periods of other resource failures. This is largely due to the highly exposed nature of much of the coast, which must also have limited the reliability of sea fishing and hunting during much of the year. These restrictions appear to have limited the intensity and possibly the antiquity of human settlement in Puale Bay.

Amalik Bay

In contrast to Puale Bay, the much smaller and more sheltered Amalik Bay contains many more islands and a much more convoluted coastline. Amalik Bay is a maximum of about 10 km wide, 12 km long, and encompasses only about 40 km^2 of marine habitat. In contrast to the much larger Puale Bay (150 km^2), Amalik Bay contains roughly 65 to 75 linear kilometers of shoreline, with Takli Island (Figure 116) alone having almost 25 km of coast. The inner portions of the bay (Geographic Harbor) are protected by the presence of Takli Island and other smaller islands near the bay mouth. The convoluted coastline and many islands provide a diversity of protected, semi-protected, and exposed habitats that support a wide range of resources, including extensive shellfish beds. Unlike Puale Bay, composite salmon scores are relatively low (1) for Amalik Bay, only about 2,300 sea birds are found in three colonies (Sowles *et al.* 1978:Map 42), and the only significant pinniped haulout has never been seen to support more than about 2,000 sea lions (Calkins and Pitcher 1983:477).

Despite Amalik Bay's smaller size and the much lower productivity of its salmon runs, seabird colonies, and pinniped haulout, numerous archaeological sites have been identified within its confines. This may be due in part to the greater amount of linear shoreline found in the confines of the bay, though much of the coast has yet to be surveyed systematically. At present, at least 22 AHRS sites with prehistoric components are recorded for Amalik Bay, some dating as early as 5,650 years ago (G. Clark 1977). Some of these are substantial shell middens two meters or more in depth, and in some areas the density of sites per kilometer of shoreline may approach that of some heavily settled areas on Kodiak. The convoluted coastal setting of Kukak Bay, where one large village site is known to contain at least 89 housepits (G. Clark 1977) and at least one site dates to Ocean Bay I times, appears very similar to that of Amalik Bay.

The difference between Puale Bay and Amalik Bay or Kukak Bay lies in the complexity of their coastlines, the diversity of habitats and resources available, the relative abundance of protected waters and shellfish beds, and the overall reliability of human subsistence resources. It appears that resource diversity and accessibility should be given equal (or greater) weight as that given to other ecological variables that condition the intensity of human settlement along the Pacific coast of the Alaska Peninsula.

Cape Douglas

Compared to the shorelines of both Puale and Amalik bays, the coast south and west of Cape Douglas is relatively straight, broken by few lagoons of any size, and very exposed. Between Cape Douglas and Cape Chiniak, a straight-line distance of about 55 km, there are only about 90 linear km of shoreline, broken only by relatively shallow bays and a few small lagoons. For the first 50 km of this shoreline, the coast is almost completely unbroken by even small lagoons. Through most of this area, the shoreline consists of wave battered sand, gravel, or boulder beaches that support few shellfish or other intertidal resources. Northeast of Hallo Bay, the relatively narrow coastal plain is backed by a nearly continuous mountain wall, and is dissected by only occasional salmon streams of limited diversity and productivity. Only one small seabird colony has been mapped along this stretch of coast (Sowles *et al.* 1978:Map 43).

Not coincidentally, only seven prehistoric sites have been recorded between Cape Douglas and Cape Chiniak, only two within the northeastern half. Two of the seven sites are located on an island near a pinniped haulout, and, except for one large village site located in a protected lagoon setting, the other sites all appear to be relatively small, shallow, or contain limited quantities of midden debris. Along the 52 km of coast between Cape Douglas and Swikshak Lagoon, no major prehistoric archaeological sites have been recorded.

Alaska Peninsula Summary

Near the end of his analysis of site distributions on the Alaska Peninsula, Dumond (1987:160) stated:

> It is almost, if not quite, accurate to say that on the islands of the Kodiak group and on those of the eastern Aleutians, everywhere there could be a visible archaeological site, there is one. The same statement simply cannot be made of the Pacific coast of the Alaska Peninsula as it is thus far known archaeologically. And yet in terms of available resources, with the routine presence of

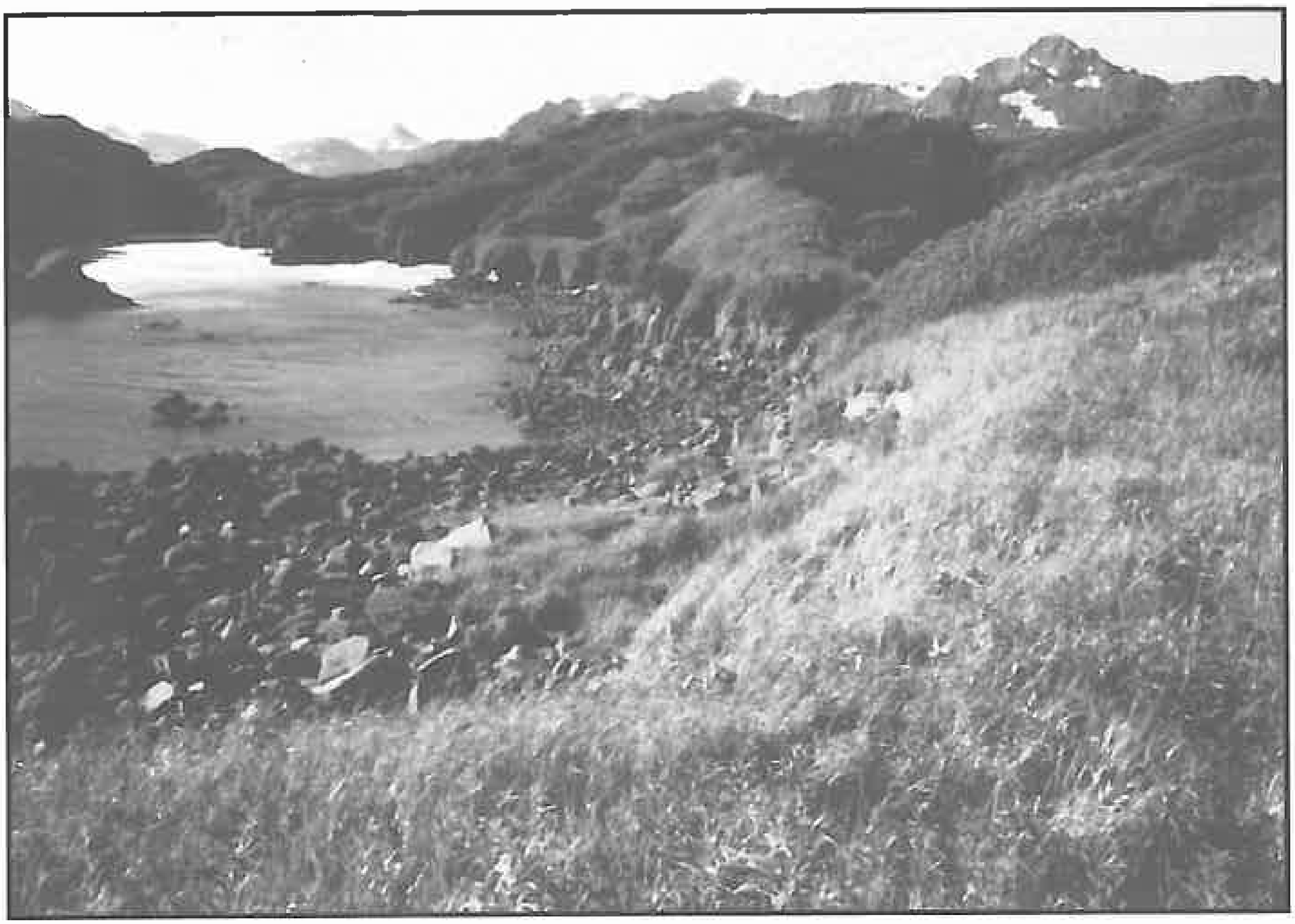
[R. Reanier 15:21]

Figure 115 Aerial view of entrance to Puale Bay

harbor seals and other sea mammals even where major rookeries and haulouts are absent, with small but regular runs of chum and pink salmon and char in even the most insignificant of the tumbling coastal streams, with beds of clams in most coastal bays, with plentiful halibut and cod offshore, and with caribou available not only a short distance across the mountains, but along the coast itself in at least small herds, the Pacific coast of the Peninsula should have equaled any of those other regions in its attractiveness to late prehistoric people. It apparently did not, and the reasons for this failure are not now evident.

What all of the foregoing does point to, however, is the inadequacy of subsistence resources alone as a predictor of the location of human population.

The distribution and density of seasonally aggregated subsistence resources like pinnipeds, seabirds, and salmon are not always good predictors of the distribution, density, and intensity of human settlement. They are important factors to consider, but diversity, productivity, and accessibility of resources are major factors in conditioning human settlement since these determine the stability and risk involved in living in a particular location. Along the more exposed coasts of the Alutiiq area, the accessibility of hunting habitats (as well as landforms suitable for occupation) may be the critical variable, since even a million pinnipeds are of little use to hunter-gatherers if they are inaccessible most of the time. In many cases, smaller or more



[M. Eldridge 11:8]

Figure 116 Semi-protected, convoluted shoreline, Takli Island

dispersed resources like shellfish, bottomfish, sea otters, whales, and others may be equally or even more important. Finally, several cultural variables must be considered, including human population size, available technology, division of labor within a society, prestige related to certain pursuits, the location of territorial boundaries, and relations with neighboring groups.

In this light, lower prehistoric population densities for the Alaska Peninsula's Pacific coast (compared to the Kodiak area) are predictable. In his analysis of maritime adaptations of southern Alaska, McCartney (1988:49) described the coastal habitats of the Alaska Peninsula as "a *punctuated* coastal pattern of ecologically rich embayments separated by areas of sparse marine resources." In this statement, McCartney appears to have been referring primarily to the Bering Sea coast, since he earlier described the distribution of marine resources along the Pacific coast as "more uniform" (McCartney 1988:46). In reviewing the available archaeological and resource data, however, our experience suggests the "punctuated productivity" model may be useful in understanding human settlement along the Alaska Peninsula's Pacific coast. The differences between the Puale Bay, Amalik Bay, and Cape Douglas areas effectively illustrate the spatial variation in the distribution of both subsistence resources and archaeological sites.

McCartney's (1988:46) "punctuated productivity" model for the north coast of the Alaska Peninsula described intensive settlement clustered around "ecological hotspots" where major lagoons punctuate a relatively straight and unprotected Bering Sea coast. The spatial inequities in resource distributions are not as pronounced for the Pacific coast of the peninsula, but they are clearly present. Productive protected habitats like those in Amalik and Kukak bays provide shelter for a diverse range of relatively accessible food resources, resource characteristics that probably supported sustained and heavier human settlement throughout the prehistory of such areas. Relatively exposed coasts like those found south of Cape Douglas or in Puale Bay appear to lack the diversity of accessible habitats, productive shellfish beds, and other resources, and appear to have been relatively lightly settled during most periods of prehistory. Such patterns are reflected in Puale Bay despite the presence of a major pinniped rookery on the islets offshore. Due to unfavorable sea conditions and a paucity of alternative resources, Puale Bay appears to have relatively few substantial archaeological sites.

Conclusions

A host of traits and adaptations are shared by the archaeological cultures of the Alutiiq region. Variation in the productivity and spatial distribution of resources is substantial enough, however, that it had major effects on the adaptations of various groups. The effects of this environmental variation are evident on both regional and local scales, and are also apparent in the divergent post-contact histories of the different areas.

Regionally, differences in resource productivity, diversity, and accessibility resulted in variation in the size and density of human populations and archaeological sites in different parts of the Alutiiq region. Locally, the same type of variation is evident within different bays on the Alaska Peninsula's Pacific coast and other parts of our study area. Regionally and locally, differences in the distribution and abundance of land vs. marine food resources led to variation in the intensity of maritime adaptations. The availability of raw materials (i.e., chipped stone vs. slate) and resources also caused technological variations in local and regional assemblages.

At any point in time, differences in resource distribution, along with demographic and social factors, had important implications for where hunter-gatherers settled, what resources they exploited, what seasonal movements (if any) occurred, what types of tools they made and used, and how they interacted with their neighbors. The adaptations of past societies in the Alutiiq region varied with their population densities. Consequently, reconstructing spatial and temporal variations in paleodemography is critical to understanding changes in Alutiiq adaptations. As population densities gradually grew among the Alutiiq and their predecessors, the nature of settlement, subsistence, and socio-political and economic interaction also changed. After European contact, population decline and economic disruption rapidly changed the nature of Alutiiq adaptations. We must be extremely cautious and selective in extrapolating post-contact adaptations backward to the pre-contact era.

If temporal shifts in population affected past adaptations, then spatial variation in population densities must also have had effects. Given the evidence for substantial variation in human population densities within the Alutiiq region, we should also expect substantial variation in adaptations to exist. This is particularly true when the evidence for demographic variation is combined with the environmental variation documented in the region.

The proximity of various Alutiiq groups to different neighbors (Aleut, Bering Sea Eskimo, Tanaina, Eyak and Tlingit, etc.) with distinct cultural traditions also clearly influenced the technological and artistic variability evident in the archaeological record of the region. Within the Alutiiq region, resource disparities ultimately led to significant variation in population density, wealth, power, trade, and overall cultural complexity.

The results of Exxon's 1990 Cultural Resource Program investigations have contributed a large body of data which, when analyzed from a cultural ecological perspective, suggests that complex precontact maritime settlement and subsistence practices occurred, along with dramatic post-contact culture change. The potential of systematically collected data from intensive archaeological survey has been proven on Kodiak, (e.g., Jordan and Knecht 1988), the Northwest Coast (e.g., Haggarty and Inglis 1983, 1985; Moss 1989), and in many other areas. Data from intensive surveys, especially when combined with C^{14} dating and the analysis of resource distributions, can provide important insights into the nature of maritime adaptations on the southern Alaska coast and the effects of European contact on Alutiiq societies. Non-destructive site mapping, stratigraphic profiling, detailed descriptions of midden constituents, and the collection and dating of C^{14} samples provide important information on the age, structure, function, and contents of sites. They are relatively cost-effective methods of gathering management and research data, especially where archaeological resources are threatened by severe erosion, vandalism, and other destructive forces. The data gleaned from such studies will allow more informed decisions about future site investigations to be made, enabling better management of the resources and a deeper understanding of the maritime cultural ecology of Prince William Sound and the Gulf of Alaska.

CHAPTER 8

SUMMARY AND CONCLUSIONS

The 1990 Exxon Cultural Resource Program accomplished its primary goal of protecting cultural resources during 1990 oil spill treatment. The procedures outlined in 36 CFR 800 which implement Section 106 of the National Historic Preservation Act were followed as described in the 1990 Work Plan of the Exxon Cultural Resource Program (Appendix A). These procedures were designed to identify and protect cultural properties during shoreline treatment. Given the size and scope of the undertaking, the site protection project was a unique test of the Section 106 process. The cooperation between state and federal agencies, Native organizations, and Exxon on a wide range of cultural resource issues illustrates the effectiveness of the Section 106 process, and of Exxon's response in compliance with state and federal historic preservation laws and regulations.

The 1990 Exxon Cultural Resource Program identified archaeological and architectural sites potentially impacted by shoreline treatment, determined the effect which planned treatment would have on these resources, and mitigated potential impacts to sites located in shoreline treatment areas. Site identification was accomplished through analysis of archaeological site and survey data compiled during the 1989 response effort, and through the use of new data collected in 1990 during intensive surveys of subdivisions requiring additional assessment. The procedure for determining the effect of treatment on cultural resources was formalized in CTAG, a consultative review process implemented as required under Section 106 of the National Historic Preservation Act.

The 1989 and 1990 archaeological data were used by CTAG to determine the effect of planned treatment on cultural resources in beach subdivisions scheduled for treatment. Shoreline treatment could proceed only after CTAG formally reviewed each subdivision and determined the appropriate constraint, and after the SHPO and FOSC signed the Shoreline Evaluation form. The Cultural Resource Program's mitigative responsibility was to ensure that the CTAG, SHPO, and FOSC-approved archaeological constraints were followed during shoreline treatment.

The Cultural Resource Program's site update procedures provided detailed information on the location, extent, nature, and condition of sites within the project area. The program's educational instruction trained Exxon treatment supervisors and beach personnel to recognize cultural resources and to follow a set of procedures that involved notification of Cultural Resource Program staff if cultural resources were encountered. The presence of professional archaeologists in the field with cleanup personnel reinforced the importance of cultural resource protection.

This report summarized the results of the 1990 Cultural Resource Program's compliance effort, combined them with the results obtained during the 1989 program, presented the site data gathered for each of the four major land managing (permitting) agencies, and analyzed the data in relation to known Alutiiq sites. Cultural Resource Program archaeologists collected considerable data on new sites and previously-known sites to protect sites during periods of shoreline treatment. 1989 SCAT reconnaissance surveys (Mobley *et al.* 1990) and intensive surveys required by CTAG in 1990 more than doubled the number of sites known from within the project area. Three hundred and twenty six (54%) of the 609 sites in the project area were identified by Exxon Cultural Resource Program staff. Five hundred and thirty-four (88%) of the sites in the project area were visited, some several times, as part of the site protection effort.

This report analyzed and interpreted all available cultural resource data from the Alutiiq region. This analysis indicates an effective compliance effort since the project collected extensive site data in a way that facilitates greater understanding of Alutiiq site type, nature, age, and distribution. Archaeological information recovered during 1989 and 1990 were merged with AHRS data and selected natural resource data from the Alutiiq region and interpreted from a cultural ecological perspective. An investigation of the relationship between the distribution, density, and diversity of natural resources and archaeological sites in the Alutiiq region, and analysis of Alutiiq demographics and social factors, indicated that complex pre-contact maritime settlement and subsistence practices occurred, along with dramatic post-contact culture change. This assessment of Alutiiq cultural ecology proposed additional shoreline surveys, C^{14} dating, and faunal analysis as avenues for future research to further clarify the nature of Alutiiq maritime adaptations.

Accurate archaeological site survey and documentation records, including maps, photographs, videotapes, and written descriptions of project area sites, features, and artifacts, are an essential ingredient of historic preservation law compliance. These data have been compiled and are presented in a 600 page confidential volume which has been provided only to the four permitting agencies and to the two Native organizations. The original documentation from the Cultural Resource Program will be available to cultural resource managers and qualified researchers through a curation agreement executed with the Rasmuson Library, University of Alaska Fairbanks in partial fulfillment of a term of agreement in the MOA. The data collected during this project are useful to state and federal agencies and Native regional organizations who administer cultural resources on lands they manage, and also form a valuable collection of research material pertinent to the history of southcentral Alaska. The final disposition of artifacts and samples collected during field work is still being negotiated.

The implementation of CTAG and the standardization of the archaeological constraint process were significant administrative contributions of the 1990 Cultural Resource Program. The creation of a separate archaeological forum for review, discussion, and approval of archaeological constraints; the direct involvement of agency and Native organization cultural resource representatives in decision-making; the flexibility which was built into the inspection constraint; and the compliance authority vested in field archaeologists are among CTAG's specific contributions. The CTAG process was an important administrative achievement of the Cultural Resource program with potential application to a wide range of emergency situations involving cultural resource protection.

Many of the approaches developed and implemented by Exxon's Cultural Resource Program to protect sites in an emergency situation are being adopted for use internationally. For example, Canada has developed SCAT process manuals for shorelines in British Columbia (Owens *et al.* 1991) and the Great Lakes region (Woodward-Clyde Consultants 1991) and has plans for two more; one for the eastern provinces and another for the Beaufort Sea area. These manuals describe the advances made in archaeological site protection by the Exxon Cultural Resource Program. The province of British Columbia also has compiled shoreline data and published an oil spill response atlas for one high risk area on the west coast of Vancouver Island (Dickins *et al.* 1990). A second atlas is nearing completion and a third is in the planning stage. These and other publications (Haggarty *et al.* 1991a; Harper *et al.* 1991a, 1991b) are based on needs identified and processes developed and implemented by the Cultural Resource Program as part of the Valdez response.

The project also increased public awareness of the need to manage and protect cultural resources. Education efforts were aimed at Exxon employees and contractors involved in shoreline treatment and the general public through financial support and participation in Alaska Archaeology Week programs in 1990 and 1991. Increasing treatment personnel's awareness of and concern for the protection of cultural resources was an essential step in mitigating potential human impacts to cultural resources. Also, the distribution of project reports to individuals, universities, libraries, and museums throughout all 50 states, five US territories, seven Canadian provinces, and seven foreign countries has made important new cultural resource information readily available to all interested parties. These educational efforts are based on the assumption that information regarding the worth of archaeological resources must be communicated to the public if the intent of state and federal cultural resource regulations is to be understood and observed.

Site videotaping techniques developed and implemented by project archaeologists proved effective from both a compliance and research perspective. Videotaping sites using portable, weather-proof, 8mm videotape cameras to document site condition prior to, during, and after treatment greatly enhanced the accurate recording of site location and condition data. Extensive site videotape documentation provided detailed audio and visual information on site composition, features, artifacts, erosion, vandalism, significance, and, most importantly, the spatial relationships between site characteristics and setting. The compliance, research, and eventual archival values of archaeological site videotapes for documentation, mapping, and subsequent analysis are immense.

Specific Exxon Cultural Resource Program contributions to the knowledge of Alutiiq archaeological sites in the region include the identification of subsided wet sites containing rare organic artifacts, the cataloging and description of intertidal zone artifact scatters, the systematic survey of previously-unsurveyed shorelines, the dating of ancient habitation deposits in rockshelters and selected tephra layers throughout the project area, and the detailed documentation of large previously-unknown villages and peripheral camps. These contributions enhance our understanding of Native history in the region prior to European contact, and indicate research and management opportunities.

The project also documented many sites in the region which relate to human occupation and use during the post-contact period. These sites contain information relating to Russian colonization, trade, fox-farming, mineral prospecting and mining, logging, commercial fishing, and World War II-era military defense. The documentation of these sites furthers our knowledge and understanding of the many changes which have occurred in the region since the mid-1700s, and indicates avenues for oral history research pertaining to the recent history of southcentral Alaska. This report has analyzed and interpreted features of both the Native and non-Native history of the Alutiiq region in addition to reporting on compliance matters as required by the permitting agencies.

The primary objective of the 1990 Exxon Cultural Resource Program was to ensure that disturbance to cultural resources was minimized during shoreline treatment. This objective was achieved through intensive archaeological survey, site consultation and inspection, site monitoring, incident investigations, education efforts, and artifact collection. These site protection endeavors enabled Exxon to proceed with shoreline treatment and remain in compliance with state and federal historic preservation laws and regulations. The transmittal of this report to the permitting agencies and to Native organizations through the SHPO marks the final step in the compliance process. The wide distribution of the published version of this report promotes the importance of Alaskan cultural resource site inventory, protection, management, and study.

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LIST OF APPENDIX ABBREVIATIONS

Abbreviation	Landowner/Manager
AJV	Afognak Joint Venture - (The following corporations have merged with AJV:Afognak Native Corporation; Akhiok-Kaguyak, Inc.; Anton Larson, Inc.; Ayakulik, Inc.; Dells Flats Natives, Inc.; Koniag, Inc.; Karluk Village;Leisnoi, Inc.; Litnik, Inc.; Nu-Nachk Pit, Inc.; Ouzinkie Native Corporation; Old Harbor Native Corporation; Port Lions Native Corporation; Shuyak, Inc.; Uganik Natives, Inc.; Uyak Natives, Inc.)
AJVS	Afognak Join Venture Selected
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CAC	Chugach Alaska Corporation
CACS	Chugach Alaska Corporation Selected
CG	US Coast Guard
CI	Cook Inlet Regional Corporation
CIS	Cook Inlet Regional Corporation Selected
CO	City of Ouzinkie
COE	US Army Corps of Engineers
COH	City of Homer
COK	City of Kodiak
COS	City of Seward
CS	Chickaloon Moose Creek Native Association, Inc. Selected
CVC	Chenega Village Corporation
CVCS	Chenega Village Corporation Selected
DNR	Alaska Department of Natural Resources
DNRS	Alaska Department of Natural Resources Selected
EB	English Bay Native Corporation
EBS	English Bay Native Corporation Selected
FAA	Federal Aviation Administration
FS	US Forest Service
FW	Far West, Inc.
FWS	US Fish and Wildlife Service
FWS-T	US Fish and Wildlife Service Uplands and Tidelands
FWST	US Fish and Wildlife Service Tidelands Only
KI	Koniag, Inc.
KS	Knikatnu, Inc. Selected
NOK	Natives of Kodiak
NOKS	Natives of Kodiak Selected
NPS	National Park Service
NS	Ninilchik Native Association, Inc. Selected
PG	Port Graham Native Corporation
PGS	Port Graham Native Corporation Selected
PRV	Private
SN	Seldovia Native Association, Inc.
SNS	Seldovia Native Association, Inc. Selected
SS	Salamatoff Native Association, Inc. Selected
TS	The Tyonek Native Corporation Selected
USN	US Navy

	Park/Refuge
AK MAR NWR	Alaska Maritime National Wildlife Refuge
ANAKCHK NP	Aniakchak National Park
BECHRF NWR	Becharof National Wildlife Refuge
KACH BA SP	Kachemak Bay State Wilderness Park
KATMAI NP	Katmai National Park
KEFJ NP	Kenai Fjords National Park
KODIAK NWR	Kodiak National Wildlife Refuge
SHUYAK SP	Shuyak State Park
USFWS-T	US Fish and Wildlife Tideland

	Site Type
HAS	Historic Artifact Scatter
HIO	Historic Isolate
HST	Historic Structure
MDN	Midden
PAS	Prehistoric Artifact Scatter
PIO	Prehistoric Isolate
PST	Prehistoric Structure
RKA	Rock Art
RKS	Rockshelter
RPT	Reported
SHP	Shipwreck

	Archaeologist
RB	Robert Betts
PMB	Peter Bowers
PEB	Paul Buck
VB	Virginia Butler
AC	Aron Crowell
ME	Morley Eldridge
JG	Jim Gallison
JH	Jim Haggarty
SL	Stefanie Ludwig
RM	Robert Mack
CM	Charles Mobley
BR	Bruce Ream
RR	Rick Reanier
CW	Chris Wooley

APPENDIX A

June 8, 1990

1990 WORK PLAN FOR THE EXXON CULTURAL RESOURCE PROGRAM

This Work Plan, to be carried out in 1990 under the supervision of the Coast Guard with the advice of the U.S. Forest Service (USFS), applies the procedures set out in 36 CFR Part 800 to implement Section 106 of the National Historic Preservation Act, as amended. It supersedes a Work Plan attached as Appendix B to a Memorandum of Agreement developed in draft form to facilitate the Section 106 process for oil spill activities in 1989. The implementation of the following procedures by Exxon is intended to identify and protect cultural properties per Stipulation B.2. (Coast Guard) of the Agreement.

IDENTIFICATION

Identification of known sites along shorelines that may be subject to Oil Spill Treatment is accomplished through the examination of existing inventories, primarily the Alaska Heritage Resource Survey (AHRS) files maintained by the DNR. All newly-discovered cultural properties resulting from the EXXONCultural Resource Program activities of 1989 have been entered into the AHRS files. Other land owning agencies and parties are to provide any additional information not included in the AHRS files. Relevant data from existing inventories is provided to qualified Exxon archaeologists responsible for the field examination of shoreline segments. Site-specific data from existing inventories is provided only to Exxon archaeologists in order to maintain its confidentiality; it is not provided to Exxon treatment personnel or other contractors.

In some cases the AHRS data, which now includes the 1989 EXXONCultural Resource Program information collected as part of the Shoreline Cleanup Assessment Team (SCAT) process, are sufficient to make determinations of effect for treatment activities on specific shoreline segments. In other cases, intensive level survey is required to collect additional data with which to make determinations of effect. The decision as to whether existing data are sufficient, or whether intensive level survey is needed, is made by the State Historic Preservation Officer (SHPO) based upon initial recommendations by the EXXON Cultural Resource Program, in consultation with the Cultural Technical Advisory Group (CTAG). Members of CTAG include the Coast Guard, USFS, Exxon, SHPO, appropriate land owners, and appropriate Native organizations. Criteria for deciding the need for intensive level survey include the type and intensity of treatment, the degree of confidence in the existing data, and the sensitivity of known cultural resources, as outlined in the document entitled "EXXON Cultural Resource Program 1990 Internal Decision Tree."

Intensive level survey as used herein is defined by the "Secretary of the Interior's Standards and Guidelines for Identification," which requests information on: the kinds of properties looked for; the boundaries of the area surveyed; the method of survey, including an estimate of the extent of survey coverage; and a record of the precise location of all properties identified. As per those Guidelines, information on the appearance, significance, integrity, and boundaries of each property will be collected, although--because of the nature of the undertaking and the Advisory Council's declaration that all properties will be considered eligible to the National Register of Historic Places--that information may not be sufficient to permit an evaluation of its significance. Additionally, information sufficient to judge the cultural resources susceptibility to treatment impacts or other oil spill related activities will be collected. Subsurface testing and use of soil probes during intensive level survey will be limited to circumstances where environmental considerations suggest the likelihood of a buried site which is otherwise not confirmed by surface evidence, or in circumstances in which information on the subsurface boundaries of a known cultural property is necessary to judge the site's susceptibility to treatment related impacts. Collection of artifacts will be limited to those encountered in subsurface tests, or those for which collection is a suitable protection strategy.

DETERMINATION OF EFFECT

Determination of Effect involves a review process by CTAG, in which information on the cultural resources present and the planned treatment methods are evaluated. Ordinarily, CTAG has two days to review information for shoreline segments and advise the SHPO on potential effects. Appropriate constraints, consisting of mitigation techniques to protect known or suspected cultural resources, are identified by CTAG and entered on the Shoreline Evaluation form, which is then forwarded to the Technical Advisory Group (TAG) and signed by the SHPO, and forwarded to the Federal on Scene Coordinator (FOSC) for approval. The Section 106 consultation process is fulfilled by virtue of the membership of CTAG, which includes the appropriate land owners and Native groups.

MITIGATION

Mitigation techniques for cultural resources are identified as constraints for each individual shoreline segment subsection, and are thus subject to review by CTAG, approval by the SHPO, and approval by the FOSC. Potential impacts may be mitigated by specific modifications to the treatment techniques, education of treatment personnel, avoidance of treatment, monitoring of a site by an Exxon archaeologist during treatment, or artifact or data collection. The discovery of human remains in a continued spill response and treatment effort will involve the documentaton and notification of the appropriate land owning agency, who will involve law enforcement and Native parties as appropriate. All steps necessary to avoid disturbance of human remains by oil spill related activities will be taken, as per the assessment and review process described above. Locational information will be kept confidential as provided by the Archaeological Resources Protection Act. Steps to be taken when heretofore unidentified cultural sites are discovered during treatment are included in the Shoreline Treatment Manual, as well as the standard constraint. Field evaluation by members of CTAG occurs at their discretion, with transportation provided by Exxon, and comments directed through CTAG to the Coast Guard.

Reports on the cultural resource program shall follow standards and guidelines as recommended by the Secretary of the Interior. A confidential interim report, to be filed with the permitting agencies by January 15, 1991, shall include descriptions of areas examined, resources documented, summaries of impacts on specific sites, and supporting maps. The final report shall be inclusive and will assess impacts to the cultural resources identified by the treatment operations. Detailed site descriptions and site locational information not necessary to the technical report will be included as a separate confidential volume. A single draft technical compliance report will be submitted to all permitting agencies for review by April 1. Following an agency review period of 30 days duration, a final report will be filed no later than July 31 and distributed to the professional community as appropriate.

APPENDIX B

Cultural Resource Program Data Inventory

Year	File	Number
Original Data File		
1989	Field SCAT Data Files by Segment	2603
	Field Site Monitoring Records	142
	Post Cleanup Assessment Records	108
	Site Incident Records	28
	Bioremediation Resurvey Records	28
	Photographic Records:	
	B/W negatives	5821
	Color negatives	956
	Color slides	1655
	Videotapes (1/2 inch tape)	57
	Field Notebooks	79
1990	Field SSAT Data Files by Subdivision	3420
	Intensive-level Archaeological Survey Records 2	90
	Site Inspection/Monitoring Records	264
	AHRS Site Updates	165
	Site Incident Records	54
	Photographic Records:	
	B/W negatives	4160
	Color negatives	153
	Color slides	2400
	Videotapes (1/2 inch tape)	71
	Field Notebooks	80
	AHRS Site Records	607
	14(H)(1) Selection Records	108
Duplicate Data File		
1989	Original data files organized by segment	
1990	Original data files organized by subdivision	

Maps

USGS Quad Reference Maps (1:63,360)
Blue Line enlargements of USGS Quad Reference Maps
USGS Quad Reference Maps with 14(h)(1) Selections Plotted (1:63,360)
USGS Maps with AHRS Sites Plotted (1:250,000)

Electronic Data Files

Administration Files

- Correspondence
- Memos
- Manuscripts and Reports
- Permit Applications
- AHRS
- CTAG
- Personnel
- Forms

Field Files

- 1990 Site Recording Files
- Segment/Subdivision Survey Files (1989/90)
- Site Inspection/Monitoring Files
- Site Incident Files

Report/Manuscripts

- 1989 Interim Report Drafts
- 1989 Interim Report
- 1989 Final Report Drafts
- 1989 Final Report
- 1990 Interim Report Drafts
- 1990 Interim Report
- 1990 Final Report Drafts

Data Bases

- 1989 35 mm Photographic Index
- 1990 35 mm Photographic Index
- 1989 Videotape Index
- 1990 Videotape Index
- 1989 AHRS Site Description Data
- 1990 AHRS Site Description Data
- 1990 Site Attribute Data
- 1990 Site Status Data
- 1989 Segment Constraint/Survey Tracking
- 1990 Subdivision Constraint/Survey Tracking
- 1990 Inspection/Monitoring Tracking
- US Forest Service Fox Farm Permit Index

APPENDIX C

1990 Exxon Cultural Resource Program
Treatment Inspections

Sub Division	Region	Landowner	Treat ment Date1	Arch1	Treat ment Date2	Arch2	Treat ment Date3	Arch3	Treat ment Date4	Arch4	Treat ment Date5	Arch5
BA-001B	PWS	FS/CACS/CVCS	5/04	JG/SL	6/05	PEB/RB	6/22	RR	8/26	RR		
CH-001A	PWS	CVC	6/15	BR								
CH-900A	PWS	CVC	7/03	RM/VB								
CR-005E	PWS	FS	5/26	BR/RR								
DA-001A	PWS	FS	5/10	JG/BR	5/11	JG/BR	7/17	SL	8/19	ME	8/31	CW
EL-011A	PWS	FS	5/13	ME/PMB								
EL-015A	PWS	FS	5/23	ME/VB	6/30	SL						
EL-054A	PWS	FS	5/25	ME/VB								
EL-055B	PWS	FS	5/20	PMB/ME								
EL-056C	PWS	FS	5/19	PMB/ME								
EL-057A	PWS	FS	9/02	PMB								
EL-106B	PWS	FS	6/25	BR/RR								
EL-107C	PWS	FS	8/31	PMB	9/01	PMB						
EL-109A	PWS	FS	5/24	ME/VB	9/01	PMB						
ER-009A	PWS	FS	5/31	RM/PEB	6/14	RR/BR						
EV-027A	PWS	CVC	5/15	ME/PMB								
EV-027AF	PWS	CVC	7/03	RM/VB								
FL-002A	PWS	CVC	5/15	PMB/ME								
GR-001AA	PWS	FS	6/29	VL/RR								
GR-009A	PWS	FS	6/25	BR/RR								
GR-103A	PWS	FS/CACS	7/29	SL								
GR-103AF	PWS	FS/CACS	6/25	RR/BR								
GR-103B	PWS	FS/CACS	6/25	RR/BR	8/15	RR/ME						
KN-0026A	PWS	CVC	6/18	RR/BR								
KN-0113A	PWS	FS	5/24	ME/VB	7/12	VB	8/01	SL				
KN-0132B	PWS	FS	5/25	ME								
KN-0132C	PWS	FS	5/27	ME/VB								
KN-0136A	PWS	CVC	6/17	RR/BR	7/21	RR						
KN-0201A	PWS	CVC	8/29	PMB/RR	9/05	PB						
KN-0206A	PWS	CVC	6/17	RR/BR	6/17							
KN-0211E	PWS	FS	7/01	PMB/JG	7/04	VB	9/11	PMB				
KN-0212A	PWS	CVC	5/14	ME/PMB								
KN-0401A	PWS	FS	6/29	RR								
KN-0401B	PWS	FS	6/29	RR	9/05	PMB						
KN-0401B	PWS	FS	6/29	RR								
KN-0405A	PWS	CVC/CG/CACS	7/17	SL								
KN-0500A	PWS	FS	7/05	PMB/JG								
KN-0500B	PWS	FS	7/05	PMB/JG								
KN-0503A	PWS	FS	7/10	RM/VB								
KN-0505A	PWS	FS	7/10	RM/VB								
KN-0704A	PWS	CVC/PRV/CACS	7/24	SL/RR								
LA-015B	PWS	CVC	8/13	RR								
LA-015C	PWS	CVC	6/27	BR	7/02	VB/RR	8/01	SL	9/05	PMB	9/06	JG
LA-015D	PWS	CVC	8/28	PMB	9/13	JG/PMB						
LA-018A	PWS	CVC	7/05	VB	9/06	CW	9/07	PMB				
LA-019A	PWS	CVC	8/28	PMB/RR	9/06	PMB	9/13	JG				
LN-001A	PWS	FS	6/03	PEB/RM	8/15	RR						
LN-002A	PWS	FS	6/25	BR/RR	8/31	JH						

1990 Exxon Cultural Resource Program
Treatment Inspections

Sub Division	Region	Landowner	Treatment Date1	Arch1	Treatment Date2	Arch2	Treatment Date3	Arch3	Treatment Date4	Arch4	Treatment Date5	Arch5
LN-006A	PWS	FS	6/05	PEB/RB	6/07	ME/BR	6/25	RR/BR	8/15	RR		
MN-007B	PWS	FS	7/23	RR/SL								
MU-003A	PWS	FS	6/26	BR								
PR-002A	PWS	FS	7/21	RR/SL	7/30	SL	9/05	JG/PMB	9/06	PMB		
PR-007A	PWS	FS	6/07	BR/ME								
SE-041A	PWS	CG/CACS	5/02	JG	5/14	PMB/BR						
MI-001A	KODIAK	DNR	8/15	PMB								
NB-001D	KODIAK	DNR	7/20	RR/ME								
SL-002A	KODIAK	BIA	6/30	PEB/RB								
SS-002B	KODIAK	DNR/BIA/PRV	7/23	BR/ME								
CB-001A	KENAI	PG	7/12	RM								
CB-003A	KENAI	PG	5/16	RR/SL	5/29	PMB/JG						
PD-001A	KENAI	DNR	6/19	PEB/RB	6/27	RM/VB						
PD-001B	KENAI	DNR	6/19	PEB/RB	6/27	RM/VB						
PD-008A	KENAI	DNR	6/19	PEB/RB								
PE-002A	KENAI	PRV	8/13	VB								
PY-006A	KENAI	FWS	5/05	PEB/RB								
PY-012B	KENAI	FWS	5/14	PEB/RB								
PY-015B	KENAI	FWS/PGS/EBS	5/09	PEB/RB								
RB-005A	KENAI	PG	6/26	RM/VB								
RB-005B	KENAI	PG	6/27	RM/VB								
TB-006A	KENAI	DNR	7/31	CW								
US-005A	KENAI	FWS	6/03	PMB/JG								
US-005B	KENAI	FWS	6/03	PMB/JG	7/30	VB						
US-008A	KENAI	FWS	6/03	PMB/JG	8/01	VB	8/07	VB				
US-010A	KENAI	FWS	8/02	VB	8/07	VB	9/02	JH				
US-012A	KENAI	FWS	8/05	VB	8/07	VB						
WB-009A	KENAI	PG	5/31	PMB/JG	6/04	JG	6/24	VB/CW				
YG-002A	KENAI	DNR	5/29	PMB/JG	7/05	JH	7/09	VB/RR				
CC-002A	AK PEN	NPS	7/03	PEB/RB								
CD-018A	AK PEN	NPS	7/05	PEB/RB								
CG-001A	AK PEN	NPS	8/04	PMB/JG								
PB-019B	AK PEN	FWS	6/25	PEB/RB	8/05	PMB/JG						
XX-500A	AK PEN	NPS	7/08	BR/ME								

APPENDIX D

1990 Exxon Cultural Resource Program
Bioremediation/Sampling Inspections

Sub Division	Region	Landowner	Bio Date1	Arch1	Bio Date2	Arch2	Bio Date3	Arch3	Bio Assess Date1	Arch1	Bio Assess Date2	Arch2	Sample Date	Arch1
CG-001A	AK PEN	NPS											8/06	PMB/JG
CB-001A	KENAI	PG	8/10	VB										
CB-003A	KENAI	PG	6/25	VB/RM										
GP-1001A	KENAI	DNR											7/18	AC
PD-001A	KENAI	DNR	7/18	CW									7/18	AC
PD-001B	KENAI	DNR											7/18	AC
PY-012B	KENAI	FWS	7/22	CW										
PY-015B	KENAI	FWS/PGS/EBS	7/22	CW										
RB-003U	KENAI	PG											7/18	AC
RB-005A	KENAI	PG	6/27	VB/RM	8/10	VB							7/18	AC
RB-005B	KENAI	PG	6/26	VB/RM	8/18	CW							7/18	AC
TB-003A	KENAI	DNR											7/18	AC
US-005B	KENAI	FWS	8/17	PEB/RB										
YG-002A	KENAI	DNR	8/09	JH										
BI-010A	KODIAK	FWS-T											7/25	BR/ME
SB-005A	KODIAK	FWS/BIA/KISH											8/10	PMB/JG
SS-002B	KODIAK	DNR/BIA/PRV	7/23	BR/SL										
BA-001B	PWS	FS/CACS/CVCS	9/05	PMB										
CH-001A	PWS	CVC	7/02	RM/VB	8/24	RR	8/26	RR						
DA-001A	PWS	FS	7/18	SL										
EL-011A	PWS	FS	7/04	RM/VB	8/05	ME/BR	9/05	PMB						
EL-015A	PWS	FS	8/29	PMB/RR										
EL-054A	PWS	FS	6/27	RR	7/31	SL	9/04	RR/PMB						
EL-055B	PWS	FS	6/25	BR/RR	7/31	SL	9/04	RR/PMB						
EL-056C	PWS	FS	6/26	RR	7/31	SL	9/04	RR/PMB						
EL-057A	PWS	FS	6/26	RR	7/31	SL	9/04	RR/PMB	6/10	BR/ME	7/08	VB		
EL-104D	PWS	FS											7/08	VB/RM
EL-106B	PWS	FS	7/10	VB/RM	8/20	RR	9/05	PMB						
EL-109A	PWS	FS	7/10	VB/RM	9/11	PMB								
ER-009A	PWS	FS	9/01	CW										
FL-002A	PWS	CVC	6/10	ME/BR										
GR-001AA	PWS	FS	7/11	VB	8/13	RR	9/02	PMB					6/20	RR
GR-009A	PWS	FS	6/25	RR/BR	8/14	RR	9/02	PMB					6/20	RR
GR-103A	PWS	FS/CACS	7/29	SL	9/02	PMB								
GR-103AF	PWS	FS/CACS	7/29	SL										
GR-103B	PWS	FS/CACS	7/29	SL	8/30	RR/ME	9/02	PMB	7/12	VB				
IN-031A	PWS	FS							7/23	SL/RR	7/26	SL/RR		
KN-0113A	PWS	FS	7/12	VB	9/05	SL			6/04	PEB/RM			7/19	SL
KN-0132B	PWS	FS	6/01	PEB/RM	8/24	PMB	9/05	PMB						
KN-0132C	PWS	FS	6/19	BR										
KN-0201A	PWS	CVC	5/31	RM/PEB	6/25	BR/RR								
KN-0207A	PWS	CVC											7/09	VB/RM

1990 Exxon Cultural Resource Program
Bioremediation/Sampling Inspections

Sub Division	Region	Landowner	Bio Date1	Arch1	Bio Date2	Arch2	Bio Date3	Arch3	Bio Assess Date1	Arch1	Bio Assess Date2	Arch2	Sample Date	Arch1
KN-0212A	PWS	CVC	7/05	RM/VB	7/21	SL								
KN-0213A	PWS	CVC											6/21	RR
KN-0300A	PWS	FS	7/10	JG/PMB	8/13	RR			7/07	VB				
KN-0401A	PWS	FS	7/29	RR	8/06	ME	8/29	PMB/RR						
KN-0401B	PWS	FS	7/29	RR	8/06	ME	8/29	PMB/RR						
KN-0405A	PWS	CVC/CG/CACS	7/17	SL	8/11	MR/RR	9/02	PMB			7/18	RR		
KN-0500A	PWS	FS							7/07	VB				
KN-0500B	PWS	FS							7/07	VB				
KN-0503A	PWS	FS	7/10	RM/VB										
KN-0505A	PWS	FS	7/11	RM/VB	7/28	SL	7/31	CW						
LA-015B	PWS	CVC	7/05	VB	7/10	VB	8/13	RR					7/19	SL
LA-015C	PWS	CVC	7/03	VB	7/10	VB	9/05	PMB	6/21	VB	7/07	VB	7/19	SL
LA-018A	PWS	CVC	7/05	VB										
LA-019A	PWS	CVC	9/13	JG										
LG-001U	PWS	FS											6/21	RR
LN-001A	PWS	FS	7/21	SL	8/20	RR	9/05	PMB						
LN-006A	PWS	FS	6/12	BR/VB	8/01	CW	9/05	PMB	6/10	BR/ME				
LN-011A	PWS	FS											7/09	VB/RM
MN-007B	PWS	FS	8/15	RR										
MU-003A	PWS	FS	6/26	BR	6/29	SL								
PR-002A	PWS	FS	7/05	VB	7/26	SL								
PR-007A	PWS	FS	7/04	RM/VB	7/30	SL	9/05	PMB	6/10	BR/ME	7/08	VB	7/09	RM/VB
SL-001E	PWS	FS/CACS	7/15	SL	8/24	RR	9/11	PMB						
ST-000U	PWS	FS											6/24	RR/BR

APPENDIX E

1990 Exxon Cultural Resource Program
Treatment Monitoring

Sub Division	Block	Region	Landowner	Treatment Date 1	Arch1	Treatment Date 2	Arch2	Treatment Date 3	Arch 3	Treatment Date 4	Arch 4
AM-001A	K13-04	AK PEN	FWS/AJVS	8/14	JG						
AM-002A	K13-03	AK PEN	FWS/AJVS	8/14	JG						
EA-001A		KENAI	FWS	8/04	VB	8/09	VB				
MR-001A		KENAI	NPS/PGS	8/01	RB/AC	8/04	RB/AC	8/26	CW	8/29	PEB/RB
NK-004C		KENAI	DNR	5/12	PEB/RB	5/13	PEB/RB				
PD-003A		KENAI	DNR	5/04	PEB/RB						
US-002A		KENAI	FWS	5/29	JG/PMB	6/01	JG/PMB	8/08	VB		
WB-003D		KENAI	PG	6/27	VB/RM	7/22	AC	8/22	PEB/RB		
CK-005A	K06-19	KODIAK	FWS/BIA	8/05	PMB/JG						
FB-013B	K02-04	KODIAK	FWS-T	6/06	PMB/JG	6/08	PMB/JG				
SI-005A	K01-11	KODIAK	FAA/DNR	7/18	ME/BR	7/20	ME/BR				
BA-001C		PWS	FS/CACS/CVCS	5/30	PEB/RM	6/21	RR				
CH-014A		PWS	CVC	6/20	BR						
CH-015A		PWS	CVC	6/20	BR						
CR-002C		PWS	FS/CACS	6/05	RB						
DI-066A		PWS	FS	7/15	PMB/JG						
EL-013B		PWS	FS	7/13	PMB/JG						
EL-056C		PWS	FS	5/19	ME/PMB	8/31	PMB/RR				
EL-058B		PWS	FS	5/19	ME/PMB	8/15	RR				
EL-058C		PWS	FS	5/20	ME/PMB						
EL-058D		PWS	FS	7/13	PMB/JG						
GR-301B		PWS	FS/CACS	6/28	SL	9/01	RR				
KN-0103A		PWS	FS/CACS	7/07	PMB/JG	7/13	PMB/JG				
KN-0104A		PWS	FS/CACS	7/07	PMB/JG	7/13	PMB/JG				
KN-0110A		PWS	FS	5/25	RR/SL	5/27	ME				
KN-0209A		PWS	FS	6/03	PEB/RM	8/08	ME/BR				
LA-023A		PWS	PRV	5/24	ME/VB	5/25	VB				
LA-024A		PWS	PRV	6/01	VB/RB						
LA-037A		PWS	CAC	9/11	JG	9/13	PB				
MU-001C		PWS	FS/CACS	6/26	BR						
PR-016A		PWS	FS/CACS	9/11	PMB						
SM-005B		PWS	FS	7/17	RR						
SP-019A		PWS	FS	8/02	SL						

APPENDIX F

1990 Exxon Cultural Resource Program
Bioremediation/Sampling Monitoring

Sub Division	Region	Landowner	Bio-remed. Date 1	Arch 1	Bio-remed. Date 2	Arch 2	Bio remed. Date 3	Arch 3	Bio Assess. Date 1	Arch 1	Sample Date 1	Arch 1
MR-001A	KENAI	NPS/PGS	8/03	RB/AC	8/29	PEB/RB						
US-002A	KENAI	FWS							8/17	PEB/RB		
SB-005A	KODIAK	FWS/BIA/KISH									8/09	PMB/JG
BA-001C	PWS	FS/CACS/CVCS	6/22	RR					6/21	RR		
CR-002C	PWS	FS/CACS	6/06	RB								
DI-066A	PWS	FS	7/15	PMB/JG								
EL-013B	PWS	FS	7/20	PEB/RB	8/05	BR/ME	9/07	JG/PMB				
EL-056C	PWS	FS	6/26	RR	7/31	SL	9/04	RR				
EL-058B	PWS	FS	6/27	RR	7/31	SL	9/04	RR				
EL-058C	PWS	FS	6/27	RR	7/31	SL						
EL-058D	PWS	FS	7/19	PEB/RB								
KN-0103A	PWS	FS/CACS	7/13	PMB/JG	8/24	PMB	8/29	PMB/RR			6/23	RR
KN-0104A	PWS	FS/CACS	7/13	PMB/JG	8/24	PMB	9/08	JG				
KN-0110A	PWS	FS	7/03	PMB/JG	8/24	PMB						
KN-0209A	PWS	FS	7/29	RR	8/04	ME/BR	8/29	RR/PMB				
MU-001C	PWS	FS/CACS	6/30	SL	8/15	ME	9/13	PMB	8/09	BR/ME	6/30	SL
SM-005B	PWS	FS	8/03	RR/ME	8/04	BR/ME	8/13	ME				

APPENDIX G

Chugach National Forest Special Use Permits
Fur and Fox Farms

Date Applied	* Permitted Location	Permittee Personal	Permittee Business	Area	Type	Cancel Date
7/01/09	PWS	Liljegren			Fox ranch	5/21/14
9/27/10	Bettles Island	Miller			Marten ranch	12/03/12
12/29/11	Goose Island	Kenney			Fox ranch	8/27/13
1/01/12	PWS		Gibbons, Wm. and Associates		Fox ranch	4/27/15
1/01/12	Gage Island	Fleming			Fox ranch	7/01/13
1/01/12	Bligh and Busby Islands	Laviosa			Fox ranch	
1/01/12	Naked and Peak Islands	McPherson			Fox ranch	
1/01/12	Naked and Peak Islands	McPherson		11264 a	Fox ranch	5/28/35
3/09/12	Chugach National Forest	Erigh			Fox ranch	8/27/13
7/09/12	Saltery Site	Lambert				10/07/12
9/15/12	Christie Island	Christie			Fur farm	
10/29/12	Raspberry Strait	Sharatin		40 ac	Fox ranch	6/07/13
1/10/13	Perry Island	Siewertsen		9160 ac	Blue fox ranc	10/21/21
1/10/13	Olson Island	Siewertsen		296 ac	Fox ranch	10/30/33
2/17/13	Goose Island	Blakney			Fox ranch	4/07/15
5/26/13	PWS	Shumaker			Fox ranch	
7/29/13	Fairmont Island	Beyer			Fox ranch	
8/01/13	Long Island		Harris & Brown	510 ac	Fox ranch	
1/01/14	Green Island	Haxby		7714 ac	Fox ranch	
1/01/14	Green Island	Haxby		7714 ac	Fur farm	7/22/27
10/02/14	Kenai Lake	Deegan		10 ac	Fox ranch	12/27/15
10/21/14	Goose Island	Laviosa			Fox farm	
8/05/15	PWS	Staniner		320 ac	Fox ranch	
3/20/16	Smith Island	Fleming		480 ac	Fox ranch	12/21/20
3/22/16	Chugach National Forest	Emil			Fox ranch	
3/25/16	Seal Island	Jackson			Fox ranch	
7/20/16	Bald Headed Chris Is.	Jefferson		102 ac	Fox ranch	12/03/23
10/30/16	Squirrel Island	Ogata			Fox farm	
12/26/16	Dutch Group	Jefferson		100 ac	Fox ranch	9/25/20
4/21/17	Goose Island		Laviosa & Nielsen	408 ac	Fox ranch	8/06/23
10/09/17	Olsen Islands	Ross		320 ac	Fox ranch	8/28/20
1/01/18	Fairmont Island		Beyer and Davis	800 ac	Fox ranch	10/09/25
1/14/18	Eleanor Island	Hirose			Fox ranch	
8/29/18	Observation Island		Kulper & Baker		Fox ranch	
8/30/18	North Island		Kulper & Baker		Fox ranch	
1/01/19	Bligh, Busby Islands		Cloudman Estate	6960 ac	Fox ranch	10/19/20
1/30/19	Eleanor Island	Shumaker		3336 ac	Fox ranch	10/30/31
2/20/19	Glacier Island	McCrary			Fox ranch	
3/13/19	Fleming Island		Gordon & Dickenson	1428 ac	Fox ranch	4/17/23
4/26/19	Glacier Island	Crompton			Fox ranch	
5/24/19	Elrington Island		Kulper & Baker	9120 ac	Fox ranch	6/20/23
5/24/19	Elrington Island		Kulper, Baker & Moldenhauer	9120 ac	Fur farm	10/14/21
5/24/19	Elrington Island	Kulper		9120 ac	Fur farm	11/15/27
6/14/19	Kanak Island	Hill		1625 ac	Fox ranch	5/02/21
6/16/19	Seal Island	Agamalian		61 ac	Fox ranch	3/03/25
8/03/19	Bettles Island	Bush		80 ac	Fox ranch	11/04/20
8/11/19	Observation Island	Towsley			Fox ranch	
8/18/19	Glacier Island	Hermsdorf			Fox ranch	1/03/20

Chugach National Forest Special Use Permits
Fur and Fox Farms

Date Applied	* Permitted Location	Permittee Personal	Permittee Business	Area	Type	Cancel Date
12/09/19	Squirrel Island	McLean		25 ac	Fox ranch	8/28/20
1/03/20	Glacier Island	Hoyt		12241 a	Fox ranch	12/31/26
1/08/20	PWS	Rogers		60 ac	Fox ranch	1/10/21
3/09/20	PWS	Cochran		800 ac	Fox ranch	12/14/20
3/22/20	Observation Island	Nettleton		160 ac	Fox ranch	1/20/21
7/13/20	PWS	Porter		306 ac	Fox ranch	12/14/22
8/28/20	Olsen Island		McLean & Lambert	320 ac	Fox ranch	?/? /21
9/25/20	Dutch Group	Liljegren		61 ac	Fox ranch	9/06/23
10/19/20	Bligh, Busby Islands		Stewart & McDonald	8387 ac	Fox ranch	8/07/3?
12/21/20	Smith Islands		St. Clair & Reitan	480 ac	Fox ranch	9/26/21
1/18/21	Eaglek Bay	Whiteford		357 ac	Fox ranch	8/06/23
1/19/21	Observation Island	Aiken		160 ac	Fox ranch	9/21/21
2/18/21	Bettles Island	McCrary		80 ac	Fox ranch	10/03/21
3/10/21	PWS	Fleming		170 ac	Fox ranch	10/31/21
4/02/21	PWS		Liljegren & Wagner	1765 ac	Fox ranch	8/03/28
6/27/21	PWS	Van		61 ac	Fur farm	
8/10/21	Kanak Island	Hoover		1642 ac	Fox ranch	11/02/22
8/16/21	Perry Island		McLean, Lambert & Kisling	10997 a	Fox ranch	11/14/23
9/11/21	Observation Island	Overseth		176 ac	Fox ranch	11/12/24
9/17/21	Bettles Island	Sullivan		112 ac	Fur farm	12/26/22
9/24/21	Channel Island	Anderson		68 ac	Fox ranch	12/21/26
10/03/21	Squirrel Island	Reiter		51 ac	Fox ranch	5/06/22
10/31/21	Smith Islands	Fleming		989 ac	Fox ranch	5/26/32
10/31/21	PWS	Wallace		170 ac	Fox ranch	5/02/22
1/18/22	PWS	Van		377 ac	Fur farm	5/01/40
2/02/22	PWS	Schmidt		61 ac	Fur farm	11/06/22
2/10/22	Sheep Bay		Vevig & Drazenovich	163 ac	Fur farm	4/14/24
2/15/22	PWS	Nielsen		30 ac	Fur farm	8/15/22
3/01/22	PWS	Bennett		173 ac	Fur farm	7/28/23
3/22/22	North Island	Anderson		11 ac	Fur farm	12/28/23
3/25/22	PWS	Singletary		41 ac	Fur farm	4/13/27
4/15/22	Martin Island	Durkee		50 ac	Fur farm	7/13/23
6/21/22	Russian River	Bishop		52 ac	Fur farm	7/19/3?
7/12/22	Ingot Island	Shumaker		2400 ac	Fur farm	10/30/31
9/21/22	Squirrel Island	Laviosa		61 ac	Fox ranch	9/20/28
12/05/22	Applegate Island	Hana		306 ac	Fox ranch	1/25/29
12/27/22	Bettles Island	Rogers		99 ac	Fur farm	3/12/27
1/11/23	PWS	Allen		3 ac	Fox ranch	
2/28/23	Fleming Island	Tregoning		1428 ac	Fur farm	10/30/30
3/10/23	PWS	Kulper			Fur farm	
4/20/23	Squire Island	Buckley		1480 ac	Fur farm	8/26/??
5/20/23	Kanak Island	Simonds		1642 ac	Fur farm	1/11/34
6/09/23	Eaglek Bay		Quist & Cox	357 ac	Fur farm	5/2?/26
7/03/23	PWS	Liljegren		173 ac	Fur farm	1/10/28
8/06/23	The Dutch Group	Liljegren		61 ac	Fur farm	1/13/27
8/06/23	Goose Island	Nielsen		408 ac	Fur farm	10/04/23
10/04/23	Goose Island		Nielsen & Spitz	408 ac	Fur farm	1/06/27
10/16/23	Perry Island		Lambert & Kisling	10997ac	Fox farm	2/21/45
12/03/23	Bald Headed Chris Is	McLean		102 ac	Fur farm	12/31/51

Chugach National Forest Special Use Permits
Fur and Fox Farms

Date Applied	* Permitted Location	Permittee Personal	Permittee Business	Area	Type	Cancel Date
12/24/23	PWS	Anderson		11 ac	Fur farm	12/21/26
3/05/24		Thacker			Fur farm	5/25/25
3/18/24	Simpson Bay	Tiedeman		11 ac	Fox ranch	
3/18/24	Simpson Bay	Tiedeman		11 ac	Fur farm	9/15/30
4/06/24	Little Green Island		Green Island Blue Fox Corp.		Fox ranch	5/20/26
4/07/24	Sheep Bay	Vevig		163 ac	Fur farm	12/21/26
4/29/24	Observation Island	Overseth		176 ac	Fox ranch	5/18/38
5/09/24	Lone Island		Gordon, Dickenson, & Brown	510 ac	Fur farm	2/14/28
6/08/24	PWS	Porter		5 ac	Fur farm	10/22/29
1/10/25	Kenai Lake	Newman		4.9 ac	Fur farm	10/23/28
1/31/25	Seal Island	Seeley		61 ac	Fur farm	9/10/30
3/14/25	Fairmont Island		W.C.L. Beyer & Son	800 ac	Fox ranch	8/16/3?
7/09/25	Wooded Island	Cunningham		700 ac	Fox farm	9/10/30
10/24/25	Wingham Island		Koppen & Townsend	1560 ac	Fur farm	2/21/31
2/09/26	Copper River Delta		Janey & Gussie	27 ac	Fur farm	11/19/30
5/18/26	Eaglek Bay	Quist		357 ac	Fur farm	8/14/28
12/21/26	Sheep Bay		Vevig & Anderson	51 ac	Fur farm	1/26/31
12/21/26	Dutch Group	McLean		61 ac	Fur farm	8/02/28
1/01/27	Glacier Island		Hoyt, O'Leary & McGrath	12241 a	Fur farm	11/29/27
1/03/27	Goose Island	Nielsen		408 ac	Fur farm	10/14/??
2/23/27	Bettles Island	Sealey		99 ac	Fur farm	10/13/27
5/23/27	Afognak Island		Hogg, Tecklenberg & Watt		Fur farm	5/16/28
6/24/27	PWS	Seeley		41 ac	Fur farm	1/25/28
8/11/27	North Island	Cunningham		11 ac	Fur farm	7/18/30
8/19/27	Bettles Island		Gilliland & Rogers	99 ac	Fur farm	7/11/29
11/23/27	Glacier Island		O'Leary & McGrath	12241 a	Fur farm	5/17/28
11/26/27	Elrington Island	Baker		9120 ac	Fur farm	12/31/3?
1/01/28	Green Island	O'Neill		7714 ac	Fur farm	12/21/33
1/12/28		Seeley			Fur farm	
1/21/28	PWS		Minor & Sanders	173 ac	Fur farm	3/25/29
1/25/28	Lone Island		Lambert & Kisling	510 ac	Fur farm	2/21/45?
4/18/28	Glacier Island	O'Leary		12241 a	Fur farm	12/07/50
5/01/28	Afognak Island		Blue Island Packing Co	210 ac	Fur farm	8/19/36
6/20/28	PWS		Liljegren & Beyer	1765 ac	Fur farm	9/21/40
6/20/28	PWS		Liljegren & Beyer	1765 ac	Fur farm	12/06/44
7/26/28	Dutch Group	Erb		61 ac	Fur farm	6/19/39
9/13/28	Squirrel Island	Kasenek		61 ac	Fur farm	8/26/29
9/23/28	Copper River Delta	Austel		20 ac	Fur farm	12/31/3?
10/23/28	Kenai Lake	Newman		4.9 ac	Fur farm	
3/25/29	Crafton Island	Minor		173 ac	Fur farm	2/26/30
7/11/29	Bettles Island	Rogers		99 ac	Fur farm	?/1?/??
8/12/29	PWS	Kompkoff		61 ac	Fur farm	11/10/??
10/22/29	PWS		Porter & Scott	5 ac	Fur farm	10/30/32
2/26/30	Crafton Island	Scott		173 ac	Fur farm	5/11/??
3/29/30	Eyak Lake Road	Isom			Fur farm	3/29/30
9/17/30	North Island	Tiedeman		11 ac	Fur farm	4/02/54
2/21/31	Wingham Island	Hedenstad		1560 ac	Fur farm	12/31/37
2/28/31	Fleming Island	Atkinson		1428 ac	Fur farm	12/31/37
10/31/31	Bettles Island	Pay		99 ac	Fur farm	7/20/36

Chugach National Forest Special Use Permits
Fur and Fox Farms

Date Applied	* Permitted Location	Permittee Personal	Permittee Business	Area	Type	Cancel Date
12/12/31	Eleanor Island	Shumaker		50 ac	Residence	9/16/32
5/17/32	Eleanor Island	Shumaker		580 ac	Fur farm	3/11/47
8/07/33	Olsen Island	McLean		296 ac	Fur farm	11/14/46
10/11/33	Kanak Island	Knuteson		1642 ac	Fur farm	12/31/43
3/01/34	Green Island	Slevin		7714 ac	Fur farm	10/30/39
9/05/34	Eaglek Islets	McLean		357 ac	Fur farm	11/14/46
5/08/35	Peak Island	Clock		1391 ac	Fur farm	4/17/50
10/14/35	Goose Island	Shaw		408 ac	Fur farm	12/31/40
8/07/36	Bligh, Busby Islands	McDonald		8387 ac	Fur farm	12/01/44
8/16/37	Fairmont Island	Pedersen		800 ac	Fur farm	9/16/46
5/18/38	Observation Island	Dverseth		176 ac	Fur farm	3/18/46
7/15/38	Wingham Island	Hedenstad		5.72 ac	Fur farm	7/31/50
10/03/40	PWS	Van		438 ac	Fur farm	10/01/42
1/01/41	Goose Island	Shaw		2.35 ac	Residence	12/01/59
9/21/42	PWS	Jackson		438 ac	Fur farm	12/03/59
5/05/43	PWS	Eleshansky		173 ac	Fur farm	7/01/59
1/18/45	Perry Island	Lambert		10997 a	Fox farm	12/31/50
1/19/45	Lone Island	Lambert		510 ac	Fur farm	12/31/50
3/08/46	Observation Island	Cook		176 ac	Fur farm	2/20/47
3/18/46	Mud Lake	Reid		10 ac	Fur farm	12/18/46
8/08/46	Eaglek Islets	McLean		357 ac	Fur farm	12/31/51
8/26/46	Fairmont Island	Fletcher		800 ac	Fur farm	12/31/52
8/06/49	Olsen Island	McLean		296 ac	Fur farm	8/03/51
12/07/50	Glacier Island	O'Leary		5 ac	Residence	4/30/54
6/21/51	Olsen Island	Maxwell		296 ac	Fur farm	12/03/59

* References to specific site locations have been edited from this appendix

APPENDIX H

1990 Exxon Cultural Resource Program
Intensive Surveys

Sub Division	Region	Landowner	CTAG Survey	Subdivision Completion Survey	Judge-mental Survey	Archaeologists	Survey Length (Meters)	Survey Duration (Minutes)	Date Survey Complete
CC-005A	AK PEN	NPS	X			PEB/RB	996	150	6/24
CC-100A	AK PEN	NPS	X			PEB/RB	3831	200	6/24
CD-018A	AK PEN	NPS	X			PEB/RB	4504	345	6/30
CD-100A	AK PEN	NPS	X			PEB/RB	501	60	6/24
TL-001A	AK PEN	NPS	X			PMB/RB/PEB/JG	7463	1680	7/21
XX-500A	AK PEN	NPS	X			RB/PEB	900	120	6/25
EA-001A	KENAI	FWS		X		PMB/JG	540	152	6/06
MR-001A	KENAI	NPS/PGS	X			CM/PEB/RB	241	1220	4/30
NK-004C	KENAI	DNR	X			PEB/RB	10911	2175	5/13
PD-002A	KENAI	DNR	X			PEB/RB	2387	107	5/01
PD-003A	KENAI	DNR	X			PEB/RB	581	523	5/01
PD-004A	KENAI	DNR	X			PEB/RB	11382	420	5/07
PD-004B	KENAI	DNR		X		PEB/RB	542	420	5/09
PE-002A	KENAI	PRV	X			PEB/RB	1912	330	6/23
PY-008A	KENAI	NPS/PGS/EBS		X		PEB/RB	937	23	4/27
PY-008B	KENAI	NPS/PGS/EBS		X		PEB/RB	1095	25	4/27
PY-008C	KENAI	NPS/PGS/EBS		X		PEB/RB	66	49	4/27
PY-008D	KENAI	NPS/PGS/EBS		X		PEB/RB	302	15	4/27
PY-008E	KENAI	NPS/PGS/EBS		X		PEB/RB	107	29	4/27
PY-008F	KENAI	NPS/PGS/EBS	X			PEB/RB	1355	20	4/27
RB-003A	KENAI	PG	X			AC/LB	557	75	7/19
WB-003A	KENAI	PG	X			RB/PEB	1322	55	5/05
WB-003B	KENAI	PG	X			RB/PEB	806	366	5/05
WB-003C	KENAI	PG	X			RB/PEB	222	20	5/05
WB-003D	KENAI	PG	X			RB/PEB	4125	127	5/05
WB-003E	KENAI	PG	X			RB/PEB	511	41	5/05
WB-009A	KENAI	PG	X			RB/PEB	196	216	4/28
CK-005A	KODIAK	FWS/BIA	X			ME/BR	4341	480	7/14
NB-001B	KODIAK	DNR	X			PEB/RB	2736	270	6/11
NB-001C	KODIAK	DNR	X			JG/PMB	698	170	6/09
NB-001D	KODIAK	DNR	X			BR/ME	11663	1290	7/14
SI-100A	KODIAK	DNR	X			PEB/RB	3132	240	6/27
SL-015A	KODIAK	AJV	X			PMB/JG	1331	450	6/14
AE-005A	PWS	FS	X			PMB/PEB	358	41	4/13
AE-005B	PWS	FS	X			PMB/PEB	1396	194	4/13
AE-005C	PWS	FS	X			PMB/PEB	291	20	4/13
BA-006A	PWS	FS/CVCS		X		BR/JG/RM	12451	420	5/22
BA-006C	PWS	FS/CVCS	X			BR/RR	3525	420	6/16
BL-012A	PWS	FS	X			PMB/PEB/JG	3111	360	4/04
CH-009A	PWS	CVC		X		SL	454	105	8/04
CH-009B	PWS	CVC	X			RB/JG	781	160	4/11
DI-061A	PWS	FS/CACS			X	VB/RM	611	180	6/10
DI-062A	PWS	FS			X	SL/ME	565	60	6/19
DI-062B	PWS	FS			X	SL/ME	260	60	6/19

1990 Exxon Cultural Resource Program
Intensive Surveys

Sub Division	Region	Landowner	CTAG Survey	Subdivision Completion Survey	Judge-mental Survey	Archaeologists	Survey Length (Meters)	Survey Duration (Minutes)	Date Survey Complete
DI-065A	PWS	FS	X			SL/RR	2273	150	6/17
DI-066A	PWS	FS	X			ME/SL	319	780	6/17
EL-010A	PWS	FS	X			PMB/PEB/JB	522	80	4/04
EL-013A	PWS	FS	X			BR/JG/SL/RR	654	300	5/24
EL-013B	PWS	FS	X			BR/JG/SL/RR	778	795	5/24
EL-015A	PWS	FS	X			RR/BR	1277	910	4/30
EL-053A	PWS	FS		X		ME/SL	1032	115	4/28
EL-053B	PWS	FS	X			SL/RR	468	30	5/22
EL-056A	PWS	FS		X		RB/JG/SL/RR	147	200	5/31
EL-056B	PWS	FS		X		SL/RR	360	60	5/31
EL-056C	PWS	FS	X			RB/JG/RR/SL	191	170	4/07
EL-056D	PWS	FS		X		SL/RR	951	135	5/31
EL-057A	PWS	FS		X		SL/RR	654	300	5/29
EL-058A	PWS	FS		X		RR	203	60	6/01
EL-058B	PWS	FS	X			SL/RR	795	210	6/01
EL-058C	PWS	FS	X			SL/RR	642	120	6/01
EL-058D	PWS	FS	X			SL/RR	359	60	6/01
EL-109A	PWS	FS	X			PMB/PEB/JG	3441	105	4/04
EN-046A	PWS	FS	X			SL/RR	1402	75	5/21
EN-046B	PWS	FS	X			ME/SL	890	185	4/19
ER-011A	PWS	FS	X			PMB/PEB	1287	240	4/11
ER-022A	PWS	FS	X			PMB/PEB	1366	85	4/12
EV-025A	PWS	CVC	X			PMB/PEB	280	45	4/12
GR-015A	PWS	FS	X			PMB/RR	4449	925	5/16
GR-301B	PWS	FS/CACS	X			RR/BR/PMB	6892	1270	5/14
IN-022A	PWS	FS	X			PMB/PEB/RB/VB	1340	210	4/03
IN-022B	PWS	FS		X		PMB/PEB	614	45	4/03
IN-022C	PWS	FS		X		PMB/PEB	248	25	4/03
IN-022D	PWS	FS		X		PMB/PEB	600	52	4/03
IN-028A	PWS	FS	X			BR/RR	636	90	4/27
IN-029A	PWS	FS	X			PEB/RB	483	86	5/26
IN-030A	PWS	FS	X			BR/JG	1375	600	5/21
IN-030B	PWS	FS		X		BR/JG	713	600	5/21
IN-033A	PWS	FS/CACS	X			PEB/RB	1491	57	5/24
IN-033B	PWS	FS/CACS	X			PEB/RB	2780	170	5/24
KN-0103A	PWS	FS/CACS	X			RB/JG/PEB/PMB	2282	342	4/07
KN-0104A	PWS	FS/CACS	X			RB/JG/PMB/PEB	1350	342	4/12
KN-0104B	PWS	FS/CACS	X			RR/BR	1099	200	4/12
KN-0106A	PWS	FS	X			ME/SL	630	115	4/27
KN-0106B	PWS	FS	X			ME/SL	262	60	4/27
KN-0106C	PWS	FS		X		SL/ME/RB/PEB	627	88	4/27
KN-0106D	PWS	FS	X			ME/SL	590	195	4/27
KN-0106E	PWS	FS		X		RB/PEB	231	120	5/30
KN-0106U	PWS	FS		X		ME/SL	120	75	4/27
KN-0107A	PWS	FS	X			PEB/RB	599	116	5/25
KN-0107B	PWS	FS	X			PEB/RB	690	95	5/25
KN-0108A	PWS	FS	X			SL/RR	729	90	5/26
KN-0113A	PWS	FS	X			ME/SL	363	435	4/30

1990 Exxon Cultural Resource Program
Intensive Surveys

Sub Division	Region	Landowner	CTAG Survey	Subdivision Completion Survey	Judge-mental Survey	Archaeologists	Survey Length (Meters)	Survey Duration (Minutes)	Date Survey Complete
KN-0113B	PWS	FS	X			ME/SL	418	30	4/30
KN-0114A	PWS	FS	X			PMB/PEB	988	170	4/14
KN-0115A	PWS	FS	X			PMB/PEB	1789	195	4/14
KN-0129A	PWS	FS		X		RB/JG	273	102	4/11
KN-0129B	PWS	FS	X			RB/JG	259	102	4/11
KN-0134A	PWS	CVC	X			PMB/PEB	382	165	4/06
KN-0135A	PWS	CVC	X			PMB/PEB	285	75	4/06
KN-0135B	PWS	CVC	X			PMB/PEB	264	100	4/10
KN-0136A	PWS	CVC	X			PMB/PEB	340	65	4/08
KN-0400A	PWS	FS	X			RB/JG	1176	70	4/03
KN-0401A	PWS	FS	X			RB/JG	709	118	4/03
KN-0401B	PWS	FS	X			RB/JG	687	118	4/03
KN-0403A	PWS	FS		X		PMB/PEB	1451	111	4/08
KN-0403B	PWS	FS	X			PMB/PEB	947	74	4/08
KN-0411A	PWS	CVC	X			BR/JG	1562	965	5/13
KN-0412A	PWS	CVC	X			BR/JG	637	60	5/21
KN-0500A	PWS	FS	X			RB/JG	2428	226	4/09
KN-0500B	PWS	FS	X			RB/JG	281	226	4/09
KN-0577B	PWS	FS/CACS	X			SL/ME	8053	750	6/17
KN-0701B	PWS	CVC	X			RB/JG	236	10	4/03
KN-0701C	PWS	CVC	X			RB/JG	727	39	4/03
KN-0702A	PWS	CVC	X			PEB/PMB	218	20	4/11
KN-0702B	PWS	CVC		X		PEB/PMB	2419	215	4/11
LA-017A	PWS	CVC	X			SL/ME	158	20	4/24
LA-018A	PWS	CVC	X			SL/ME	390	120	4/23
LA-019A	PWS	CVC	X			RB/JG	183	213	4/16
MN-007A	PWS	FS		X		JG/PMB	8532	360	7/10
MN-007B	PWS	FS	X			JG/PMB	6558	550	6/29
MN-500A	PWS	FS		X		RM/VB	5109	600	6/08
MN-500B	PWS	FS	X			RM/VB	5183	630	6/09
NA-005A	PWS	FS	X			RB/PEB	2471	220	4/13
NA-006B	PWS	FS	X			SL/ME	3432	345	5/05
NA-006C	PWS	FS	X			SL/ME/JG	4743	480	5/06
NA-026A	PWS	FS		X		BR/RB	583	1380	6/08
NA-026B	PWS	FS	X			ME/SL/BR/RM	5622	1330	5/26
NA-026C	PWS	FS		X		SL/ME	541	300	6/28
NJ-002A	PWS	FS	X			ME/SL	2285	600	6/17
PR-004A	PWS	FS	X			PEB/RB	3399	235	5/26
PR-006A	PWS	FS	X			BR/RM	1488	555	5/24
PR-016A	PWS	FS/CACS	X			RB/JG/RB/PEB	15000	1400	4/15
SE-041A	PWS	CG/CACS		X		JG/SL/BR/PMB	2081	1061	5/14
SM-005A	PWS	FS	X			PMB/PEB/JG	451	210	4/07
SM-005B	PWS	FS	X			PMB/PEB/JG	1292	210	4/07
SM-006A	PWS	FS	X			BR/RR	1521	245	4/28
SM-006B	PWS	FS	X			BR/RR	914	180	4/28
SM-006C	PWS	FS	X			BR/RR	1473	110	4/28
SQ-002A	PWS	FS	X			RB/JG	5983	127	4/15

APPENDIX I

1990 Exxon Cultural Resource Program
New AHRS Sites

AHRS	Region	Site Type	Found During Survey	Found During Insp/ Monitr	Upland Site Component	ITZ Site Component	Post-Contact Site	Pre-Contact Site	Sitemap Produced	Citation
AFG-171	AK PENIN	HIST ARTFCT SCATTER	X		X	X	X		X	PEB/RB 6/29/90
AFG-176	AK PENIN	MIDDEN	X		X			X		PEB/RB 6/29/90
AFG-177	AK PENIN	PREHIST ARTFCT SCATTER	X		X			X	X	ME/BR 7/8/90
XMK-070	AK PENIN	MIDDEN	X		X	X		X	X	JG/PMB 6/15/90
XMK-071	AK PENIN	MIDDEN	X		X	X		X	X	JG/PMB 6/17/90
XMK-072	AK PENIN	PREHISTORIC ISOLATE	X			X		X	X	PMB/JG 6/17/90
XMK-074	AK PENIN	MIDDEN	X		X	X		X	X	PEB/RB 6/27/90
XMK-075	AK PENIN	MIDDEN	X		X	X		X	X	BR/ME 7/17/90
XMK-076	AK PENIN	PREHISTORIC ISOLATE		X		X		X	X	JG 8/14/90
XMK-077	AK PENIN	PREHISTORIC ISOLATE	X			X		X	X	PMB/JG 6/18/90
AFG-167	KENAI	HISTORIC STRUCTURE	X		X		X		X	PMB/JG 6/5/90
AFG-168	KENAI	PREHISTORIC ISOLATE	X			X		X	X	PMB/JG 6/5/90
AFG-169	KENAI	PREHISTORIC ISOLATE	X		X	X		X	X	JG/PMB 6/6/90
AFG-170	KENAI	MIDDEN	X		X	X		X	X	JG/PMB 6/6/90
AFG-175	KENAI	MIDDEN	X		X	X		X	X	WILSON (USFWS) 5/22/90; PMB/JG 6/5/90
AFG-180	KENAI	HISTORIC STRUCTURE	X		X		X		X	PMB/JG 6/3/90
SEL-186	KENAI	MIDDEN	X		X			X	X	RM/VB 6/30/90
SEL-215	KENAI	PREHIS ARTFCT SCATTER	X			X		X	X	PEB/RB 5/6/90
SEL-216	KENAI	PREHIS ARTFCT SCATTER	X			X		X	X	PEB/RB 5/8/90
SEL-217	KENAI	PREHIS ARTFCT SCATTER	X			X		X	X	PEB/RB 5/11/90
SEL-218	KENAI	PREHISTORIC ISOLATE	X			X		X	X	PEB/RB 5/11/90
SEL-222	KENAI	HISTORIC STRUCTURE	X		X		X		X	PEB/RB 6/22/90
SEL-223	KENAI	MIDDEN	X		X		X		X	PEB/RB 6/22/90
SEL-224	KENAI	HISTORIC STRUCTURE	X		X		X		X	JG/PMB 5/31/90
SEL-225	KENAI	HISTORIC STRUCTURE	X		X		X		X	JG/PMB 5/31/90
AFG-166	KODIAK	PREHISTORIC ISOLATE	X			X		X	X	JG/PMB 6/9/90
AFG-172	KODIAK	HISTORIC STRUCTURE		X	X		X		X	JG/PMB 6/7/90
AFG-173	KODIAK	MIDDEN	X		X	X		X	X	BR/ME 7/11/90
AFG-174	KODIAK	HISTORIC STRUCTURE		X	X	X	X		X	JG/PMB 6/8/90
AFG-179	KODIAK	PREHISTORIC ISOLATE	X		X	X		X		BR/ME 7/23/90
KOD-434	KODIAK	MIDDEN		X	X			X	X	WILSON (USFWS) 7/90; JG/PMB 8/5/90
KOD-435	KODIAK	PREHISTORIC ISOLATE	X			X	X	X	X	BR/ME 7/13/90
KOD-436	KODIAK	MIDDEN		X	X	X		X	X	PB/JG 8/9/90
KOD-437	KODIAK	MIDDEN	X		X	X		X	X	BR/AC 8/23/90
KOD-438	KODIAK	PREHIS ARTFCT SCATTER	X		X	X		X	X	BR/AC 8/23/90
KOD-439	KODIAK	MIDDEN	X		X	X		X		BR/AC 8/23/90
SEW-488B	PWS	PREHIS ARTFCT SCATTER	X			X		X	X	RR/BR 4/19/90
SEW-505	PWS	ROCKSHELTER	X		X		?	X	X	ME/SL 6/13/90
SEW-509	PWS	ROCKSHELTER	X		X		X	?		ME 6/15/90
SEW-510	PWS	ROCKSHELTER	X		X			X	X	PEB/RB 5/90

1990 Exxon Cultural Resource Program
New AHRS Sites

AHRS	Region	Site Type	Found During Survey	Found During Insp/ Monitr	Upland Site Component	ITZ Site Component	Post-Contact Site	Pre-Contact Site	Sitemap Produced	Citation
SEW-513	PWS	PREHIS ARTFCT SCATTER		X		X		X	X	JG/SL 5/4/90
SEW-514	PWS	HISTORIC STRUCTURE	X		X		X	?	X	BR/JG 5/12/90
SEW-515	PWS	HISTORIC STRUCTURE	X		X		X		X	BR/JG 5/12/90
SEW-516	PWS	HISTORIC STRUCTURE	X		X		X		X	BR/JG 5/12/90
SEW-517	PWS	ROCKSHELTER		X	X			X	X	ME/PMB 5/20/90
SEW-518	PWS	ROCKSHELTER		X	X			X	X	ME/PMB 5/90
SEW-519	PWS	HISTORIC STRUCTURE	X		X		X		X	SL/ME 4/24/90
SEW-520	PWS	ROCKSHELTER	X		X			X	X	ME/SL 4/26/90
SEW-521	PWS	HISTORIC STRUCTURE	X		X		X		X	RR/BR/PMB· 4/28/90
SEW-522	PWS	HISTORIC STRUCTURE	X		X		X		X	RB/VB 5/29/90
SEW-523	PWS	HISTORIC STRUCTURE	X		X		X			SL/RR 5/30/90
SEW-524	PWS	HISTORIC STRUCTURE	X		X		X			SL/RR 5/29/90
SEW-525	PWS	HISTORIC STRUCTURE	X		X		X			RB/JG 4/12/90
SEW-526	PWS	MIDDEN	X		X	X		X	X	REAM ET AL 6/15/90
SEW-527	PWS	HISTORIC STRUCTURE	X		X		X			SL/RR 6/1/90
SEW-528	PWS	SHIPWRECK	X			X	X		X	VB/RM 6/6/90
SEW-529	PWS	PREHISTORIC ISOLATE	X		X			X		PMB/RR 5/4/90
SEW-537	PWS	ROCK ART		X		X	?	X	X	RR/SL 5/26/90
SEW-538	PWS	PREHIS ARTFCT SCATTER		X		X		X	X	PEB/RB
SEW-539	PWS	HISTORIC STRUCTURE	X		X		X		X	RB/PEB 7/25/90
SEW-541	PWS	ROCKSHELTER	X		X		?	?		RB/RR 6/2/90
SEW-542	PWS	PREHIS ARTFCT SCATTER		X		X		X	X	RR/PMB 8/29/90

APPENDIX J

1990 Exxon Cultural Resource Program
Updated AHRS Sites

AHRS	Region	Site Type	Upland Site Component	Intertidal Site Component	Post-Contact Component	Pre-Contact Component	Sitemap Produced	Citation
AFG-001	AK PENIN	MIDDEN	X	X		X	X	PMB/JG 8/4/90
AFG-043	AK PENIN	MIDDEN	X	X	X	X	X	PMB/JG 8/12/90
KAR-112	AK PENIN	HISTORIC STRUCTURE	X		X		X	PEB/RB 6/25/90
KAR-121	AK PENIN	MIDDEN	X			X		PEB/RB 6/25/90
KAR-122	AK PENIN	PREHIST ARTFCT SCATTER	X			X		PEB/RB 6/25/90
KAR-124	AK PENIN	MIDDEN	X		X	X		ME/BR 7/7/90
KAR-128	AK PENIN	PREHIST ARTFCT SCATTER	X			X		PEB/RB 6/25/90
KAR-134	AK PENIN	HISTORIC STRUCTURE	X		X			ME/BR 7/7/90
XMK-007	AK PENIN	MIDDEN	X	X	X	X	X	PEB/RB 8/18/90
XMK-021	AK PENIN	PREHIST ARTFCT SCATTER	X	X		X		RB/PEB 6/29 - 7/5/90
XMK-022	AK PENIN	MIDDEN	X	X		X	X	RB/PEB 6/27/90; ME 7/17/90
XMK-025	AK PENIN	PREHIST ARTFCT SCATTER	X	X		X	X	JG 8/14/90
XMK-058	AK PENIN	MIDDEN	X	X		X	X	BR/ME 7/23/90; JG/PMB 7/29/90, 8/3&4/90
XMK-071	AK PENIN	MIDDEN	X	X		X		JG/PMB 6/17/90; ME 7/16/90
AFG-039	KENAI	HISTORIC STRUCTURE	X		X		X	PMB/JG 6/3/90
AFG-099	KENAI	HISTORIC STRUCTURE	X		X		X	JG/PMB 6/3/90; VB 8/1/90
AFG-100	KENAI	HISTORIC STRUCTURE	X		X		X	PMB/JG 6/3/90; VB 7/30/90
AFG-101	KENAI	HISTORIC STRUCTURE	X		X		X	JG/PMB 6/06/90; VB 8/4/90
AFG-103	KENAI	MIDDEN	X			X	X	VB 8/3/90
AFG-104	KENAI	MIDDEN	X	X		X	X	JG/PMB 6/04/90; VB 6/30/90
AFG-105	KENAI	MIDDEN	X	X		X	X	PMB/JG 6/04/90; VB 7/30/90
AFG-106	KENAI	PREHISTORIC ISOLATE	X			X		VB 8/2/90
AFG-167	KENAI	HISTORIC STRUCTURE	X		X			PMB/JG 6/5/90; VB 8/4/90
AFG-168	KENAI	PREHISTORIC ISOLATE		X		X		PMB/JG 6/5/90; VB 8/4/90
AFG-175	KENAI	MIDDEN	X	X		X		PMB/JG 6/5/90; VB 7/30/90
SEL-017	KENAI	HISTORIC STRUCTURE	X	X	X			RM/VB 7/14/90
SEL-025	KENAI	HISTORIC STRUCTURE	X		X		X	RB/PEB/RM/VB 7/01/90
SEL-129	KENAI	MIDDEN	X			X		VB/RM 6/29/90
SEL-178	KENAI	MIDDEN	X	X		X	X	PEB/RB 4/30/90
SEL-179	KENAI	MIDDEN	X	X		X	X	PEB/RB 5/02/90; RM/VB 6/27/90; AC 7/22/90
SEL-181	KENAI	MIDDEN	X	X		X	X	VB/RM 6/25/90
SEL-188	KENAI	MIDDEN	X	X		X	X	RB/PEB 8/29/90
SEL-194	KENAI	MIDDEN	X	X		X	X	VB/RM 7/16/90; RM 8/9/90
SEL-195	KENAI	PREHISTORIC ISOLATE		X		X	X	PEB/RB 5/02/90
SEL-197	KENAI	PREHIST ARTFCT SCATTER		X		X	X	RB/PEB 5/9/90; AC 7/18/90
SEL-198	KENAI	MIDDEN	X	X		X	X	PEB/RB 5/05/90
SEL-206	KENAI	PREHIST ARTFCT SCATTER		X		X	X	RM 8/9/90
SEL-211	KENAI	MIDDEN	X	X		X	X	VB/RM 6/26/90
SEL-223	KENAI	MIDDEN	X		X		X	PEB/RB 6/22/90; VB 8/13/90
XBS-014	KENAI	MIDDEN	X		X	X	X	RM/VB 7/15/90
XBS-015	KENAI	MIDDEN	X			X	X	RM/VB 7/13/90
AFG-005	KODIAK	MIDDEN	X	X	X	X	X	PEB/RB 8/19/90
AFG-026	KODIAK	MIDDEN	X	X		X	X	JG/AC 8/26/90
AFG-027	KODIAK	MIDDEN	X	X		X	X	AC/JG 8/27/90
AFG-028	KODIAK	MIDDEN	X	X		X	X	JG/AC 8/28/90

1990 Exxon Cultural Resource Program
Updated AHRS Sites

AHRS	Region	Site Type	Upland Site Component	Intertidal Site Component	Post-Contact Component	Pre-Contact Component	Sitemap Produced	Citation
AFG-034	KODIAK	MIDDEN	X	X		X	X	AC/BR 8/17/90
AFG-046	KODIAK	MIDDEN	X	X	X	X	X	BR/ME 7/18/90
AFG-053	KODIAK	MIDDEN	X			X		PEB/RB 8/27/90
AFG-063	KODIAK	REPORTED	X			X		AC/JG 8/29/90
AFG-072	KODIAK	MIDDEN	X	X		X	X	PEB/RB 8/27/90
AFG-081	KODIAK	MIDDEN	X	X		X	X	PEB/RB 8/22/90
AFG-094	KODIAK	MIDDEN	X			X	X	PEB/RB 8/23/90
AFG-098	KODIAK	MIDDEN	X	X		X		BR/ME 7/13/90
AFG-111	KODIAK	PREHIST ARTFCT SCATTER		X	X	X	X	JG/PMB 6/8/90; BR/ME 7/23/90
AFG-119	KODIAK	MIDDEN	X	X		X	X	PEB/RB 8/21/90
AFG-125	KODIAK	MIDDEN	X	X		X	X	ME/BR 7/11/90
AFG-126	KODIAK	MIDDEN	X	X		X	X	BR/AC 8/15/90
AFG-127	KODIAK	MIDDEN	X	X		X	X	BR/AC 8/14/90
AFG-129	KODIAK	MIDDEN	X	X		X	X	BR/ME 7/25/90
AFG-137	KODIAK	MIDDEN	X	X		X		PEB/RB 8/21/90
AFG-138	KODIAK	MIDDEN	X	X		X	X	BR/AC 8/19/90
AFG-141	KODIAK	MIDDEN	X	X		X	X	BR/AC 8/14/90
AFG-143	KODIAK	MIDDEN	X	X		X	X	AC/JG 8/27/90
AFG-146	KODIAK	MIDDEN	X	X		X	X	BR/AC 8/15/90
AFG-148	KODIAK	MIDDEN	X	X		X		PEB/RB 8/20/90
AFG-152	KODIAK	SHIPWRECK		X	X			BR/ME 7/23/90
AFG-166	KODIAK	PREHISTORIC ISOLATE		X		X	X	PMB/JG 6/9/90; 6/14/90
KAR-098	KODIAK	PREHISTORIC STRUCTURE		X		X		JG/PMB 6/14/90
KAR-113	KODIAK	MIDDEN	X	X	X		X	PEB/RB 6/30/90
KOD-010	KODIAK	MIDDEN	X	X		X		JG/AC 8/30/90
KOD-033	KODIAK	MIDDEN	X	X		X	X	BR/AC 8/18/90
KOD-077	KODIAK	MIDDEN	X	X	X	X	X	PMB/JG 8/12/90 PEB/RB 8/24/90
KOD-171	KODIAK	MIDDEN	X	X		X	X	ME/BR 7/13/90
KOD-205	KODIAK	HISTORIC STRUCTURE	X		X			AC/JG 8/30/90
KOD-223	KODIAK	MIDDEN	X	X	X	X	X	BR/AC 8/21/90
KOD-226	KODIAK	MIDDEN	X	X		X	X	PMB/JG 8/10/90
KOD-254	KODIAK	MIDDEN	X			X	X	AC/JG 8/24/90
KOD-299	KODIAK	MIDDEN		X		X	X	AC/JG 8/24/90
KOD-351	KODIAK	MIDDEN	X	X		X	X	AC/JG 8/30/90
KOD-396	KODIAK	MIDDEN	X	X		X		PMB/JG 8/12/90; PEB/RB 8/24/90
KOD-400	KODIAK	MIDDEN	X	X		X	X	PEB/RB 8/24/90
KOD-407	KODIAK	MIDDEN	X	X	X	X	X	PEB/RB 8/26/90
KOD-414	KODIAK	MIDDEN	X	X		X	X	AC/JG 8/25/90
KOD-415	KODIAK	MIDDEN	X	X		X	X	AC/JG 8/25/90
KOD-427	KODIAK	PREHISTORIC ISOLATE	X			X		AC/JG 8/24/90
KOD-432	KODIAK	MIDDEN	X	X		X	X	PEB/RB 8/25/90
SEW-004	PWS	ROCKSHELTER	X			X		PEB/RB 7/28/90
SEW-026	PWS	HISTORIC STRUCTURE	X	X	X	X		RR/PMB 8/23/90
SEW-060	PWS	HISTORIC ISOLATE	X		X	?		RR/ME 8/14/90
SEW-061	PWS	HISTORIC ISOLATE	X		X	?		RR/ME 8/21/90
SEW-065	PWS	HISTORIC ISOLATE	X	X	X			ME/RR 8/22/90
SEW-068	PWS	MIDDEN	X	X	X	X	X	ME/RR 8/15/90; 8/21/90; 8/22/90
SEW-071	PWS	REPORTED				X		RR 6/29/90

1990 Exxon Cultural Resource Program
Updated AHRS Sites

AHRS	Region	Site Type	Upland Site Component	Intertidal Site Component	Post-Contact Component	Pre-Contact Component	Sitemap Produced	Citation
SEW-072	PWS	PREHIST ARTFCT SCATTER		X		X		RR/SL 7/26/90
SEW-073	PWS	ROCKSHELTER	X			X		RR/PMB 8/25/90
SEW-076	PWS	MIDDEN	X	X		X	X	PMB/RM 5/30/90; RR/PMB 8/24/90
SEW-077	PWS	PREHIST ARTFCT SCATTER	X	X	X	X	X	ME/BR 8/7/90
SEW-206	PWS	HISTORIC ISOLATE	X		X			RR/ME 8/21/90
SEW-234	PWS	HISTORIC STRUCTURE	X	X	X			JG/PMB 6/30/90
SEW-235	PWS	HISTORIC ISOLATE	X		X		X	VB/RM 6/10/90
SEW-236	PWS	HISTORIC STRUCTURE	X		X			RB/JG 4/06/90; PMB/JG 9/13/90
SEW-238	PWS	HISTORIC STRUCTURE	X	X	X			SL/RR 7/24/90; RR/PMB 8/31/90
SEW-240	PWS	HISTORIC STRUCTURE	X		X		X	RR/BR 4/28/90
SEW-241	PWS	PREHIST ARTFCT SCATTER	X	X	X	X		SL 7/15/90; ME 8/12/90
SEW-243	PWS	HISTORIC STRUCTURE	X		X			JH 6/09/89
SEW-245	PWS	HISTORIC STRUCTURE	X		X			RR/ME 8/22/90
SEW-248	PWS	HISTORIC STRUCTURE	X		X		X	BR/RM 5/26/90
SEW-249	PWS	ROCKSHELTER	X	X		X	X	PEB/RB 7/19/90; RR/PMB 8/25/90
SEW-276	PWS	HISTORIC STRUCTURE	X		X			JG/RB 4/12/90
SEW-292	PWS	MIDDEN		X		X		RB/PEB 7/22/90
SEW-293	PWS	PREHIST ARTFCT SCATTER		X		X		RB/PEB 7/22/90
SEW-295	PWS	PREHISTORIC ISOLATE		X		X		RB/PEB 7/22/90
SEW-337	PWS	HISTORIC STRUCTURE	X	X	X			PEB/RB 5/28/90
SEW-339	PWS	HISTORIC STRUCTURE	X		X		X	JG/SL 5/02/90; RR/PMB 9/2/90
SEW-350	PWS	PREHISTORIC ISOLATE	X	X	X	?		RR/ME 8/22/90
SEW-361	PWS	HISTORIC ISOLATE	X		X			BR/RM 5/26/90
SEW-430	PWS	ROCKSHELTER	X			X	X	RR/SL 5/22/90; ME/BR 8/5/90; RR/P 8/30/90
SEW-435	PWS	HISTORIC STRUCTURE	X	X	X		X	RR/BR 4/22/90; RB/PB/JG 3/30/90; R SL 7/16/90; RR 8/31/90
SEW-436	PWS	ROCKSHELTER	X	X		X		RR/SL 7/14/90; VB/RM 7/10/90; RR/PMB 8/30/90
SEW-437	PWS	HISTORIC STRUCTURE	X		X			RR/SL 7/14/90; RR/PMB 8/30/90
SEW-438	PWS	HISTORIC STRUCTURE	X		X		X	RR/BR 4/25/90; SL/VB 6/2/90; RR 8/13/90; RR/PEB 8/29/90
SEW-440	PWS	MIDDEN	X	X	X	X	X	ME/VB 5/27/90; JG/PEB 9/14/90
SEW-441	PWS	HISTORIC STRUCTURE	X		X			RR/PMB 9/5/90
SEW-442	PWS	HISTORIC STRUCTURE	X		X			RR/PMB 9/1/90
SEW-443	PWS	ROCKSHELTER	X			X		ME/PMB 5/19/90; SL/RR 6/1/90; JG/PMB 9/13
SEW-444	PWS	PREHISTORIC ISOLATE	X	X	X	X		SL 7/23,26,29/90
SEW-445	PWS	PREHISTORIC ISOLATE	X	X	X	?		ME/RR 8/11/90, 8/15/90
SEW-447	PWS	ROCKSHELTER	X		X	X	X	RM/PEB 6/03/90; RR 7/29/90; RR/ME 8/4/90; RR 8/12
SEW-448	PWS	SHIPWRECK		X	X			RR/SL 7/24/90
SEW-450	PWS	HISTORIC STRUCTURE	X	X	X		X	RB/JG 4/01/90 ME/SL 6/22/90
SEW-451	PWS	HISTORIC STRUCTURE	X		X			RB/JG 4/01/90 ME/SL 6/22/90
SEW-452	PWS	HISTORIC STRUCTURE	X		X		X	PEB/RMM 6/02/90
SEW-453	PWS	HISTORIC STRUCTURE	X		X			BR/PEB/JG 5/02/90; BR/ME 8/6/90; RR/PEB 9/2/90
SEW-457	PWS	HISTORIC STRUCTURE	X		X		X	ME/VB 5/23/90

1990 Exxon Cultural Resource Program
Updated AHRS Sites

AHRS	Region	Site Type	Upland Site Component	Intertidal Site Component	Post-Contact Component	Pre-Contact Component	Sitemap Produced	Citation
SEW-458	PWS	HISTORIC STRUCTURE	X		X		X	ME/VB 5/24/90
SEW-462	PWS	ROCKSHELTER	X			X	X	SL/RR 7/14/90; RR/PMB 8/31/90
SEW-463	PWS	HISTORIC STRUCTURE	X		X		X	RM/VT 7/05/90 ME/PMB 8/3/90; RR/P 8/30/90
SEW-464	PWS	HISTORIC STRUCTURE	X		X			RB/PEB 6/03/90
SEW-465	PWS	HISTORIC STRUCTURE	X		X			RB/RM 6/05/90
SEW-469	PWS	ROCKSHELTER		X		X		WILSON (USFWS) 4/30/89
SEW-474	PWS	HISTORIC ISOLATE	X		X		X	BR/ME 8/04/90
SEW-480	PWS	HISTORIC STRUCTURE	X		X			ME/LS 6/23/90
SEW-481	PWS	ROCKSHELTER	X			X		PEB/RB; 7/28/90
SEW-488A	PWS	MIDDEN	X	X	X	X	X	JG/RB 4/07/90; PMB/JG; 7/11/90; JG/PMB 9/13
SEW-488B	PWS	PREHIST ARTFCT SCATTER		X		X	X	RR/BR 4/19/90;
SEW-494	PWS	HISTORIC ISOLATE		X	X			BR/RR 7/21/90
SEW-495	PWS	ROCKSHELTER	X			X	X	RB/VB/SL 6/02/90
SEW-496	PWS	HISTORIC ARTIFACT SCATT	X	X	X			RR/PMB 8/24/90
SEW-502	PWS	MIDDEN	X	X	?	X		BR/ME 8/6/90; VB/RM 7/11/90
SEW-505	PWS	ROCKSHELTER	X		?	X	X	ME/SL 6/13/90; RR/PMB 9/4/90
SEW-513	PWS	PREHIST ARTFCT SCATTER		X		X	X	JG/SL 5/4/90; RR/PMB 9/2/90
SEW-518	PWS	ROCKSHELTER	X			X		ME/PMB 5/90; PMB/JG 9/13/90
SEW-520	PWS	ROCKSHELTER	X			X	X	ME/SL 4/26/90; PEB/RM 6/04/90
SEW-537	PWS	ROCK ART		X	?	X		RR/SL 5/26/90; RR/PMB 9/2/90; PMB/ 9/13/90
SEW-541	PWS	ROCKSHELTER	X		?	?		RB/RR 6/2/90; ME 6/11/90; RR 8/1
XBS-006	PWS	HISTORIC STRUCTURE	X		?	?		SL 7/16/90
XBS-016	PWS	HISTORIC STRUCTURE	X	X	X			BR/RR 6/18/90

APPENDIX K

Examples of 1990 Site Incident Reports

Incident Type 1: Reported Artifact

The Valdez archaeology office received fax copy of incident origination form on 8 June 1990 from the Anchorage archaeology office stating that tarmat removal in PR-XXX (Squad 6, *Beulah Candies*) had been suspended pending archaeological investigation of plank-like wood remains identified in fossil peat deposit underlying cobble and boulder beach. Weather and communication system difficulties precluded field investigation until the morning of 11 June 1990.

Exxon Archaeologists Bruce Ream and Morley Eldridge arrived at reported location 0845 and began general inspection of setting, helicopter N125DN dispatched to meet *Beulah Candies* and transport Exxon representative Ray Sotelo and ADEC representative Dave Arruda to inspect site. Cursory inspection revealed extensive deposit of fossil peat containing remnant forest trunks, stumps, and root nets throughout segment. Could not identify discovery locus. Sotelo and Arruda arrived 0915. We spent some time discussing local geomorphology and answering general questions regarding PWS prehistory and site types. Both individuals expressed a keen interest in archaeology program and are anxious to cooperate in protecting resource.

Arruda relocated discovery site, situated within bedrock boulder and cobble armor originating from adjacent outcrop. Presumed plank remains had been uncovered during removal of tarmat. Worker called attention to wood, Arruda investigated and noted that there appeared to be several parallel aligned planks just below the mineral surface. Inspection of the underside was conducted by feeling along one side with a finger which indicated that the wood was rather thin and appeared flat. Work was immediately suspended and the remains were covered with ca. 5 cm of fine sand and gravel from an adjacent source. It should be noted that this action was undertaken only after considerable thought as to the best procedure for preservation and disguise. The location was not marked.

Ream and Eldridge removed the overburden by trowel and proceeded to uncover more of the area for inspection (approximately 1 meter square). The wood was ultimately found to be natural, probably a pair of compressed parallel trunks which had been planed flat on the exposed surface by abrasive tidal action. Limbs, and a convex lower surface were exposed by pedestaling the remains. All concerned agreed that the setting possessed good potential for the discovery of a site at this location. Additional time was spent discussing peat formation processes, tectonic activity, and site types expected in such settings.

While completing intertidal inspection, group was buzzed by a low flying helicopter (N579DX) which circled twice and then landed. Passengers consisted of Judith Bittner (SHPO) and Ray Burger (ADNR) who were making a survey of segments being worked, and were informed by their pilot that N125DN was the "archaeology" helicopter. Introductions were made all around, and Ream explained activities associated with incident. Remainder of time was spent discussing general issues previously outlined above. Bittner and Burger toured portions of the intertidal and upper tidal areas with Eldridge, then departed for the M/V *Arctic Salvor*. Sotelo and Arruda departed via bowpicker for segments currently being worked.

Ream and Eldridge conducted additional reconnaissance survey of ITZ and adjoining backshore areas before leaving. Numerous CMTs (estimated total 40) were discovered on the small peninsular landform east of the discovery locale. Intensive inspection of the UITZ and erosional surfaces around the perimeter of this landform failed to disclose evidence of subsurface remains. Physical setting of this segment subdivision suggests the likely potential for the presence of a site, either here or nearby. Ream and Eldridge departed at 1145 hrs.

Incident Type 2: Reported Site Disturbance

Helicopter pilot Spatuzzi reported in the late afternoon of 5/4/90 that a vessel and cleanup crew may be operating in the vicinity of KN-XXX. We overflew KN-XXX at approximately 1500 hours on 5/5/90 and observed apparent disturbance in the ITZ within the known boundary of SEW-488.

Archaeologists landed and documented disturbances to site. This incident was discussed on-site with Exxon representative Craig Levine, Coast Guard representative David Sylvestor, and ADEC representative Brian Fitzsimmons. Incident was discussed via telephone between Reanier & Bowers and Jim Haggarty the evening of 5/5/90.

Preliminary inspection of site suggests minimal disturbance has occurred. Additional field investigation will be required to assess the degree of impact to SEW-488.

Exxon Cultural Resource Program Briefings

Following the incident on 5/4/90, in which a beach was treated without the required archaeological monitoring, a major effort has been made by the Exxon Valdez archaeologists in Valdez to contact all of the Exxon representatives. In order to reduce the possibility of future incidents of this type, we considered it essential to contact all Exxon reps in the field.

On the evening of 5/5/90, Rick Reanier and Peter Bowers made telephone contact with two of the vessels operating in PWS. Jim Gallison contacted the three remaining vessels stationed in PWS. Reanier discussed plans for a rendezvous in the field with Tommy Tomblin aboard the *Pacific Seahorse*, while Bowers talked with Al Snook aboard the *Arctic Salvor*. A third vessel assigned to the Corinthian, could not be raised by telephone. Jim Gallison phoned the Exxon Representatives on board their respective vessels: Chris Katsimpalis, *Don Bollinger*; Nick Martinez, *Adele Candies*; Randy Boyer, *Beulah Candies* and made arrangements to meet with them in the field on May 6th.

Bowers and Reanier departed Valdez at 1055 on 5/6/90. They located the *Pacific Seahorse* in the northern part of Upper Passage. The archaeologists landed and were met by Exxon Representative Tommy Tomblin. The ensuing conversation with Tomblin indicated that he was aware of the Exxon cultural resource program, and is genuinely concerned about such matters. Reanier had worked with Tomblin last summer on Kodiak, and found him knowledgeable about the sensitivity of archaeological sites. They went through the briefing packet prepared for Jim Haggarty's orientation program, and also provided a copy of the Chuck Mobley orientation videotape. At the conclusion of our meeting, we felt that Tomblin had a very good understanding of the program.

Reanier and Bowers departed Upper Passage at 1205, and flew to the *Arctic Salvor*. The *Arctic Salvor* was anchored at the time south of Block and Eleanor Islands. Bowers and Reanier met with Snook on board the *Salvor*. Both the *Arctic Salvor* and the *Don Bollinger* were scheduled to conduct bioremediation this summer.

At 1100 hrs Jim Gallison and Bruce Ream departed Valdez by helicopter and traveled to the north end of Erlington Island to meet with Exxon representative, Nick Martinez. On board the *Adele Candies* they reviewed the Cultural Resource Program guidelines and provided him with a copy of the Cultural Resource Program video tape prepared by Chuck Mobley. Also, Gallison and Ream provided a current listing of segments requiring either an inspector or monitor. At Mr. Martinez' request, a short talk on the Cultural Resource Program was given to the crew, and the video tape was shown.

Gallison and Ream departed the *Adele Candies* at 1430 and traveled to Bainbridge Island to meet Randy Boyer, Exxon representative working off the vessel the *Beulah Candies*. Gallison had worked with Mr. Boyer two days earlier during an archaeological inspection. At that time, Gallison reviewed the Cultural Resource Program with Mr. Boyer and spoke with the beach crew working at the site. Our visit was brief, and centered on the incident surrounding KN-XXX. Mr. Boyer appreciated our concerns and explained that he would make every effort to pass the information on to his replacement, Ray Sotelo, when he rotated-out on May 9th. Mr. Sotelo also received a briefing before entering the field from the ExxonCultural Resource office in Anchorage.

From Bainbridge Island, they travelled to Seal Island and meet with Chris Katsimpalis, working off the vessel the *Don Bollinger*. Gallison had recently worked with Mr. Katsimpalis during a site inspection. Our visit was short and involved simply updating Mr. Katsimpalis with the list of inspection/monitor segments.

Incident Type 3: Agency Incident

At 1120 hrs. on 8-30-90 the Exxon CRP received a request from the SHPO office for information on a diesel fuel spill from a reported shipwreck near the mouth of the Karluk River on Kodiak Island and any potential impact on archaeological sites in that area (See Incident Origination Form dated 8-30-90). Exxon Archaeologists Bob Betts and Paul Buck responded by helicopter from Kodiak at 1545 hrs. accompanied by the owner of the Exxon contracted 126' long landing craft *Bradley River* which was reported to have gone aground near Karluk Village.

We arrived at the shipwreck location at approximately 1700 hrs. The *Bradley River* was hard aground 50 m offshore approximately two miles northeast of the mouth of Karluk River. The deck was awash with waves crashing over the sides of the vessel and debris from the ship was scattered along the coastline northeast of the point of grounding. A sheen of diesel oil extended northeast from the *Bradley River* beyond Cape Uyak where it began breaking up in the high winds and heavy seas. Debris along the shoreline consisted of empty supersacks, wooden timbers (cribbing), spools of wire, 55 gal. drums and other assorted equipment and supplies washed overboard. A six man Veco crew assisted by several crewmembers from the *Bradley River* were engaged in dragging as much of the debris to the upper ITZ as possible. The grounding occurred along coastline with a high energy narrow (20 - 30 m wide) intertidal zone consisting of cobbles and boulders backed by bedrock cliffs 50 - 75 m high which formed the base of steep slopes rising to more than 1,000' elevation (see map). No known sites or potential for unknown cultural resources existed in the immediate area of the shipwreck.

After the initial aerial videotaping of the shipwreck and clean-up work in progress we used the helicopter Loran system to measure the length of the debris scatter and oil slick. Debris extended for 1.03 statute miles along the shoreline northeast of the grounding location and we followed visible oil slick for 1.8 statute miles. Upon determining that there was no visible oil slick between the grounded *Bradley River* and the mouth of the Karluk River we landed at the Karluk airstrip where an ERA 212 helicopter under Exxon contract was located. We had received a request to allow the use of our helicopter (99W) to transport personal belongings and equipment taken off the Bradley River from Karluk into Kodiak. After landing at Karluk we accompanied the owner of the *Bradley River* and the ships master, to the site of the shipwreck using the 212 helicopter. Enroute to the debris clean-up location we obtained additional aerial videotape footage of the *Bradley River* and coastline in the vicinity of the grounding.

Early reports of 9,000 gallons of diesel oil spilled appeared to have been an overestimate. The ship's master had calculated a maximum of 2700 gallons of Number 1 diesel in the ship's tanks at the time of the grounding. The master indicated to us that all of the present oil slick has come from the ship's tanks and not from supersacks still on deck containing oil soaked sediments. No full supersacks had been washed overboard.

Upon our arrival the Veco clean-up crew had completed dragging debris up into the upper intertidal. A rising tide prevented our remaining on the beach for more than about half an hour. No visible oil or sheen was present in the ITZ at the shipwreck site. We departed the shipwreck site after taking additional videotape and still photos of the *Bradley River* and the debris. We were dropped off at the Karluk airstrip to wait for the return of 99W which arrived at approximately 1920 hrs to take us back to Kodiak. We arrived in Kodiak at 2030 hrs. and reported by phone to Chris Wooley at the CRP office in Anchorage in addition to sending a map of the shipwreck site by Fax.

There appears to be no threat to cultural resources from the clean-up efforts associated with the *Bradley River* shipwreck unless there is a significant change in the present situation. The only possible location in the vicinity of the shipwreck with moderate to high site potential is a gravel beach located approximately 3 miles from the grounding. If a significant amount of oil or shipwreck debris reaches this beach, an archaeological assessment of any clean-up activity in this area should be conducted.

APPENDIX L

1990 Exxon Cultural Resource Program
Artifact Catalog

AHRS	Region	Artifact #	Arch	Date	Artifact Type	Material	Provenience
KOD-223	KOD	49-KOD-223-001	AC/BR	8/22	Glass Bead	Glass	Intertidal zone
KOD-400	KOD	49-KOD-400-001	PMB/RB	8/24	Pecked/Notched Cobble	Sandstone	Upland feature
KOD-400	KOD	49-KOD-400-002	PMB/RB	8/24	Stemmed Ground Micropoint	Greenstone	Midden face
KOD-432	KOD	49-KOD-432-002	PMB/RB	8/25	Barbed Ground Point	Slate	Midden face
KOD-432	KOD	49-KOD-432-003	PMB/RB	8/25	Pecked Battered Cobble	Granite	Midden face
KOD-432	KOD	49-KOD-432-004	PMB/RB	8/25	Ground Bone Wedge	Bone	Supratidal zone, below midden
SEL-188	KEN	49-SEL-188-039	PEB	4/26	Green Glass Fragment	Glass	Intertidal zone, Test B
SEL-188	KEN	49-SEL-188-048	PEB	4/26	Flake	Basalt	Intertidal zone, Test B
SEL-188	KEN	49-SEL-188-049	PEB	4/26	Edge Battered Cobble (Hammerstone)	Basalt	Intertidal zone, Test B
SEL-188	KEN	49-SEL-188-050	PEB	4/26	Split Grooved Cobble	Basalt	Intertidal zone, Test B
SEL-188	KEN	49-SEL-188-051	AC/RB	8/02	Splitting Adze Fragment (Midsection)	Graywacke	Supratidal zone
SEL-188	KEN	49-SEL-188-052	AC/RB	8/02	Splitting Adze Fragment (Bit End)	Graywacke	Intertidal zone surface
SEL-188	KEN	49-SEL-188-053	AC/RB	8/02	Boulder Spall, Retouched	Graywacke	Intertidal zone surface
SEL-188	KEN	49-SEL-188-054	AC/RB	8/02	End Battered Cobble (Hammerstone)	Basalt	Intertidal zone surface
SEL-188	KEN	49-SEL-188-055	AC/RB	8/02	Boulder Spall, Retouched	Graywacke	Intertidal zone surface
SEL-188	KEN	49-SEL-188-057	AC/RB	8/02	Notched Grooved Cobble	Graywacke(?)	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-058	AC/RB	8/02	End Battered Cobble Core (w/spall facet)	Granite(?)	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-059	AC/RB	8/02	Notched Ulu Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-060	AC/RB	8/02	Boulder Spall, Retouched	Granite(?)	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-061	AC/RB	8/02	Boulder Spall, Retouched	Basalt	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-062	AC/RB	8/02	Bead	Slate(?)	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-063	AC/RB	8/02	Pick (?) Fragment	Graywacke	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-064	AC/RB	8/02	Notched Battered Cobble	Graywacke	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-065	AC/RB	8/02	Battered Cobble	Granite(?)	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-068	AC/RB	8/02	Ground Slate Rod Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-069	AC/RB	8/02	Notched Pebble	Basalt	Intertidal zone surface
SEL-188	KEN	49-SEL-188-070	RB	8/28	Ground Slate Rod Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-071	RB	8/28	Retouched Flake	Green Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-072	RB	8/28	Ulu Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-074	RB	8/28	Wedge Fragment (Bit)	Greenstone	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-075	RB	8/28	Battered Core Fragment	Greenstone	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-076	RB	8/28	Retouched Boulder Spall	Greywacke	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-077	RB	8/28	Adze Midsection	Greywacke	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-078	RB	8/28	Grooved Cobble	Granite(?)	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-080	RB	8/29	Ulu Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-082	RB	8/29	Ground Slate Rod Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-083	RB	8/29	Ground Slate Flake	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-084	RB	8/29	Ground Slate Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-086	RB	8/29	Boulder Spall, Retouched	Greywacke	Intertidal zone surface
SEL-188	KEN	49-SEL-188-087	RB	8/29	Ground Slate Flake	Slate	Intertidal zone surface
SEL-188	KEN	49-SEL-188-090	RB	8/29	Pecked, Notched Cobble	Greywacke	Intertidal zone subsurface

1990 Exxon Cultural Resource Program
Artifact Catalog

AHRS	Region	Artifact #	Arch	Date	Artifact Type	Material	Provenience
SEL-188	KEN	49-SEL-188-091	RB	8/29	Ground Slate Fragment	Slate	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-092	RB	8/29	Splitting Adze	Greywacke	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-093	RB	8/29	Splitting Adze Fragment	Greywacke	Intertidal zone subsurface
SEL-188	KEN	49-SEL-188-094	RB	8/29	Battered Cobble (Hammerstone)	Basalt	Intertidal zone subsurface
SEL-195	KEN	49-SEL-195-002	RR/SL	5/19	Kachemak Grooved Cobble Lamp	Gabbro	Intertidal zone
SEW-440	PWS	49-SEW-440-001	RR/SL	5/25	Cobble Lamp	Gabbro	Intertidal zone

APPENDIX M

1989/1990 Exxon Cultural Resource Program
Cumulative Report of Project Activity
At All Sites

AHRS	Landowner	Park/ Refuge	Re gion	Site Type	Up-Land	In ter tidal	His tor ic	Pre-His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known pre-1989	New site 1989	New site 1990	Site up-date 1989	Site up-date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post-treat. assess ment89	Site Inci dent 1989
AFG-001	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X	X	X	X			
AFG-005	AJV		KOD	MDN	X	X	X	X		C	X			X	X	X				
AFG-010	FS		KOD	MDN	X	X	X	X			X			X						
AFG-012	FS		KOD	MDN	X	X		X			X			X						
AFG-023	AJV/FWST	USFWS-T	KOD	MDN	X			X			X									
AFG-024	AJV/FWST	USFWS-T	KOD	MDN	X			X			X									
AFG-025	AJV/FWST	USFWS-T	KOD	MDN	X	X	X	X			X									
AFG-026	AJV/FWST	USFWS-T	KOD	MDN	X	X		X	1		X			X	X	X				X
AFG-027	AJV/FWST	USFWS-T	KOD	MDN	X	X		X			X			X	X	X				X
AFG-028	AJV/FWST	USFWS-T	KOD	MDN	X	X		X	2		X			X	X	X			X	
AFG-029	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-030	FWST/AJV	USFWS-T	KOD	MDN	X			X			X			X						
AFG-031	FWST/AJV	USFWS-T	KOD	MDN	X			X			X			X						
AFG-032	FWST/AJV	USFWS-T	KOD	MDN	X		X	X			X			X						
AFG-033	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-034	AJV/FWST	USFWS-T	KOD	MDN	X	X		X			X			X	X	X				
AFG-035	FWST/AJV	USFWS-T	KOD	HST	X		X				X			X						
AFG-038	FWST/AJV/FS /DNRS	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-039	FWS	AK MAR NWR	KEN	HST	X		X				X				X	X	X			
AFG-043	NPS	KATMAI NP	AKP	MDN	X	X	X	X			X			X	X	X				
AFG-044	NPS	KATMAI NP	AKP	MDN	X		X	?			X			X						
AFG-046	FAA/DNR		KOD	MDN	X	X	X	X	5		X			X	X	X		X	X	X
AFG-047	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-049	DNR	SHUYAK SP	KOD	RPT	X		X				X									
AFG-050	AJV/FWST	USFWS-T	KOD	HST	X		X				X									
AFG-052	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-053	FWST/AJV	USFWS-T	KOD	MDN	X			X			X			X	X					
AFG-054	FWST/AJV	USFWS-T	KOD	MDN	X			X			X									
AFG-055	FWST/AJV	USFWS-T	KOD	RPT	X			X			X									
AFG-056	FWST/AJV	USFWS-T	KOD	RPT	X			X			X									
AFG-057	FWST/AJV	USFWS-T	KOD	MDN	X		X	X			X									
AFG-058	DNR	NA	KOD	MDN	X	X	X	X			X			X						
AFG-059	DNR	NA	KOD	RPT	X		X				X									
AFG-060	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X									
AFG-061	FS		KOD	HST	X		X				X			X						
AFG-063	AJV/FWST	USFWS-T	KOD	RPT	X			X			X			X	X					
AFG-065	FWST/AJV	USFWS-T	KOD	MDN	X			X			X			X						
AFG-066	FWST/AJV	USFWS-T	KOD	MDN	X			X			X			X						
AFG-067	FWST/AJV	USFWS-T	KOD	HST	X	X	X				X			X						
AFG-068	FWST/AJV	USFWS-T	KOD	MDN	X			X			X									
AFG-069	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-070	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-071	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-072	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X				X	X				
AFG-074	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						

1989/1990 Exxon Cultural Resource Program
Cumulative Report of Project Activity
At All Sites

AHRS	Landowner	Park/ Refuge	Re gion	Site Type	Up- Land	In ter tidal	His tor ic	Pre- His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known pre- 1989	New site 1989	New site 1990	Site up- date 1989	Site up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post- treat. assess ment89	Site Inci dent 1989
AFG-075	FWST/AJV	USFWS-T	KOD	MDN	X			X			X									
AFG-076	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-077	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X			X						
AFG-078	FWST/AJV	USFWS-T	KOD	MDN	X	X		X			X									
AFG-081	DNR	SHUYAK SP	KOD	MDN	X	X		X	3		X			X	X	X				
AFG-082	DNR	SHUYAK SP	KOD	MDN	X			X			X			X						
AFG-083	DNR	SHUYAK SP	KOD	MDN	X			X			X			X						
AFG-084	DNR/BIA	SHUYAK SP	KOD	MDN	X	X		X			X			X						
AFG-085	DNR	SHUYAK SP	KOD	MDN	X	X		X			X			X						
AFG-086	DNR	SHUYAK SP	KOD	MDN	X	X		X			X			X						
AFG-087	FWS	AK MAR NWR	KEN	MDN	X		X				X									
AFG-091	DNR	NA	KOD	RPT	X		X				X									
AFG-093	DNR	SHUYAK SP	KOD	HST	X		X					X								
AFG-094	AJV		KOD	MDN	X			X				X			X	X				
AFG-095	AJV		KOD	PAS		X		X	4			X								
AFG-096	AJV		KOD	PIO		X		X	1			X								
AFG-097	DNR/BIA	SHUYAK SP	KOD	MDN	X			X	2			X								
AFG-098	DNR	SHUYAK SP	KOD	MDN	X	X		X				X			X		X			
AFG-099	FWS	AK MAR NWR	KEN	HST	X		X					X			X	X	X			
AFG-100	FWS	AK MAR NWR	KEN	HST	X		X					X			X	X				
AFG-101	FWS	AK MAR NWR	KEN	HST	X		X					X			X	X		X		
AFG-102	DNR	NA	KOD	MDN	X			X				X								
AFG-103	FWS	AK MAR NWR	KEN	MDN	X			X				X			X	X	X			
AFG-104	FWS	AK MAR NWR	KEN	MDN	X	X		X		A		X			X	X		X	X	
AFG-105	FWS	AK MAR NWR	KEN	MDN	X	X		X				X			X	X		X		
AFG-106	FWS	AK MAR NWR	KEN	PIO	X			X	1			X			X		X			
AFG-108	NPS	KATMAI NP	AKP	HST	X		X					X								
AFG-109	NPS	KATMAI NP	AKP	HST	X	X	X					X								
AFG-110	NPS	KATMAI NP	AKP	MDN	X			X				X								
AFG-111	DNR/BIA/PRV	SHUYAK SP	KOD	PAS		X	X	X				X			X	X	X		X	
AFG-112	DNR/BIA	SHUYAK SP	KOD	MDN	X			X				X								
AFG-113	DNR	SHUYAK SP	KOD	MDN	X			X				X								
AFG-115	DNR	SHUYAK SP	KOD	HST	X		X					X								
AFG-116	DNR	SHUYAK SP	KOD	MDN	X			X				X								
AFG-117	NPS	KATMAI NP	AKP	MDN	X	X		X	3			X								
AFG-118	NPS	KATMAI NP	AKP	MDN	X			X				X							X	
AFG-119	AJV/FWST	USFWS-T	KOD	MDN	X	X		X		C		X			X	X				
AFG-120	AJV/FWST	USFWS-T	KOD	MDN	X			X				X							X	
AFG-121	FWS-T	KODIAK NWR	KOD	MDN	X	X		X				X								
AFG-122	FWS-T	KODIAK NWR	KOD	MDN	X	X		X	5			X							X	
AFG-123	AJV/FWST	USFWS-T	KOD	MDN	X	X		X				X							X	
AFG-124	AJV/FWST	USFWS-T	KOD	MDN	X	X		X				X								
AFG-125	FWS-T	KODIAK NWR	KOD	MDN	X	X		X				X			X	X				
AFG-126	FWS-T	KODIAK NWR	KOD	MDN	X	X		X				X			X	X				
AFG-127	FWS-T	KODIAK NWR	KOD	MDN	X	X		X				X			X	X				
AFG-128	FWS-T	KODIAK NWR	KOD	MDN	X	X		X	1			X							X	
AFG-129	FWS-T	KODIAK NWR	KOD	MDN	X	X		X				X			X	X			X	X

1989/1990 Exxon Cultural Resource Program
Cumulative Report of Project Activity
At All Sites

AHRS	Landowner	Park/ Refuge	Region	Site Type	Up-Land	Intertidal	Historic	Pre-Historic	Artifact Coll. 1989	Artifact Coll. 1990	Site known pre-1989	New site 1989	New site 1990	Site update 1989	Site update 1990	1990 Site Map	Site Inspected 1990	Site Monitor 1990	Post-treat. assessment89	Site Incident 1989
AFG-130	FWST/AJV	USFWS-T	KOD	MDN	X	X		X				X								
AFG-132	DNR	NA	KOD	MDN	X	X		X	1			X								
AFG-133	FWST/AJV	USFWS-T	KOD	MDN	X			X				X								
AFG-134	NPS	KATMAI NP	AKP	PST	X			X				X								
AFG-135	AJV		KOD	MDN	X	X		X				X								
AFG-136	AJV/PRV		KOD	HST	X	X	X					X								
AFG-137	AJV/DNR		KOD	MDN	X	X		X				X			X					
AFG-138	DNR	NA	KOD	MDN	X	X		X				X			X	X				
AFG-139	DNR	NA	KOD	MDN	X	X		X				X								
AFG-140	PRV		KOD	HST	X	X	X					X								
AFG-141	AJV/PRV/BIA		KOD	MDN	X	X		X				X			X	X				
AFG-142	DNR	NA	KOD	MDN	X	X		X				X								
AFG-143	AJV/FWST	USFWS-T	KOD	MDN	X	X		X	1			X			X	X				X
AFG-144	DNR	NA	KOD	MDN	X	X		X				X								
AFG-146	AJV/FWST	KODIAK NWR	KOD	MDN	X	X		X				X			X	X				
AFG-147	PRV		KOD	HST	X	X	X					X								
AFG-148	AJV		KOD	MDN	X	X		X				X			X					
AFG-151	DNR	SHUYAK SP	KOD	MDN	X			X				X								
AFG-152	DNR/BIA/PRV	SHUYAK SP	KOD	SHP		X	X					X			X					
AFG-153	AJV		KOD	HST	X		X					X								
AFG-154	DNR	NA	KOD	MDN	X			X				X								
AFG-160	DNR	SHUYAK SP	KOD	MDN	X	X		X				X								
AFG-161	FWST/AJV	USFWS-T	KOD	MDN	X	X		X				X								
AFG-162	AJV		KOD	HST	X		X					X								
AFG-163	AJV		KOD	MDN	X	X		X				X								
AFG-164	DNR	SHUYAK SP	KOD	MDN	X		X	X				X								
AFG-165	NPS	KATMAI NP	AKP	PST	X			X				X								
AFG-166	DNR	SHUYAK SP	KOD	PIO		X		X					X		X	X				
AFG-167	FWS	AK MAR NWR	KEN	HST	X		X						X		X			X		
AFG-168	FWS	AK MAR NWR	KEN	PIO		X		X					X		X			X		
AFG-169	FWS	AK MAR NWR	KEN	PIO	X	X		X					X					X		
AFG-170	FWS	AK MAR NWR	KEN	MDN	X	X		X					X					X		
AFG-171	NPS	KATMAI NP	AKP	HAS	X	X	X						X			X	X			
AFG-172	FWS-T	KODIAK NWR	KOD	HST	X		X						X			X		X		
AFG-173	DNR	SHUYAK SP	KOD	MDN	X	X		X					X			X	X			
AFG-174	DNR/BIA/PRV	SHUYAK SP	KOD	HST	X	X	X						X			X				
AFG-175	FWS	AK MAR NWR	KEN	MDN	X	X		X		A			X		X			X		
AFG-176	NPS	KATMAI NP	AKP	MDN	X			X					X				X			
AFG-177	NPS	KATMAI NP	AKP	PAS	X			X		A			X			X	X			
AFG-179	DNR/BIA/PRV	SHUYAK SP	KOD	PIO	X	X		X					X							
AFG-180	FWS	AK MAR NWR	KEN	HST	X		X						X				X			
CHK-016	FW/BIA/PRV		AKP	PAS	X			X			X									
CHK-019	FW/BIA/PRV		AKP	HST	X	X	X				X									
CHK-020	FW/BIA/PRV		AKP	MDN	X			X			X									
CHK-021	FW/BIA/PRV		AKP	HST	X		X				X									
CHK-022	FW/BIA/PRV		AKP	HST	X		X				X									
CHK-023	FW/BIA/PRV		AKP	HST	X		X				X									

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CHK-024	FW/BIA/PRV		AKP	SHP	X		X				X									
CHK-025	FW/BIA/PRV		AKP	HST	X		X				X									
CHK-027	FW/BIA/PRV		AKP	HST	X		X				X									
CHK-029	FW/BIA/PRV		AKP	HST	X		X				X									
CHK-030	FW/BIA/PRV		AKP	MDN	X	X		X			X									
ILI-058	NPS	KATMAI NP	AKP	MDN	X			X				X								
KAG-001	AJV/BIA/FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KAG-002	FWS/AJVS	KODIAK NWR	KOD	MDN	X	X	X	X			X			X						
KAG-004			KOD	MDN	X	X		X			X			X						
KAG-014	FWS/AJVS	KODIAK NWR	KOD	MDN	X			X				X								
KAR-002	FWS/PRV/KI	KODIAK NWR	KOD	RPT			X				X			X						
KAR-016	BIA		KOD	MDN	X	X		X			X			X					X	
KAR-017	AJV/BIA		KOD	MDN	X	X		X			X			X					X	
KAR-026	AJVS/FWS		KOD	MDN	X	X		X			X			X						
KAR-092	BIA		KOD	MDN	X	X		X			X			X						
KAR-094	BIA		KOD	MDN	X		X	X			X			X						
KAR-095	BIA		KOD	MDN	X			X			X			X						
KAR-097	BIA		KOD	MDN	X			X			X			X					X	
KAR-098	AJV		KOD	PST		X		X			X			X	X					
KAR-099	AJV		KOD	HST	X		X				X			X						
KAR-100	BIA		KOD	PIO		X		X			X			X						
KAR-101	AJV/BIA		KOD	MDN	X	X		X			X			X						
KAR-112	FWS	BECHRF NWR	AKP	HST	X		X				X			X	X	X	X			
KAR-113	BIA		KOD	MDN	X	X	X					X			X	X	X			
KAR-114	AJV		KOD	MDN	X			X				X								
KAR-115	BIA		KOD	MDN	X	X		X				X								
KAR-116	FWS	BECHRF NWR	AKP	HST	X		X					X							X	
KAR-117	FWS	BECHRF NWR	AKP	HST	X		X	X				X								
KAR-118	FWS	BECHRF NWR	AKP	HST	X		X					X								
KAR-120	FWS	BECHRF NWR	AKP	MDN	X			X				X								
KAR-121	FWS	BECHRF NWR	AKP	MDN	X			X	1			X			X				X	
KAR-122	FWS	BECHRF NWR	AKP	PAS	X			X	2			X			X					
KAR-123	FWS	BECHRF NWR	AKP	PIO	X			X				X								
KAR-124	FWS	BECHRF NWR	AKP	MDN	X		X	X				X			X					
KAR-125	BIA		KOD	MDN	X			X				X								
KAR-126	FWS	BECHRF NWR	AKP	PIO	X			X				X								
KAR-127	NPS	KATMAI NP	AKP	MDN	X			X				X								
KAR-128	FWS	BECHRF NWR	AKP	PAS	X			X				X			X					
KAR-129	FWS	BECHRF NWR	AKP	HST	X		X					X								
KAR-130	FWS	BECHRF NWR	AKP	HST	X		X					X								
KAR-131	FWS	BECHRF NWR	AKP	PIO	X			X				X								
KAR-132	FWS	BECHRF NWR	AKP	PAS	X			X	1			X								
KAR-133	FWS	BECHRF NWR	AKP	HST	X		X					X								
KAR-134	FWS	BECHRF NWR	AKP	HST	X		X					X			X					
KAR-135	FWS	BECHRF NWR	AKP	HST	X		X					X								
KOD-001	DNR		KOD	RPT				X			X									
KOD-009	AJV/PRV/BIA		KOD	MDN	X			X			X			X						

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KOD-010	AJV/BIA		KOD	MDN	X	X		X			X			X	X					
KOD-031	AJV/BIA		KOD	MDN	X	X	X				X			X						
KOD-032	AJV		KOD	MDN	X	X		X			X			X						
KOD-033	AJV		KOD	MDN	X	X		X			X			X	X	X				
KOD-035	AJV/BIA/PRV		KOD	MDN	X			X			X			X						
KOD-036	AJV/BIA/PRV		KOD	MDN	X	X		X			X			X						
KOD-037	AJV/BIA/PRV		KOD	MDN	X			X			X			X						
KOD-038	CO		KOD	MDN	X	X		X			X			X						
KOD-054	AJV/BIA		KOD	MDN	X			X			X			X						
KOD-062	DNR		KOD	MDN	X	X		X			X									
KOD-063	DNR		KOD	MDN	X	X	X				X									
KOD-064	DNR		KOD	MDN	X	X	X				X									
KOD-065	DNR		KOD	MDN	X			X			X									
KOD-067	DNR/PRV		KOD	MDN	X	X		X			X									X
KOD-068	DNR/PRV		KOD	MDN	X		X	X			X									X
KOD-069	DNR/PRV		KOD	MDN	X			X			X									X
KOD-070	DNR/PRV		KOD	MDN	X			X			X									X
KOD-071	DNR		KOD	MDN	X			X			X									
KOD-072	DNR		KOD	RPT				X			X									
KOD-073	DNR		KOD	MDN	X			X			X									
KOD-074	DNR		KOD	RPT			X	X			X			X						
KOD-075	DNR		KOD	RPT			X	X			X			X						
KOD-076	DNR/AJVS		KOD	MDN	X	X	X	X			X			X						
KOD-077	DNR/AJVS/BIA		KOD	MDN	X	X	X	X	4	C	X			X	X	X				
KOD-078	DNR/BIA/AJVS		KOD	MDN	X		X	X			X			X						
KOD-079	AJV/BIA/FWS/DNR/PRV	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-080	DNR/BIA/AJVS		KOD	MDN	X	X		X			X			X						
KOD-098	AJV/BIA/FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-099	AJV/BIA/FWS	KODIAK NWR	KOD	MDN	X	X	X	X			X			X						
KOD-100	AJV/BIA/FWS	KODIAK NWR	KOD	MDN	X			X			X									
KOD-102	AJV/BIA		KOD	MDN	X			X			X			X						
KOD-111	AJV		KOD	MDN	X	X	X	X			X			X						
KOD-112	AJV/BIA/PRV		KOD	MDN	X			X			X			X						
KOD-113	AJV/BIA		KOD	MDN	X			X			X									
KOD-114	AJV/BIA		KOD	MDN	X	X	X	X			X			X						
KOD-115	AJV/BIA		KOD	MDN	X	X		X	4		X			X						
KOD-116	AJV/BIA		KOD	MDN	X	X	X	X	2		X			X						
KOD-118	AJV/BIA		KOD	MDN	X	X		X			X			X						
KOD-119	AJV/BIA		KOD	MDN	X			X			X									
KOD-120	AJV/BIA		KOD	PAS	X			X			X			X						
KOD-121	AJV/BIA		KOD	MDN	X	X	X	X			X			X						
KOD-122	AJV/BIA		KOD	MDN	X			X			X			X						
KOD-129	AJV/PRV/BIA		KOD	MDN	X			X			X			X						

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KOD-130	AJV/BIA/FWS /DNR/PRV	KODIAK NWR	KOD	RPT	X		X	X			X			X						
KOD-168	FWS	KODIAK NWR	KOD	RPT				X			X									
KOD-170	FWS/KI	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-171	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X			X	X	X		X	X	
KOD-172	FWS/BIA	KODIAK NWR	KOD	MDN	X	X	X	X			X			X						
KOD-184	FWS	KODIAK NWR	KOD	RPT				X			X									
KOD-187	FWS	KODIAK NWR	KOD	MDN	X	X		X			X									
KOD-196	BIA/AJV/PRV		KOD	HST	X		X				X			X						
KOD-199	DNR		KOD	HST	X		X				X									
KOD-202	AJV/BIA/PRV		KOD	HST	X	X	X				X			X						
KOD-205	AJV/BIA		KOD	HST	X		X				X			X	X					
KOD-213	DNR/PRV		KOD	MDN	X	X		X			X									
KOD-223	FWS/BIA	KODIAK NWR	KOD	MDN	X	X	X	X		X	X			X	X	X			X	
KOD-224	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X					X	
KOD-225	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-226	FWS		KOD	MDN	X	X		X			X				X	X				
KOD-227	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-228	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X									
KOD-229	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-230	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-231	FWS	KODIAK NWR	KOD	MDN	X			X			X									
KOD-232	FWS	KODIAK NWR	KOD	MDN	X			X			X			X						
KOD-233	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X			X			X									
KOD-238	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-239	FWS	KODIAK NWR	KOD	MDN	X			X			X			X					X	
KOD-240	FWS	KODIAK NWR	KOD	MDN	X			X			X									
KOD-241	FWS	KODIAK NWR	KOD	MDN	X			X			X			X						
KOD-245	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-246	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-247	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-249	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-250	FWS	KODIAK NWR	KOD	MDN	X			X			X									
KOD-251	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-252	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-253	FWS	KODIAK NWR	KOD	MDN	X			X			X			X						
KOD-254	FWS	KODIAK NWR	KOD	MDN	X			X			X			X	X	X				
KOD-255	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-256	FWS	KODIAK NWR	KOD	MDN	X			X			X									
KOD-257	FWS	KODIAK NWR	KOD	PIO	X			X			X									
KOD-273	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X									
KOD-276	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-277	FWS/PRV	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-286	FWS/PRV	KODIAK NWR	KOD	MDN	X			X			X			X						
KOD-288	FWS	KODIAK NWR	KOD	MDN	X			X			X			X						
KOD-289	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-290	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						

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KOD-291	FWS	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-292	FWS/PRV	KODIAK NWR	KOD	MDN	X	X		X			X			X						
KOD-293	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X			X									
KOD-296	FWS/BIA	KODIAK NWR	KOD	MDN	X			X			X									
KOD-299	FWS	KODIAK NWR	KOD	MDN		X		X			X				X	X				
KOD-351	AJV/BIA		KOD	MDN	X	X		X			X			X	X	X				
KOD-353	DNR		KOD	MDN	X			X			X									
KOD-354	DNR		KOD	MDN	X		X	X			X									
KOD-364	DNR		KOD	RPT			X	X			X									
KOD-366	FWS	KODIAK NWR	KOD	HST	X		X					X								
KOD-367	FWS	KODIAK NWR	KOD	MDN	X			X				X								
KOD-368	KI		KOD	MDN	X			X	2			X		X						
KOD-370	BIA/AJV/PRV		KOD	MDN	X			X				X								
KOD-371	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-372	BIA/AJV/PRV		KOD	MDN	X			X				X								
KOD-373	BIA/AJV/PRV		KOD	MDN	X			X				X								
KOD-374	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-375	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-376	KI/CG		KOD	MDN	X			X	1			X								
KOD-377	AJV/BIA		KOD	MDN	X			X				X								
KOD-378	AJV/BIA		KOD	MDN	X	X		X				X								
KOD-379	AJV		KOD	MDN	X			X				X								
KOD-380	AJV/BIA/PRV		KOD	MDN	X			X				X								
KOD-381	AJV/BIA		KOD	MDN	X			X				X								
KOD-382	AJV/BIA		KOD	MDN	X	X		X				X								
KOD-383	AJV/BIA		KOD	MDN	X	X		X				X								
KOD-384	AJV/BIA		KOD	MDN	X	X		X				X								
KOD-385	AJV/BIA		KOD	MDN	X	X		X	4			X								
KOD-386	DNR		KOD	MDN	X	X		X				X								
KOD-387	DNR		KOD	MDN	X			X				X								
KOD-388	DNR		KOD	MDN	X	X		X				X								
KOD-389	DNR		KOD	MDN	X	X		X				X								
KOD-390	DNR		KOD	MDN	X	X		X				X								
KOD-391	AJV/BIA/FWS	KODIAK NWR	KOD	MDN	X			X				X								
KOD-392	AJV/BIA		KOD	MDN	X	X		X				X								
KOD-393	DNR/BIA/AJV S		KOD	HST	X	X	X					X								
KOD-394	DNR		KOD	MDN	X	X		X				X								
KOD-395	DNR/AJVS		KOD	MDN	X	X		X				X								
KOD-396	DNR/BIA/AJV S		KOD	MDN	X	X		X				X			X					
KOD-397	DNR/BIA/AJV S		KOD	HIO	X		X					X								
KOD-398	DNR		KOD	MDN	X			X				X								
KOD-399	DNR		KOD	MDN	X	X		X				X								
KOD-400	DNR		KOD	MDN	X	X		X		X		X			X	X				
KOD-401	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X				X								

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KOD-402	FWS/BIA	KODIAK NWR	KOD	MDN	X			X				X								
KOD-403	FWS	KODIAK NWR	KOD	MDN	X			X				X								
KOD-404	AJV/BIA/FWS/DNR/PRV	KODIAK NWR	KOD	MDN	X			X				X								
KOD-405	DNR/BIA/AJVS		KOD	MDN	X	X		X				X								
KOD-406	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-407	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X	X	X				X			X	X				
KOD-408	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-409	DNR		KOD	MDN	X	X		X				X								
KOD-410	BIA/AJV		KOD	MDN	X			X				X								
KOD-411	AJV/PRV/BIA		KOD	MDN	X	X		X				X								
KOD-412	FWS	KODIAK NWR	KOD	MDN	X			X				X								
KOD-413	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-414	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X				X			X	X				
KOD-415	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X	1			X			X	X				
KOD-416	AJV		KOD	MDN	X	X		X				X								
KOD-417	AJV		KOD	MDN	X	X		X				X								
KOD-418	AJV/BIA/FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-419	FWS	KODIAK NWR	KOD	MDN	X		X	X				X								
KOD-420	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-421	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-422	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-423	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-424	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-425	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-426	AJV		KOD	MDN	X			X				X								
KOD-427	DNR		KOD	PIO	X			X				X			X					X
KOD-428	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
KOD-429	FWS	KODIAK NWR	KOD	MDN	X			X				X								
KOD-430	DNR		KOD	MDN	X	X		X				X								
KOD-432	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X		X	1	X		X			X	X				X
KOD-433	DNR		KOD	HST	X		X					X								
KOD-434	FWS/BIA	KODIAK NWR	KOD	MDN	X			X					X			X				
KOD-435	FWS/BIA	KODIAK NWR	KOD	PIO		X	X	X					X			X				
KOD-436	FWS/BIA/KI	KODIAK NWR	KOD	MDN	X	X		X					X			X				
KOD-437	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X					X			X				
KOD-438	FWS/BIA	KODIAK NWR	KOD	PAS	X	X		X					X			X				
KOD-439	FWS/BIA	KODIAK NWR	KOD	MDN	X	X		X					X							
SEL-017	EB/PRV/BIA/BLM/EBS/DNR		KEN	HST	X	X	X				X			X	X					
SEL-025	DNR	KACH BA SP	KEN	HST	X		X				X				X	X	X			
SEL-119	DNR	KACH BA SP	KEN	MDN	X			X			X			X						
SEL-129	DNR	KACH BA SP	KEN	MDN	X			X			X			X	X				X	
SEL-172	NPS/PGS	KEFJ NP	KEN	MDN	X			X			X			X						
SEL-173	NPS/PGS	KEFJ NP	KEN	MDN	X			X			X			X						
SEL-174	NPS/PGS	KEFJ NP	KEN	MDN	X			X			X			X						

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SEL-178	DNR	KACH BA SP	KEN	MDN	X	X		X	3			X			X	X		X		
SEL-179	PG		KEN	MDN	X	X		X	1			X			X	X		X	X	X
SEL-181	PG		KEN	MDN	X	X		X	4			X			X	X	Y		X	
SEL-183	DNR/CG		KEN	HST	X		X					X								
SEL-184	DNR	KACH BA SP	KEN	PST		X		X				X								
SEL-185	NPS/PGS	KEFJ NP	KEN	HST	X		X					X								
SEL-186	DNR	KACH BA SP	KEN	MDN	X			X					X							
SEL-187	DNR	KACH BA SP	KEN	SHP		X	X					X								
SEL-188	NPS/PGS	KEFJ NP	KEN	MDN	X	X		X	8	X		X			X	X		X		
SEL-194	NPS/PGS	KEFJ NP	KEN	MDN	X	X		X				X			X	X				
SEL-195	PG		KEN	PIO		X		X	1	X		X			X	X	X			
SEL-196	DNR	KACH BA SP	KEN	PAS	X	X		X	1			X								
SEL-197	FWS/PGS/EBS	AK MAR NWR	KEN	PAS		X		X	1			X			X	X				
SEL-198	FWS/PGS/EBS	AK MAR NWR	KEN	MDN	X	X		X				X			X	X				
SEL-200	FWS	AK MAR NWR	KEN	PAS		X		X				X								
SEL-201	FWS	AK MAR NWR	KEN	PAS		X	X	X				X								
SEL-202	FWS	AK MAR NWR	KEN	HST	X		X					X								
SEL-203	FWS	AK MAR NWR	KEN	HST	X		X					X								
SEL-204	NPS/PGS	KEFJ NP	KEN	PIO		X		X				X								
SEL-206	NPS/PGS	KEFJ NP	KEN	PAS		X		X				X			X	X				
SEL-207	PG		KEN	MDN	X			X				X								
SEL-208	PG		KEN	MDN	X			X				X					X		X	
SEL-209	NPS/PGS	KEFJ NP	KEN	MDN	X	X		X				X								
SEL-211	DNR	KACH BA SP	KEN	MDN	X	X		X							X	X	X			
SEL-215	DNR	KACH BA SP	KEN	PAS		X		X					X			X		X		
SEL-216	DNR	KACH BA SP	KEN	PAS		X		X					X			X		X		
SEL-217	DNR	KACH BA SP	KEN	PAS		X		X					X			X		X		
SEL-218	DNR	KACH BA SP	KEN	PIO		X		X					X			X		X		
SEL-222	PRV (CONTINENTA		KEN	HST	X		X						X			X	X			
SEL-223	PRV (CONTINENTA		KEN	MDN	X		X						X		X	X	X			
SEL-224	DNR	KACH BA SP	KEN	HST	X		X						X			X				
SEL-225	DNR	KACH BA SP	KEN	HST	X		X						X			X				
SEW-004	FS/CACS		PWS	RKS	X			X	3		X			X	X			X	X	X
SEW-009	FS/CG/CACS		PWS	HST	X	X	X				X			X						
SEW-019	CVC		PWS	MDN	X	X	X	X			X			X					X	X
SEW-026	PRV		PWS	HST	X	X	X	X			X			X	X			X		
SEW-039	CVC		PWS	HST	X		X				X			X						
SEW-060	FS		PWS	HIO	X		X	?			X				X					
SEW-061	FS/CACS		PWS	HIO	X		X	?			X			X	X					
SEW-062	FS/CACS		PWS	HST	X		X				X			X						
SEW-065	CVC		PWS	HIO	X	X	X				X			X	X					
SEW-068	CVC		PWS	MDN	X	X	X	X			X			X	X	X			X	
SEW-069	CVC		PWS	RPT			X				X						X			
SEW-071	CVC/FS/CG/C ACS		PWS	RPT				X			X				X				X	

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SEW-072	CVC		PWS	PAS		X		X	4		X			X	X					
SEW-073	FS/CACS		PWS	RKS	X			X	1		X			X	X			X	X	
SEW-074	FS/CACS		PWS	HIO	X		X				X			X						
SEW-075	FS/CACS/CVCS		PWS	RPT				X			X									
SEW-076	FS/CACS/CVCS		PWS	MDN	X	X		X			X			X	X	X	X	X	X	
SEW-077	FS/CVC/CG/CVCS		PWS	PAS	X	X	X	X			X			X	X	X			X	X
SEW-078	FS		PWS	RPT				X			X									
SEW-086	FS/CACS		PWS	RKS	X			X			X									
SEW-087	FS/CVC/CACS		PWS	RKS	X			X			X									
SEW-095	CVC/PRV		PWS	HST	X		X				X			X						
SEW-206	FS/CACS		PWS	HIO	X		X				X				X					
SEW-207	FS/CACS		PWS	PAS	X	X		X			X						X			
SEW-208	FS/CACS		PWS	HST	X	X	X				X									
SEW-220	FS/CACS/DNRS		PWS	HST	X		X				X									
SEW-224	FS/CACS		PWS	HST	X		X				X			X						
SEW-225	FS/CACS		PWS	HST	X		X				X									
SEW-229	FS/CACS		PWS	HIO	X		X				X									
SEW-234	FS/BLM/CACS		PWS	HST	X	X	X				X				X					
SEW-235	FS/CACS		PWS	HIO	X		X				X			X	X	X				
SEW-236	FS/CACS		PWS	HST	X		X				X			X	X					
SEW-238	CAC/PRV		PWS	HST	X	X	X				X			X	X		X			
SEW-240	FS/CACS		PWS	HST	X		X				X				X	X				
SEW-241	FS/CACS		PWS	PAS	X	X	X	X			X			X	X		X		X	
SEW-243	FS/CACS		PWS	HST	X		X				X				X					
SEW-245	FS/CACS		PWS	HST	X		X				X			X	X					
SEW-248	FS		PWS	HST	X		X		1		X			X	X	X			X	
SEW-249	FS/CACS		PWS	RKS	X	X		X			X			X	X	X		X	X	
SEW-261	FS/CACS		PWS	HIO	X		X				X			X						
SEW-276	FS/CACS		PWS	HST	X		X				X				X					
SEW-281	FS/CG/CACS		PWS	HST	X		X				X			X						
SEW-283	FS		PWS	HST	X		X				X									
SEW-292	FS/BLM/CACS		PWS	MDN		X		X			X				X					
SEW-293	FS/BLM/CACS		PWS	PAS		X		X			X				X		X			
SEW-295	FS/BLM/CACS		PWS	PIO		X		X			X				X					
SEW-337	FS		PWS	HST	X	X	X				X				X					
SEW-339	FS/CG/CACS		PWS	HST	X		X				X				X	X	X			
SEW-350	FS		PWS	PIO	X	X	X	?			X			X	X					
SEW-361	FS		PWS	HIO	X		X				X				X					
SEW-391	FS/PRV/CACS		PWS	HST	X	X	X				X			X						
SEW-429	FS/CACS		PWS	RPT				X			X									
SEW-430	FS		PWS	RKS	X			X		C	X				X	X		X		
SEW-431	CVC		PWS	RKS	X			X			X									
SEW-434	FS		PWS	HST	X		X					X								

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SEW-435	FS		PWS	HST	X	X	X					X			X	X		X	X	
SEW-436	FS		PWS	RKS	X	X		X	1			X			X		X			
SEW-437	FS		PWS	HST	X		X					X			X		X			
SEW-438	FS		PWS	HST	X		X					X			X	X	X			
SEW-440	FS		PWS	MDN	X	X	X	X		X		X			X	X	X		X	
SEW-441	FS		PWS	HST	X		X					X			X		X		X	
SEW-442	FS		PWS	HST	X		X					X			X		X		X	
SEW-443	FS		PWS	RKS	X			X				X			X			X	X	
SEW-444	FS		PWS	PIO	X	X	X	X				X			X					
SEW-445	FS		PWS	PIO	X	X	X	?				X			X					
SEW-446	FS/CACS		PWS	HST	X		X					X								
SEW-447	FS		PWS	RKS	X		X	X				X			X	X		X	X	
SEW-448	FS		PWS	SHP		X	X					X			X					
SEW-449	FS		PWS	HST	X		X					X								
SEW-450	FS		PWS	HST	X	X	X					X			X	X	X		X	
SEW-451	FS		PWS	HST	X		X					X			X		X		X	
SEW-452	FS		PWS	HST	X		X					X			X	X				
SEW-453	FS/CG/CACS		PWS	HST	X		X					X			X		X			
SEW-454	CAC		PWS	HIO		X	X					X								
SEW-455	CAC		PWS	SHP		X	X					X								
SEW-456	CAC		PWS	HST	X		X					X								
SEW-457	FS		PWS	HST	X		X					X			X	X	X			
SEW-458	FS		PWS	HST	X		X					X			X	X	X			
SEW-459	FS		PWS	HST	X		X					X								
SEW-460	FS		PWS	HST	X		X					X					X			
SEW-461	FS		PWS	HST	X		X					X								
SEW-462	FS		PWS	RKS	X			X				X			X	X	X		X	
SEW-463	CAC		PWS	HST	X		X					X			X	X	X			
SEW-464	FS		PWS	HST	X		X					X			X		X			
SEW-465	FS		PWS	HST	X		X					X			X		X			
SEW-466	FS		PWS	HST	X	X	X					X								
SEW-467	FS		PWS	HST	X		X					X								
SEW-468	FS		PWS	HST	X		X	X				X								
SEW-469	FS		PWS	RKS		X		X				X			X			X	X	X
SEW-470	CVC/PRV		PWS	HST	X	X	X					X								
SEW-471	FS		PWS	MDN	X		X	X	C			X								
SEW-472	CVC		PWS	PIO	X			X				X								
SEW-473	CVC		PWS	HST	X		X					X								
SEW-474	FS		PWS	HIO	X		X					X			X	X			X	X
SEW-475	FS		PWS	HIO	X		X					X								
SEW-476	FS		PWS	HIO	X		X					X								
SEW-477	FS/CVC/CVCS		PWS	HIO	X							X								
SEW-478	FS/CVC/CVCS		PWS	HIO		X	X		1			X								
SEW-479	FS		PWS	HST	X		X					X								
SEW-480	FS		PWS	HST	X		X					X			X					
SEW-481	FS/CACS		PWS	RKS	X			X				X			X			X	X	
SEW-482	FS/CACS		PWS	HST	X		X					X							X	

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SEW-483	CAC		PWS	HST	X		X					X								
SEW-484	CVC		PWS	HST	X		X					X								
SEW-485	CVC		PWS	HST	X		X					X					X			
SEW-486	FS/CVC		PWS	SHP		X	X					X								
SEW-487	FS		PWS	SHP		X	X					X								
SEW-488A	FS/CACS		PWS	MDN	X	X	X	X	3	C		X			X	X		X	X	X
SEW-488B	FS/CACS		PWS	PAS		X		X					X		X	X		X		
SEW-489	FS		PWS	HST	X		X					X								
SEW-490	FS		PWS	SHP		X	X					X								
SEW-491	CVC		PWS	PAS		X		X				X								
SEW-492	CVC		PWS	PST		X		X				X								
SEW-493	FS		PWS	HIO		X	X					X								
SEW-494	FS/CACS		PWS	HIO		X	X					X			X					
SEW-495	FS		PWS	RKS	X			X				X			X	X				
SEW-496	CVC		PWS	HAS	X	X	X					X			X		X			
SEW-497	CVC		PWS	HST		X	X					X							X	
SEW-498	CVC/CG/FS/CVCS		PWS	HST	X	X	X					X								
SEW-499	FS		PWS	HST	X		X					X								
SEW-500	CVC		PWS	PIO		X		X				X								
SEW-502	FS/PRV/CACS		PWS	MDN	X	X	?	X				X			X					
SEW-503	FS		PWS	HST	X		X					X								
SEW-505	FS		PWS	RKS	X		?	X					X		X	X		X		
SEW-509	FS		PWS	RKS	X		X	?					X							
SEW-510	FS		PWS	RKS	X			X					X			X				
SEW-513	FS		PWS	PAS		X		X					X		X	X	X			
SEW-514	CVC		PWS	HST	X		X	?					X			X				
SEW-515	CVC		PWS	HST	X		X						X			X				
SEW-516	CVC		PWS	HST	X		X						X			X				
SEW-517	FS		PWS	RKS	X			X		C			X			X		X		
SEW-518	FS		PWS	RKS	X			X					X		X			X		
SEW-519	FS		PWS	HST	X		X						X			X				
SEW-520	FS		PWS	RKS	X			X					X		X	X	X			
SEW-521	FS/CACS		PWS	HST	X		X						X					X		
SEW-522	FS		PWS	HST	X		X						X			X				
SEW-523	FS		PWS	HST	X		X						X							
SEW-524	FS		PWS	HST	X		X						X							
SEW-525	FS/CACS		PWS	HST	X		X						X							
SEW-526	FS/CVCS		PWS	MDN	X	X		X					X			X				
SEW-527	FS		PWS	HST	X		X						X					X		
SEW-528	FS		PWS	SHP		X	X						X							
SEW-529	FS		PWS	PIO	X			X					X							
SEW-537	FS		PWS	RKA		X	?	X					X		X		X			
SEW-538	FS		PWS	PAS		X		X	C				X			X				
SEW-539	FS/CACS		PWS	HST	X		X						X			X				
SEW-541	FS		PWS	RKS	X		?	?					X		X					
SEW-542	FS		PWS	PAS		X		X					X			X				

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SUT-001	FWS/KI	AK MAR NWR	AKP	RPT			X				X									
SUT-016	NPS	ANAKCHK NP	AKP	MDN	X		X	X			X									
SUT-017	FWS/DNRS	AK PEN NWR	AKP	MDN	X			X				X								
SUT-018	FWS/DNRS	AK PEN NWR	AKP	MDN	X			X				X								
SUT-019	AJV/FWS-T	AK PEN NWR	AKP	HST	X		X					X								
SUT-020	FWS/KI	AK MAR NWR	AKP	MDN	X			X				X								
UGA-031	FWS		AKP	MDN	X		X	X			X									
UGA-043	FWS/DNRS	BECHRF NWR	AKP	MDN	X			X			X			X					X	
UGA-059	FWS/AJVS	BECHRF NWR	AKP	MDN	X			X			X									
XBS-006	FS		PWS	HST	X		?	?			X				X					
XBS-014	NPS/BIA/EBS	KEFJ NP	KEN	MDN	X		X	X			X			X	X	X				
XBS-015	NPS/BIA/EBS	KEFJ NP	KEN	MDN	X			X				X			X	X				
XBS-016	FS		PWS	HST	X	X	X					X			X		X			
XBS-017	FS		PWS	HST	X	X	X					X								
XBS-018	FWS	AK MAR NWR	KEN	MDN	X			X				X								
XMK-007	NPS	KATMAI NP	AKP	MDN	X	X	X	X			X			X	X	X				
XMK-014	NPS/PRV	KATMAI NP	AKP	MDN	X		X				X			X						
XMK-015	NPS	KATMAI NP	AKP	HAS	X		X				X			X						
XMK-018	NPS	KATMAI NP	AKP	MDN	X			X			X			X						
XMK-019	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X						
XMK-020	NPS	KATMAI NP	AKP	MDN	X			X			X			X						
XMK-021	NPS	KATMAI NP	AKP	PAS	X	X		X			X				X					
XMK-022	NPS	KATMAI NP	AKP	MDN	X	X		X	1		X			X	X	X				
XMK-024	NPS	KATMAI NP	AKP	PAS	X	X		X			X									
XMK-025	NPS	KATMAI NP	AKP	PAS	X	X		X			X				X	X				
XMK-026	NPS	KATMAI NP	AKP	MDN	X			X			X			X						
XMK-027	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X						
XMK-028	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X						
XMK-029	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X						
XMK-030	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X						
XMK-031	NPS	KATMAI NP	AKP	MDN	X	X		X			X			X						
XMK-046	NPS/PRV	KATMAI NP	AKP	MDN	X		X				X									
XMK-058	NPS	KATMAI NP	AKP	MDN	X	X		X	7			X			X	X	X		X	X
XMK-059	NPS	KATMAI NP	AKP	MDN	X	X		X				X								
XMK-060	NPS	KATMAI NP	AKP	HST	X	X	X					X								
XMK-061	NPS	KATMAI NP	AKP	HST	X		X					X								
XMK-062	NPS	KATMAI NP	AKP	HST	X		X					X								
XMK-063	NPS	KATMAI NP	AKP	MDN	X			X				X								
XMK-064	NPS	KATMAI NP	AKP	MDN	X			X				X								
XMK-065	NPS	KATMAI NP	AKP	MDN	X	X		X				X								
XMK-066	NPS	KATMAI NP	AKP	MDN	X			X				X								
XMK-067	NPS	KATMAI NP	AKP	MDN	X			X				X								
XMK-068	NPS	KATMAI NP	AKP	MDN	X			X				X								
XMK-070	NPS	KATMAI NP	AKP	MDN	X	X		X					X							
XMK-071	NPS	KATMAI NP	AKP	MDN	X	X		X					X		X					
XMK-072	NPS	KATMAI NP	AKP	PIO		X		X					X							
XMK-074	NPS	KATMAI NP	AKP	MDN	X	X		X					X							

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Cumulative Report of Project Activity
At All Sites

AHRS	Landowner	Park/ Refuge	Region	Site Type	Up-Land	Intertidal	Historic	Pre-Historic	Artifact Coll. 1989	Artifact Coll. 1990	Site known pre-1989	New site 1989	New site 1990	Site up-date 1989	Site up-date 1990	1990 Site Map	Site Inspectd 1990	Site Monitor 1990	Post-treat. assessment89	Site Incident 1989
XMK-075	NPS	KATMAI NP	AKP	MDN	X	X		X					X							
XMK-076	NPS	KATMAI NP	AKP	PIO		X		X					X							
XMK-077	NPS	KATMAI NP	AKP	PIO		X		X					X							
XTI-008	DNR		KOD	MDN	X	X	X	X			X			X						
XTI-009	DNR		KOD	MDN	X	X		X			X			X						
XTI-016	FWS/AJVS	KODIAK NWR	KOD	MDN		X		X			X			X						
XTI-017	FWS/AJVS	KODIAK NWR	KOD	MDN	X	X	X	X			X			X						
XTI-018	FWS/AJVS	KODIAK NWR	KOD	RKA	X			X			X			X						
XTI-054	DNR		KOD	RPT				X			X			X						
XTI-055	DNR		KOD	MDN	X			X			X			X						
XTI-056	DNR		KOD	MDN	X	X	X	X			X									
XTI-060	DNR		KOD	MDN	X			X			X			X						
XTI-061	FWS/AJVS	KODIAK NWR	KOD	HST	X		X				X			X						
XTI-065	DNR		KOD	MDN	X			X			X									
XTI-066	DNR		KOD	MDN	X	X		X			X									
XTI-067	FWS	KODIAK NWR	KOD	MDN	X	X		X				X								
XTI-068	FWS	KODIAK NWR	KOD	PAS	X			X	1			X								
XTI-069	FWS/AJVS	KODIAK NWR	KOD	HAS	X		X					X								

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Cumulative Report of Project Activity
At State of Alaska/DNR Sites

AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre- 1989	New Site 1989	New Site 1990	Site Up- date 1989	Site Up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
KOD-001	DNR		RPT				X			X									
KOD-062	DNR		MDN	X	X		X			X									
KOD-063	DNR		MDN	X	X	X				X									
KOD-064	DNR		MDN	X	X	X				X									
KOD-065	DNR		MDN	X			X			X									
KOD-067	DNR/PRV		MDN	X	X		X			X									X
KOD-068	DNR/PRV		MDN	X		X	X			X									X
KOD-069	DNR/PRV		MDN	X			X			X									X
KOD-070	DNR/PRV		MDN	X			X			X									X
KOD-071	DNR		MDN	X			X			X									
KOD-072	DNR		RPT				X			X									
KOD-073	DNR		MDN	X			X			X									
KOD-074	DNR		RPT			X	X			X									
KOD-075	DNR		RPT			X	X			X									
KOD-076	DNR/AJVS		MDN	X	X	X	X			X			X						
KOD-077	DNR/AJVS/BIA		MDN	X	X	X	X	X		X			X	X	X				
KOD-078	DNR/BIA/AJVS		MDN	X		X	X			X			X						
KOD-080	DNR/BIA/AJVS		MDN	X	X		X			X			X						
KOD-199	DNR		HST	X		X				X									
KOD-213	DNR/PRV		MDN	X	X		X			X									
KOD-353	DNR		MDN	X			X			X									
KOD-354	DNR		MDN	X		X	X			X									
KOD-364	DNR		RPT			X	X			X									
KOD-386	DNR		MDN	X	X		X				X								
KOD-387	DNR		MDN	X			X				X								
KOD-388	DNR		MDN	X	X		X				X								
KOD-389	DNR		MDN	X	X		X				X								
KOD-390	DNR		MDN	X	X		X				X								
KOD-393	DNR/BIA/AJVS		HST	X	X	X					X								
KOD-394	DNR		MDN	X	X		X				X								
KOD-395	DNR/AJVS		MDN	X	X		X				X								
KOD-396	DNR/BIA/AJVS		MDN	X	X		X				X			X					
KOD-397	DNR/BIA/AJVS		HIO	X		X					X								
KOD-398	DNR		MDN	X			X				X								
KOD-399	DNR		MDN	X	X		X				X								
KOD-400	DNR		MDN	X	X		X		X		X			X	X				
KOD-405	DNR/BIA/AJVS		MDN	X	X		X				X								
KOD-409	DNR		MDN	X	X		X				X								
KOD-427	DNR		PIO	X			X				X			X					X
KOD-430	DNR		MDN	X	X		X				X								
KOD-433	DNR		HST	X		X					X								
SEL-017	EB/PRV/BIA/B		HST	X	X	X				X			X	X					
	LM/EBS/DNRS																		
SEL-183	DNR/CG		HST	X		X					X								
SEW-220	FS/CACS/DNRS		HST	X		X				X									
XTI-008	DNR		MDN	X	X	X	X			X			X						

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AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre- 1989	New Site 1989	New Site 1990	Site Up- date 1989	Site Up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
XTI-009	DNR		MDN	X	X		X			X									
XTI-054	DNR		RPT				X			X			X						
XTI-055	DNR		MDN	X			X			X			X						
XTI-056	DNR		MDN	X	X	X	X			X									
XTI-060	DNR		MDN	X			X			X			X						
XTI-065	DNR		MDN	X			X			X									
XTI-066	DNR		MDN	X	X		X			X									
SUT-017	FWS/DNRS	AK PEN NWR	MDN	X			X				X								
SUT-018	FWS/DNRS	AK PEN NWR	MDN	X			X				X								
UGA-043	FWS/DNRS	BECHRF NWR	MDN	X			X			X								X	
SEL-025	DNR	KACH BA SP	HST	X		X				X				X	X	X			
SEL-119	DNR	KACH BA SP	MDN	X			X			X			X						
SEL-129	DNR	KACH BA SP	MDN	X			X			X			X	X				X	
SEL-178	DNR	KACH BA SP	MDN	X	X		X	X			X			X	X		X		
SEL-184	DNR	KACH BA SP	PST		X		X				X								
SEL-186	DNR	KACH BA SP	MDN	X			X					X							
SEL-187	DNR	KACH BA SP	SHP		X	X					X								
SEL-196	DNR	KACH BA SP	PAS	X	X		X	X			X								
SEL-211	DNR	KACH BA SP	MDN	X	X		X							X	X	X			
SEL-215	DNR	KACH BA SP	PAS		X		X					X			X		X		
SEL-216	DNR	KACH BA SP	PAS		X		X					X			X		X		
SEL-217	DNR	KACH BA SP	PAS		X		X					X			X		X		
SEL-218	DNR	KACH BA SP	PIO		X		X					X			X		X		
SEL-224	DNR	KACH BA SP	HST	X		X						X			X				
SEL-225	DNR	KACH BA SP	HST	X		X						X			X				
KOD-079	AJV/BIA/FWS/ DNR/PRV	KODIAK NWR	MDN	X	X		X			X			X						
KOD-130	AJV/BIA/FWS/ DNR/PRV	KODIAK NWR	RPT	X		X	X			X			X						
KOD-404	AJV/BIA/FWS/ DNR/PRV	KODIAK NWR	MDN	X			X				X								
AFG-046	DNR/FAA		MDN	X	X	X	X	X		X			X	X	X		X	X	
AFG-058	DNR		MDN	X	X	X	X			X			X						
AFG-059	DNR		RPT	X		X				X									
AFG-091	DNR		RPT	X		X				X									
AFG-102	DNR		MDN	X			X				X								
AFG-132	DNR		MDN	X	X		X	X			X								
AFG-137	AJV/DNR		MDN	X	X		X				X			X					
AFG-138	DNR		MDN	X	X		X				X			X	X				
AFG-139	DNR		MDN	X	X		X				X								
AFG-142	DNR		MDN	X	X		X				X								
AFG-144	DNR		MDN	X	X		X				X								
AFG-154	DNR		MDN	X			X				X								
AFG-049	DNR	SHUYAK SP	RPT	X		X				X									
AFG-081	DNR	SHUYAK SP	MDN	X	X		X	X		X			X	X	X				
AFG-082	DNR	SHUYAK SP	MDN	X			X			X			X						
AFG-083	DNR	SHUYAK SP	MDN	X			X			X			X						

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AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre- 1989	New Site 1989	New Site 1990	Site Up- date 1989	Site Up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
AFG-084	DNR/BIA	SHUYAK SP	MDN	X	X		X			X			X						
AFG-085	DNR	SHUYAK SP	MDN	X	X		X			X			X						
AFG-086	DNR	SHUYAK SP	MDN	X	X		X			X			X						
AFG-093	DNR	SHUYAK SP	HST	X		X					X								
AFG-097	DNR/BIA	SHUYAK SP	MDN	X			X	X			X								
AFG-098	DNR	SHUYAK SP	MDN	X	X		X				X			X		X			
AFG-111	DNR/BIA/PRV	SHUYAK SP	PAS		X	X	X				X			X	X	X		X	
AFG-112	DNR/BIA	SHUYAK SP	MDN	X			X				X								
AFG-113	DNR	SHUYAK SP	MDN	X			X				X								
AFG-115	DNR	SHUYAK SP	HST	X		X					X								
AFG-116	DNR	SHUYAK SP	MDN	X			X				X								
AFG-151	DNR	SHUYAK SP	MDN	X			X				X								
AFG-152	DNR/BIA/PRV	SHUYAK SP	SHP		X	X					X			X					
AFG-160	DNR	SHUYAK SP	MDN	X	X		X				X								
AFG-164	DNR	SHUYAK SP	MDN	X		X	X				X								
AFG-166	DNR	SHUYAK SP	PIO		X		X					X		X	X				
AFG-173	DNR	SHUYAK SP	MDN	X	X		X					X			X	X			
AFG-174	DNR/BIA/PRV	SHUYAK SP	HST	X	X	X						X			X				
AFG-179	DNR/BIA/PRV	SHUYAK SP	PIO	X	X		X					X							
AFG-038	FWST/AJV/FS/ DNRS	USFWS-T	MDN	X	X		X			X			X						

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AHRS	Landowner	Park/ Refuge	Site Type	Up-Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre-1989	New Site 1989	New Site 1990	Site Up-date 1989	Site Up-date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
AFG-010	FS		MDN	X	X	X	X			X			X						
AFG-012	FS		MDN	X	X		X			X			X						
AFG-038	FWST/AJV/FS/ DNRS	USFWS-T	MDN	X	X		X			X			X						
AFG-061	FS		HST	X		X				X			X						
SEW-004	FS/CACS		RKS	X			X	X		X			X	X			X	X	X
SEW-009	FS/CG/CACS		HST	X	X	X				X			X						
SEW-060	FS		HIO	X		X	?			X				X					
SEW-061	FS/CACS		HIO	X		X	?			X			X	X					
SEW-062	FS/CACS		HST	X		X				X			X						
SEW-071	CVC/FS/CG/CA CS		RPT				X			X				X				X	
SEW-073	FS/CACS		RKS	X			X	X		X			X	X			X	X	
SEW-074	FS/CACS		HIO	X		X				X									
SEW-075	FS/CACS/CVCS		RPT				X			X									
SEW-076	FS/CACS/CVCS		MDN	X	X		X			X			X	X	X	X	X	X	
SEW-077	FS/CVC/CG/CV CS		PAS	X	X	X	X			X			X	X	X			X	X
SEW-078	FS		RPT				X			X									
SEW-086	FS/CACS		RKS	X			X			X									
SEW-087	FS/CVC/CACS		RKS	X			X			X									
SEW-206	FS/CACS		HIO	X		X				X				X					
SEW-207	FS/CACS		PAS	X	X		X			X						X			
SEW-208	FS/CACS		HST	X	X	X				X									
SEW-220	FS/CACS/DNRS		HST	X		X				X									
SEW-224	FS/CACS		HST	X		X				X			X						
SEW-225	FS/CACS		HST	X		X				X									
SEW-229	FS/CACS		HIO	X		X				X									
SEW-234	FS/BLM/CACS		HST	X	X	X				X				X					
SEW-235	FS/CACS		HIO	X		X				X			X	X	X				
SEW-236	FS/CACS		HST	X		X				X			X	X					
SEW-240	FS/CACS		HST	X		X				X				X	X				
SEW-241	FS/CACS		PAS	X	X	X	X			X			X	X		X		X	
SEW-243	FS/CACS		HST	X		X				X				X					
SEW-245	FS/CACS		HST	X		X				X			X	X					
SEW-248	FS		HST	X		X		X		X			X	X	X			X	
SEW-249	FS/CACS		RKS	X	X		X			X			X	X	X		X	X	
SEW-261	FS/CACS		HIO	X		X				X									
SEW-276	FS/CACS		HST	X		X				X				X					
SEW-281	FS/CG/CACS		HST	X		X				X			X						
SEW-283	FS		HST	X		X				X									
SEW-292	FS/BLM/CACS		MDN		X		X			X				X					
SEW-293	FS/BLM/CACS		PAS		X		X			X				X		X			
SEW-295	FS/BLM/CACS		PIO		X		X			X				X					
SEW-337	FS		HST	X	X	X				X				X					
SEW-339	FS/CG/CACS		HST	X		X				X				X	X	X			

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AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre- 1989	New Site 1989	New Site 1990	Site Up- date 1989	Site Up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
SEW-350	FS		PIO	X	X	X	?			X			X	X					
SEW-361	FS		HIO	X		X				X				X					
SEW-391	FS/PRV/CACS		HST	X	X	X				X			X						
SEW-429	FS/CACS		RPT				X			X									
SEW-430	FS		RKS	X			X			X				X	X		X		
SEW-434	FS		HST	X		X					X								
SEW-435	FS		HST	X	X	X					X			X	X		X	X	
SEW-436	FS		RKS	X	X		X	X			X			X		X			
SEW-437	FS		HST	X		X					X			X		X			
SEW-438	FS		HST	X		X					X			X	X	X			
SEW-440	FS		MDN	X	X	X	X		X		X			X	X	X		X	
SEW-441	FS		HST	X		X					X			X		X		X	
SEW-442	FS		HST	X		X					X			X		X		X	
SEW-443	FS		RKS	X			X				X			X			X	X	
SEW-444	FS		PIO	X	X	X	X				X			X					
SEW-445	FS		PIO	X	X	X	?				X			X					
SEW-446	FS/CACS		HST	X		X					X								
SEW-447	FS		RKS	X		X	X				X			X	X		X	X	
SEW-448	FS		SHP		X	X					X			X					
SEW-449	FS		HST	X		X					X								
SEW-450	FS		HST	X	X	X					X			X	X	X		X	
SEW-451	FS		HST	X		X					X			X		X		X	
SEW-452	FS		HST	X		X					X			X	X				
SEW-453	FS/CG/CACS		HST	X		X					X			X		X			
SEW-457	FS		HST	X		X					X			X	X	X			
SEW-458	FS		HST	X		X					X			X	X	X			
SEW-459	FS		HST	X		X					X								
SEW-460	FS		HST	X		X					X					X			
SEW-461	FS		HST	X		X					X								
SEW-462	FS		RKS	X			X				X			X	X	X		X	
SEW-464	FS		HST	X		X					X			X		X			
SEW-465	FS		HST	X		X					X			X		X			
SEW-466	FS		HST	X	X	X					X								
SEW-467	FS		HST	X		X					X								
SEW-468	FS		HST	X		X	X				X								
SEW-469	FS		RKS		X		X				X			X			X	X	X
SEW-471	FS		MDN	X		X	X	X			X								
SEW-474	FS		HIO	X		X					X			X	X			X	X
SEW-475	FS		HIO	X		X					X								
SEW-476	FS		HIO	X		X					X								
SEW-477	FS/CVC/CVCS		HIO	X							X								
SEW-478	FS/CVC/CVCS		HIO		X	X		X			X								
SEW-479	FS		HST	X		X					X								
SEW-480	FS		HST	X		X					X			X					
SEW-481	FS/CACS		RKS	X			X				X			X			X	X	
SEW-482	FS/CACS		HST	X		X					X							X	
SEW-486	FS/CVC		SHP		X	X					X								

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SEW-487	FS		SHP		X	X					X								
SEW-488A	FS/CACS		MDN	X	X	X	X	X	X		X			X	X		X	X	X
SEW-488B	FS/CACS		PAS		X		X					X		X	X		X		
SEW-489	FS		HST	X		X					X								
SEW-490	FS		SHP		X	X					X								
SEW-493	FS		HIO		X	X					X								
SEW-494	FS/CACS		HIO		X	X					X			X					
SEW-495	FS		RKS	X			X				X			X	X				
SEW-498	CVC/CG/FS/CV CS		HST	X	X	X					X								
SEW-499	FS		HST	X		X					X								
SEW-502	FS/PRV/CACS		MDN	X	X	?	X				X			X					
SEW-503	FS		HST	X		X					X								
SEW-505	FS		RKS	X		?	X					X		X	X		X		
SEW-509	FS		RKS	X		X	?					X							
SEW-510	FS		RKS	X			X					X			X				
SEW-513	FS		PAS		X		X					X		X	X	X			
SEW-517	FS		RKS	X			X					X			X		X		
SEW-518	FS		RKS	X			X					X		X			X		
SEW-519	FS		HST	X		X						X			X				
SEW-520	FS		RKS	X			X					X		X	X	X			
SEW-521	FS/CACS		HST	X		X						X					X		
SEW-522	FS		HST	X		X						X			X				
SEW-523	FS		HST	X		X						X							
SEW-524	FS		HST	X		X						X							
SEW-525	FS/CACS		HST	X		X						X							
SEW-526	FS/CVCS		MDN	X	X		X					X			X				
SEW-527	FS		HST	X		X						X					X		
SEW-528	FS		SHP		X	X						X							
SEW-529	FS		PIO	X			X					X							
SEW-537	FS		RKA		X	?	X					X		X		X			
SEW-538	FS		PAS		X		X					X			X				
SEW-539	FS/CACS		HST	X		X						X			X				
SEW-541	FS		RKS	X		?	?					X		X					
SEW-542	FS		PAS		X		X					X			X				
XBS-006	FS		HST	X		?	?			X				X					
XBS-016	FS		HST	X	X	X					X			X		X			
XBS-017	FS		HST	X	X	X					X								

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AHRS	Landowner	Park/ Refuge	Site Type	Up-Land	Inter tidal	Historic	Pre Historic	Artifact Coll. 1989	Artifact Coll. 1990	Site known Pre-1989	New Site 1989	New Site 1990	Site Update 1989	Site Update 1990	1990 Site Map	Site Inspectd 1990	Site Monitor 1990	Post treat. assessment89	Site Incident 1989
SUT-016	NPS	ANAKCHK NP	MDN	X		X	X			X									
AFG-001	NPS	KATMAI NP	MDN	X	X		X			X			X	X	X	X			
AFG-043	NPS	KATMAI NP	MDN	X	X	X	X			X			X	X	X				
AFG-044	NPS	KATMAI NP	MDN	X		X	?			X			X						
AFG-108	NPS	KATMAI NP	HST	X		X					X								
AFG-109	NPS	KATMAI NP	HST	X	X	X					X								
AFG-110	NPS	KATMAI NP	MDN	X			X				X								
AFG-117	NPS	KATMAI NP	MDN	X	X		X	X			X								
AFG-118	NPS	KATMAI NP	MDN	X			X				X							X	
AFG-134	NPS	KATMAI NP	PST	X			X				X								
AFG-165	NPS	KATMAI NP	PST	X			X				X								
AFG-171	NPS	KATMAI NP	HAS	X	X	X						X			X	X			
AFG-176	NPS	KATMAI NP	MDN	X			X					X				X			
AFG-177	NPS	KATMAI NP	PAS	X			X					X			X	X			
ILI-058	NPS	KATMAI NP	MDN				X				X								
KAR-127	NPS	KATMAI NP	MDN				X				X								
XMK-007	NPS	KATMAI NP	MDN	X	X	X	X			X			X	X	X				
XMK-014	NPS/PRV	KATMAI NP	MDN			X				X									
XMK-015	NPS	KATMAI NP	HAS			X				X			X						
XMK-018	NPS	KATMAI NP	MDN				X			X			X						
XMK-019	NPS	KATMAI NP	MDN				X			X			X						
XMK-020	NPS	KATMAI NP	MDN				X			X			X						
XMK-021	NPS	KATMAI NP	PAS	X	X		X			X				X					
XMK-022	NPS	KATMAI NP	MDN		X		X	X		X			X	X	X				
XMK-024	NPS	KATMAI NP	PAS				X			X									
XMK-025	NPS	KATMAI NP	PAS	X	X		X			X				X	X				
XMK-026	NPS	KATMAI NP	MDN				X			X			X						
XMK-027	NPS	KATMAI NP	MDN				X			X			X						
XMK-028	NPS	KATMAI NP	MDN				X			X			X						
XMK-029	NPS	KATMAI NP	MDN				X			X			X						
XMK-030	NPS	KATMAI NP	MDN				X			X			X						
XMK-031	NPS	KATMAI NP	MDN				X			X			X						
XMK-046	NPS/PRV	KATMAI NP	MDN			X				X									
XMK-058	NPS	KATMAI NP	MDN	X	X		X	X			X			X	X	X		X	X
XMK-059	NPS	KATMAI NP	MDN				X				X								
XMK-060	NPS	KATMAI NP	HST			X					X								
XMK-061	NPS	KATMAI NP	HST			X					X								
XMK-062	NPS	KATMAI NP	HST			X					X								
XMK-063	NPS	KATMAI NP	MDN				X				X								
XMK-064	NPS	KATMAI NP	MDN				X				X								
XMK-065	NPS	KATMAI NP	MDN				X				X								
XMK-066	NPS	KATMAI NP	MDN				X				X								
XMK-067	NPS	KATMAI NP	MDN				X				X								
XMK-068	NPS	KATMAI NP	MDN				X				X								
XMK-070	NPS	KATMAI NP	MDN	X	X		X					X							
XMK-071	NPS	KATMAI NP	MDN	X	X		X					X		X					

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AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre- 1989	New Site 1989	New Site 1990	Site Up- date 1989	Site Up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
XMK-072	NPS	KATMAI NP	PIO		X		X					X							
XMK-074	NPS	KATMAI NP	MDN	X	X		X					X							
XMK-075	NPS	KATMAI NP	MDN	X	X		X					X							
XMK-076	NPS	KATMAI NP	PIO		X		X					X							
XMK-077	NPS	KATMAI NP	PIO		X		X					X							
SEL-172	NPS/PGS	KEFJ NP	MDN				X			X			X						
SEL-173	NPS/PGS	KEFJ NP	MDN				X			X			X						
SEL-174	NPS/PGS	KEFJ NP	MDN				X			X			X						
SEL-185	NPS/PGS	KEFJ NP	HST			X					X								
SEL-188	NPS/PGS	KEFJ NP	MDN	X	X		X	X	X		X			X	X		X		
SEL-194	NPS/PGS	KEFJ NP	MDN	X	X		X				X			X	X				
SEL-204	NPS/PGS	KEFJ NP	PIO				X				X								
SEL-206	NPS/PGS	KEFJ NP	PAS		X		X				X			X	X				
SEL-209	NPS/PGS	KEFJ NP	MDN				X				X								
XBS-014	NPS/BIA/EBS	KEFJ NP	MDN	X		X	X			X				X	X				
XBS-015	NPS/BIA/EBS	KEFJ NP	MDN	X			X				X			X	X				

APPENDIX Q

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AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre- 1989	New Site 1989	New Site 1990	Site Up- date 1989	Site Up- date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
AFG-039	FWS	AK MAR NWR	HST	X		X				X				X	X	X			
AFG-087	FWS	AK MAR NWR	MDN	X		X				X									
AFG-099	FWS	AK MAR NWR	HST	X		X					X			X	X	X			
AFG-100	FWS	AK MAR NWR	HST	X		X					X			X	X				
AFG-101	FWS	AK MAR NWR	HST	X		X					X			X	X				
AFG-103	FWS	AK MAR NWR	MDN	X			X				X			X	X		X		
AFG-104	FWS	AK MAR NWR	MDN	X	X		X				X			X	X	X			
AFG-105	FWS	AK MAR NWR	MDN	X	X		X				X			X	X		X	X	
AFG-106	FWS	AK MAR NWR	PIO	X			X	X			X			X		X			
AFG-167	FWS	AK MAR NWR	HST	X		X						X		X			X		
AFG-168	FWS	AK MAR NWR	PIO		X		X					X		X			X		
AFG-169	FWS	AK MAR NWR	PIO	X	X		X					X					X		
AFG-170	FWS	AK MAR NWR	MDN	X	X		X					X					X		
AFG-175	FWS	AK MAR NWR	MDN	X	X		X					X		X			X		
AFG-180	FWS	AK MAR NWR	HST	X		X						X				X			
SEL-197	FWS/PGS/EBS	AK MAR NWR	PAS		X		X	X			X			X	X				
SEL-198	FWS/PGS/EBS	AK MAR NWR	MDN	X	X		X				X			X	X				
SEL-200	FWS	AK MAR NWR	PAS		X		X				X								
SEL-201	FWS	AK MAR NWR	PAS		X	X	X				X								
SEL-202	FWS	AK MAR NWR	HST	X		X					X								
SEL-203	FWS	AK MAR NWR	HST	X		X					X								
SUT-001	FWS/KI	AK MAR NWR	RPT			X				X									
SUT-020	FWS/KI	AK MAR NWR	MDN	X			X				X								
XBS-018	FWS	AK MAR NWR	MDN	X			X				X								
SUT-017	FWS/DNRS	AK PEN NWR	MDN	X			X				X								
SUT-018	FWS/DNRS	AK PEN NWR	MDN	X			X				X								
SUT-019	AJV/FWS-T	AK PEN NWR	HST	X		X					X								
KAR-026	AJVS/FWS	BECHRF NWR	MDN	X	X		X			X			X						
KAR-112	FWS	BECHRF NWR	HST	X		X				X			X	X	X	X			
KAR-116	FWS	BECHRF NWR	HST	X		X					X							X	
KAR-117	FWS	BECHRF NWR	HST	X		X	X				X								
KAR-118	FWS	BECHRF NWR	HST	X		X					X								
KAR-120	FWS	BECHRF NWR	MDN	X			X				X								
KAR-121	FWS	BECHRF NWR	MDN	X			X	X			X			X				X	
KAR-122	FWS	BECHRF NWR	PAS	X			X	X			X			X					
KAR-123	FWS	BECHRF NWR	PIO	X			X				X								
KAR-124	FWS	BECHRF NWR	MDN	X		X	X				X			X					
KAR-126	FWS	BECHRF NWR	PIO	X			X				X								
KAR-128	FWS	BECHRF NWR	PAS	X			X				X			X					
KAR-129	FWS	BECHRF NWR	HST	X		X					X								
KAR-130	FWS	BECHRF NWR	HST	X		X					X								
KAR-131	FWS	BECHRF NWR	PIO	X			X				X								
KAR-132	FWS	BECHRF NWR	PAS	X			X	X			X								
KAR-133	FWS	BECHRF NWR	HST	X		X					X								
KAR-134	FWS	BECHRF NWR	HST	X		X					X			X					

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KAR-135	FWS	BECHRF NWR	HST	X		X					X								
UGA-031	FWS	BECHRF NWR	MDN	X		X	X			X									
UGA-043	FWS/DNRS	BECHRF NWR	MDN	X			X			X								X	
UGA-059	FWS/AJVS	BECHRF NWR	MDN	X			X			X									
AFG-121	FWS-T	KODIAK NWR	MDN	X	X		X				X								
AFG-122	FWS-T	KODIAK NWR	MDN	X	X		X	X			X							X	
AFG-125	FWS-T	KODIAK NWR	MDN	X	X		X				X			X	X				
AFG-126	FWS-T	KODIAK NWR	MDN	X	X		X				X			X	X				
AFG-127	FWS-T	KODIAK NWR	MDN	X	X		X				X			X	X				
AFG-128	FWS-T	KODIAK NWR	MDN	X	X		X	X			X							X	
AFG-129	FWS-T	KODIAK NWR	MDN	X	X		X				X			X	X			X	X
AFG-146	AJV/FWST	KODIAK NWR	MDN	X	X		X				X			X	X				
AFG-172	FWS-T	KODIAK NWR	HST	X		X						X			X		X		
KAG-001	AJV/BIA/FWS	KODIAK NWR	MDN	X	X		X			X			X						
KAG-002	FWS/AJVS	KODIAK NWR	MDN	X	X	X	X			X									
KAG-014	FWS/AJVS	KODIAK NWR	MDN	X			X				X								
KAR-002	FWS/PRV/KI	KODIAK NWR	RPT			X				X			X						
KOD-079	AJV/BIA/FWS/ DNR/PRV	KODIAK NWR	MDN	X	X		X			X			X						
KOD-098	AJV/BIA/FWS	KODIAK NWR	MDN	X	X		X			X			X						
KOD-099	AJV/BIA/FWS	KODIAK NWR	MDN	X	X	X	X			X			X						
KOD-100	AJV/BIA/FWS	KODIAK NWR	MDN	X			X			X									
KOD-130	AJV/BIA/FWS/ DNR/PRV	KODIAK NWR	RPT	X		X	X			X			X						
KOD-168	FWS	KODIAK NWR	RPT				X			X									
KOD-170	FWS/KI	KODIAK NWR	MDN	X	X		X			X			X						
KOD-171	FWS/BIA	KODIAK NWR	MDN	X	X		X			X			X	X	X		X	X	
KOD-172	FWS/BIA	KODIAK NWR	MDN	X	X	X	X			X									
KOD-184	FWS	KODIAK NWR	RPT				X			X									
KOD-187	FWS	KODIAK NWR	MDN	X	X		X			X									
KOD-223	FWS/BIA	KODIAK NWR	MDN	X	X	X	X		X	X			X	X	X			X	
KOD-224	FWS	KODIAK NWR	MDN	X	X		X			X			X					X	
KOD-225	FWS	KODIAK NWR	MDN	X	X		X			X			X						
KOD-226	FWS	KODIAK NWR	MDN	X	X		X			X				X	X				
KOD-227	FWS/BIA/KI	KODIAK NWR	MDN	X	X		X			X			X						
KOD-228	FWS/BIA	KODIAK NWR	MDN	X	X		X			X									
KOD-229	FWS/BIA/KI	KODIAK NWR	MDN	X	X		X			X			X						
KOD-230	FWS/BIA	KODIAK NWR	MDN	X	X		X			X			X						
KOD-231	FWS	KODIAK NWR	MDN	X			X			X									
KOD-232	FWS	KODIAK NWR	MDN	X			X			X			X						
KOD-233	FWS/BIA/KI	KODIAK NWR	MDN	X			X			X									
KOD-238	FWS/BIA	KODIAK NWR	MDN	X	X		X			X			X						
KOD-239	FWS	KODIAK NWR	MDN	X			X			X			X					X	
KOD-240	FWS	KODIAK NWR	MDN	X			X			X									
KOD-241	FWS	KODIAK NWR	MDN	X			X			X			X						
KOD-245	FWS	KODIAK NWR	MDN	X	X		X			X			X						

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KOD-246	FWS	KODIAK NWR	MDN	X	X		X			X			X						
KOD-247	FWS	KODIAK NWR	MDN	X	X		X			X			X						
KOD-249	FWS	KODIAK NWR	MDN	X	X		X			X			X						
KOD-250	FWS	KODIAK NWR	MDN	X			X			X									
KOD-251	FWS/BIA	KODIAK NWR	MDN	X	X		X			X			X						
KOD-252	FWS	KODIAK NWR	MDN	X	X		X			X			X						
KOD-253	FWS	KODIAK NWR	MDN	X			X			X			X						
KOD-254	FWS	KODIAK NWR	MDN	X			X			X			X	X	X				
KOD-255	FWS/BIA	KODIAK NWR	MDN	X	X		X			X			X						
KOD-256	FWS	KODIAK NWR	MDN	X			X			X									
KOD-257	FWS	KODIAK NWR	PIO	X			X			X									
KOD-273	FWS/BIA	KODIAK NWR	MDN	X	X		X			X									
KOD-276	FWS/BIA	KODIAK NWR	MDN	X	X		X			X									
KOD-277	FWS/PRV	KODIAK NWR	MDN	X	X		X			X									
KOD-286	FWS/PRV	KODIAK NWR	MDN	X			X			X			X						
KOD-288	FWS	KODIAK NWR	MDN	X			X			X									
KOD-289	FWS	KODIAK NWR	MDN	X	X		X			X									
KOD-290	FWS	KODIAK NWR	MDN	X	X		X			X									
KOD-291	FWS	KODIAK NWR	MDN	X	X		X			X									
KOD-292	FWS/PRV	KODIAK NWR	MDN	X	X		X			X			X						
KOD-293	FWS/BIA	KODIAK NWR	MDN	X	X		X			X									
KOD-296	FWS/BIA	KODIAK NWR	MDN	X			X			X									
KOD-299	FWS	KODIAK NWR	MDN		X		X			X				X	X				
KOD-366	FWS	KODIAK NWR	HST	X		X					X								
KOD-367	FWS	KODIAK NWR	MDN	X			X				X								
KOD-371	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-374	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-375	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-391	AJV/BIA/FWS	KODIAK NWR	MDN	X			X				X								
KOD-401	FWS/BIA	KODIAK NWR	MDN	X	X		X				X								
KOD-402	FWS/BIA	KODIAK NWR	MDN	X			X				X								
KOD-403	FWS	KODIAK NWR	MDN	X			X				X								
KOD-404	AJV/BIA/FWS/ DNR/PRV	KODIAK NWR	MDN	X			X				X								
KOD-406	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-407	FWS/BIA/KI	KODIAK NWR	MDN	X	X	X	X				X			X	X				
KOD-408	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-412	FWS	KODIAK NWR	MDN	X			X				X								
KOD-413	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-414	FWS/BIA	KODIAK NWR	MDN	X	X		X				X			X	X				
KOD-415	FWS/BIA	KODIAK NWR	MDN	X	X		X	X			X			X	X				
KOD-418	AJV/BIA/FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-419	FWS	KODIAK NWR	MDN	X		X	X				X								
KOD-420	FWS/BIA/KI	KODIAK NWR	MDN	X	X		X				X								
KOD-421	FWS/BIA/KI	KODIAK NWR	MDN	X	X		X				X								
KOD-422	FWS/BIA	KODIAK NWR	MDN	X	X		X				X								

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KOD-423	FWS/BIA	KODIAK NWR	MDN	X	X		X				X								
KOD-424	FWS/BIA	KODIAK NWR	MDN	X	X		X				X								
KOD-425	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-428	FWS	KODIAK NWR	MDN	X	X		X				X								
KOD-429	FWS	KODIAK NWR	MDN	X			X				X								
KOD-432	FWS/BIA/KI	KODIAK NWR	MDN	X	X		X	X	X		X			X	X				X
KOD-434	FWS/BIA	KODIAK NWR	MDN	X			X					X			X				
KOD-435	FWS/BIA	KODIAK NWR	PIO		X	X	X					X			X				
KOD-436	FWS/BIA/KI	KODIAK NWR	MDN	X	X		X					X			X				
KOD-437	FWS/BIA	KODIAK NWR	MDN	X	X		X					X			X				
KOD-438	FWS/BIA	KODIAK NWR	PAS	X	X		X					X			X				
KOD-439	FWS/BIA	KODIAK NWR	MDN	X	X		X					X							
XTI-016	FWS/AJVS	KODIAK NWR	MDN		X		X			X			X						
XTI-017	FWS/AJVS	KODIAK NWR	MDN	X	X	X	X			X			X						
XTI-018	FWS/AJVS	KODIAK NWR	RKA	X			X			X			X						
XTI-061	FWS/AJVS	KODIAK NWR	HST	X		X				X									
XTI-067	FWS	KODIAK NWR	MDN	X	X		X				X								
XTI-068	FWS	KODIAK NWR	PAS	X			X	X			X								
XTI-069	FWS/AJVS	KODIAK NWR	HAS	X		X					X								
AFG-023	AJV/FWST	USFWS-T	MDN	X			X			X									
AFG-024	AJV/FWST	USFWS-T	MDN	X			X			X									
AFG-025	AJV/FWST	USFWS-T	MDN	X	X	X	X			X									
AFG-026	AJV/FWST	USFWS-T	MDN	X	X		X	X		X			X	X	X				X
AFG-027	AJV/FWST	USFWS-T	MDN	X	X		X			X			X	X	X				X
AFG-028	AJV/FWST	USFWS-T	MDN	X	X		X	X		X			X	X	X			X	
AFG-029	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-030	FWST/AJV	USFWS-T	MDN	X			X			X			X						
AFG-031	FWST/AJV	USFWS-T	MDN	X			X			X			X						
AFG-032	FWST/AJV	USFWS-T	MDN	X		X	X			X			X						
AFG-033	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-034	AJV/FWST	USFWS-T	MDN	X	X		X			X				X	X				
AFG-035	FWST/AJV	USFWS-T	HST	X		X				X			X						
AFG-038	FWST/AJV/FS/ DNRS	USFWS-T	MDN	X	X		X			X			X						
AFG-047	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-050	AJV/FWST	USFWS-T	HST	X		X				X									
AFG-052	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-053	FWST/AJV	USFWS-T	MDN	X			X			X				X					
AFG-054	FWST/AJV	USFWS-T	MDN	X			X			X									
AFG-055	FWST/AJV	USFWS-T	RPT	X			X			X									
AFG-056	FWST/AJV	USFWS-T	RPT	X			X			X									
AFG-057	FWST/AJV	USFWS-T	MDN	X		X	X			X									
AFG-060	FWST/AJV	USFWS-T	MDN	X	X		X			X									
AFG-063	AJV/FWST	USFWS-T	RPT	X			X			X				X					
AFG-065	FWST/AJV	USFWS-T	MDN	X			X			X									
AFG-066	FWST/AJV	USFWS-T	MDN	X			X			X									

1989/1990 Exxon Cultural Resource Program
Cumulative Report of Project Activity
At US Fish and Wildlife Service Sites

AHRS	Landowner	Park/ Refuge	Site Type	Up- Land	In ter tidal	His tor ic	Pre His tor ic	Arti fact Coll. 1989	Arti fact Coll. 1990	Site known Pre-1989	New Site 1989	New Site 1990	Site Up-date 1989	Site Up-date 1990	1990 Site Map	Site Insp ectd 1990	Site Mon itor 1990	Post treat. assess ment89	Site Inci dent 1989
AFG-067	FWST/AJV	USFWS-T	HST	X	X	X				X									
AFG-068	FWST/AJV	USFWS-T	MDN	X			X			X									
AFG-069	FWST/AJV	USFWS-T	MDN	X	X		X			X									
AFG-070	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-071	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-072	FWST/AJV	USFWS-T	MDN	X	X		X			X				X	X				
AFG-074	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-075	FWST/AJV	USFWS-T	MDN	X			X			X									
AFG-076	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-077	FWST/AJV	USFWS-T	MDN	X	X		X			X			X						
AFG-078	FWST/AJV	USFWS-T	MDN	X	X		X			X									
AFG-119	AJV/FWST	USFWS-T	MDN	X	X		X				X			X	X				
AFG-120	AJV/FWST	USFWS-T	MDN	X			X				X							X	
AFG-123	AJV/FWST	USFWS-T	MDN	X	X		X				X							X	
AFG-124	AJV/FWST	USFWS-T	MDN	X	X		X				X								
AFG-130	FWST/AJV	USFWS-T	MDN	X	X		X				X								
AFG-133	FWST/AJV	USFWS-T	MDN	X			X				X								
AFG-143	AJV/FWST	USFWS-T	MDN	X	X		X	X			X			X	X				X
AFG-161	FWST/AJV	USFWS-T	MDN	X	X		X				X								

APPENDIX R

1990 Exxon Cultural Resource Program
Alutiiq Site Resource Scores

AHRS	Re-gion	Envrn mental Zone	Site Sub-Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Sal-mon	1 km Sal-mon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
AFG-043	AKP	EXPOSED	LG VLG	24	180			X	X	12	2	0	0	3	0	0	0
AFG-125	KOD	SEMI-PRO	LG VLG	11						11	0	1	0	3	0	15	0
KAG-002	KOD	SEMI-PRO	LG VLG	15	117		X	X	X	5	0	1	0	4	1	3	0
KAR-022	KOD	PROTECTD	LG VLG	74		X	X	X		10	4	0	0	0	0	2	0
KAR-023	KOD	RIVERINE	LG VLG	14	200		X	X		3	3	0	0	0	0	0	0
KAR-039	KOD	SEMI-PRO	LG VLG	28			X			10	4	0	0	1	0	1	0
KAR-046	KOD	PROTECTD	LG VLG	132			X	X		10	4	0	0	1	0	1	0
KAR-092	KOD	PROTECTD	LG VLG	14	100		X			9	2	0	0	1	0	1	0
KOD-038	KOD	SEMI-PRO	LG VLG	11	105					12	2	0	0	4	0	10	1
KOD-062	KOD	PROTECTD	LG VLG	12				X	X	25	7	0	0	4	1	2	0
KOD-068	KOD	SEMI-PRO	LG VLG	12	100			X		14	3	1	0	6	0	5	0
KOD-077	KOD	PROTECTD	LG VLG	20	400			X	X	21	0	0	0	6	1	9	2
KOD-145	KOD	PROTECTD	LG VLG	45	200		X	X		6	0	0	0	1	0	3	0
KOD-153	KOD	PROTECTD	LG VLG	23			X	X		14	0	0	0	0	0	0	0
KOD-157	KOD	PROTECTD	LG VLG	25	240		X	X	X	6	0	0	0	2	0	3	0
KOD-160	KOD	PROTECTD	LG VLG	11	70			X	X	4	0	0	0	2	1	3	1
KOD-171	KOD	SEMI-PRO	LG VLG	22	200		X	X		6	3	0	0	6	1	6	1
KOD-179	KOD	PROTECTD	LG VLG	35	450			X		6	4	0	0	2	0	3	0
KOD-204	KOD	EXPOSED	LG VLG	19				X		2	0	1	0	2	1	9	2
KOD-225	KOD	PROTECTD	LG VLG	11			X			7	0	0	0	3	1	2	0
KOD-226	KOD	PROTECTD	LG VLG	11	6			X		4	0	0	0	3	0	10	1
KOD-235	KOD	PROTECTD	LG VLG	16			X			8	4	0	0	2	0	2	0
KOD-246	KOD	SEMI-PRO	LG VLG	14				X		2	0	0	0	8	1	5	0
KOD-259	KOD	PROTECTD	LG VLG	14	4			X	X	6	0	0	0	2	0	4	0
KOD-267	KOD	PROTECTD	LG VLG	12	75			X		2	0	0	0	8	0	5	1
KOD-336	KOD	PROTECTD	LG VLG	13	140			X	X	13	0	0	0	3	0	5	1
KOD-396	KOD	PROTECTD	LG VLG	30				?		21	0	0	0	6	1	9	2
KOD-415	KOD	SEMI-PRO	LG VLG	15						3	0	0	0	3	1	2	0
KOD-434	KOD	EXPOSED	LG VLG	15						6	3	0	0	5	1	6	0
SEL-119	KEN	SEMI-PRO	LG VLG	15						8	1	0	0	0	0	3	0
UGA-043	AKP	EXPOSED	LG VLG	25			X	X		2	0	0	0	2	1	3	1
XBS-020	KEN	SEMI-PRO	LG VLG	20					X	1	0	0	0	1	0	3	0
XMK-006	AKP	SEMI-PRO	LG VLG	89		X	X	X		10	2	1	0	2	0	4	1
XMK-049	AKP	SEMI-PRO	LG VLG	13				X	X	5	2	0	0	1	0	4	0
XTI-008	KOD	EXPOSED	LG VLG	15	400			X	X	3	1	0	0	3	0	4	0
XTI-056	KOD	EXPOSED	LG VLG	15						3	2	0	0	3	1	4	0
XTI-067	KOD	SEMI-PRO	LG VLG	25	500			X		4	0	0	0	6	1	1	0
AFG-001	AKP	SEMI-PRO	MED VLG	6	30		?	X		11	0	0	0	2	1	1	0
AFG-029	KOD	PROTECTD	MED VLG	8				X		15	4	0	0	2	1	3	0
AFG-074	KOD	SEMI-PRO	MED VLG	6				X		12	0	1	0	4	1	11	0
AFG-083	KOD	EXPOSED	MED VLG	6			X	X		11	0	0	0	1	1	14	1
AFG-097	KOD	PROTECTD	MED VLG	6		X	X	X		18	2	0	0	3	0	16	0
AFG-103	KEN	EXPOSED	MED VLG	8			?			0	0	5	0	3	1	5	0
AFG-137	KOD	PROTECTD	MED VLG	7	100			X		10	0	0	0	1	0	0	0
AFG-138	KOD	SEMI-PRO	MED VLG	7	100					5	2	0	0	2	0	0	0

1990 Exxon Cultural Resource Program
Alutiiq Site Resource Scores

AHRS	Re-gion	Envrn-mental Zone	Site Sub-Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Sal-mon	1 km Sal-mon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
AFG-158	KOD	SEMI-PRO	MED VLG	7						14	0	1	0	1	0	15	1
AFG-160	KOD	EXPOSED	MED VLG	6						5	0	1	0	3	0	11	1
AFG-173	KOD	EXPOSED	MED VLG	8						13	0	0	0	1	0	14	1
AFG-175	KEN	EXPOSED	MED VLG	10						0	0	5	0	3	1	5	0
CHK-020	AKP	SEMI-PRO	MED VLG	7						10	1	0	0	0	0	0	0
COR-041	PWS	PROTECTD	MED VLG	7				X	X	25	1	0	0	1	0	0	0
KAG-004	KOD	SEMI-PRO	MED VLG	9						8	1	0	0	3	0	2	0
KAR-016	KOD	SEMI-PRO	MED VLG	10	125		X	X		9	3	0	0	1	0	1	0
KAR-017	KOD	SEMI-PRO	MED VLG	8			X			9	3	0	0	1	0	1	0
KAR-025	KOD	SEMI-PRO	MED VLG	10	380		X	X	X	2	0	0	0	4	1	3	1
KAR-029	KOD	PROTECTD	MED VLG	8			X	X		4	0	0	0	0	0	0	0
KAR-037	KOD	SEMI-PRO	MED VLG	7		X	X	X	X	10	4	0	0	1	0	1	0
KAR-048	KOD	PROTECTD	MED VLG	6				X		10	4	0	0	1	0	1	0
KAR-115	KOD	SEMI-PRO	MED VLG	9	150			X		9	3	0	0	1	0	1	0
KOD-035	KOD	SEMI-PRO	MED VLG	9	100			X	X	11	0	0	0	2	0	8	0
KOD-079	KOD	PROTECTD	MED VLG	6	120					26	0	0	0	5	1	7	0
KOD-163	KOD	SEMI-PRO	MED VLG	6			X	X		13	0	0	0	3	0	7	1
KOD-174	KOD	PROTECTD	MED VLG	8						3	0	0	0	7	1	5	1
KOD-183	KOD	EXPOSED	MED VLG	7	60			X	X	4	0	0	0	6	1	4	2
KOD-189	KOD	SEMI-PRO	MED VLG	8						5	0	0	0	6	1	9	0
KOD-190	KOD	PROTECTD	MED VLG	10	300			X		12	5	0	0	1	0	3	0
KOD-223	KOD	PROTECTD	MED VLG	6	300		X	X	X	11	0	0	0	3	0	2	0
KOD-227	KOD	SEMI-PRO	MED VLG	6	50		?	?		7	0	0	0	4	1	11	0
KOD-233	KOD	SEMI-PRO	MED VLG	8			X	X		4	0	0	0	3	0	9	1
KOD-239	KOD	PROTECTD	MED VLG	10			X	X		7	0	0	0	4	1	3	0
KOD-249	KOD	PROTECTD	MED VLG	8				X		3	2	0	0	5	0	4	0
KOD-250	KOD	PROTECTD	MED VLG	7						3	0	0	0	5	0	3	0
KOD-251	KOD	SEMI-PRO	MED VLG	6	100			X		7	1	0	0	2	0	1	0
KOD-254	KOD	SEMI-PRO	MED VLG	7						8	0	0	0	3	0	2	0
KOD-255	KOD	SEMI-PRO	MED VLG	9	160			X		8	0	0	0	3	0	1	0
KOD-272	KOD	PROTECTD	MED VLG	10	30		X	X		3	0	0	0	7	1	5	1
KOD-280	KOD	PROTECTD	MED VLG	6			?	X		6	0	0	0	1	0	0	0
KOD-283	KOD	RIVERINE	MED VLG	6			X	X		7	1	0	0	0	0	0	0
KOD-293	KOD	SEMI-PRO	MED VLG	7				X		3	0	0	0	6	1	7	1
KOD-305	KOD	RIVERINE	MED VLG	10		?	?	X		3	3	0	0	0	0	1	0
KOD-332	KOD	PROTECTD	MED VLG	8	100		X	X		8	2	0	0	1	0	3	0
KOD-343	KOD	PROTECTD	MED VLG	9	120			X		6	0	0	0	1	1	2	0
KOD-387	KOD	SEMI-PRO	MED VLG	8	100			X		25	3	1	0	7	0	4	0
KOD-414	KOD	EXPOSED	MED VLG	6	40			?		1	1	0	0	3	0	2	0
SEL-003	KEN	SEMI-PRO	MED VLG	7					X	5	3	0	0	0	0	0	0
SEL-129	KEN	SEMI-PRO	MED VLG	10						3	0	1	0	0	0	4	0
UGA-031	AKP	SEMI-PRO	MED VLG	10					X	3	0	0	0	0	0	2	0
XBS-015	KEN	SEMI-PRO	MED VLG	8						4	0	0	0	2	0	6	0
XMK-046	AKP	SEMI-PRO	MED VLG	6			X	X		10	2	1	0	2	0	4	1
AFG-005	KOD	EXPOSED	SML VLG	4	30		X	X	X	6	3	0	0	1	1	0	0
AFG-007	KOD	PROTECTD	SML VLG	1				X		12	0	0	0	3	0	6	0

1990 Exxon Cultural Resource Program
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AHRS	Re-gion	Envrn mental Zone	Site Sub-Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Sal-mon	1 km Sal-mon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
AFG-014	KOD	PROTECTD	SML VLG	1	33					11	0	0	0	2	0	6	0
AFG-018	KOD	PROTECTD	SML VLG	2	85			X		10	4	0	0	2	0	8	0
AFG-026	KOD	SEMI-PRO	SML VLG	2	30			X		16	2	0	0	5	0	13	0
AFG-027	KOD	PROTECTD	SML VLG	1	30					16	2	0	0	5	0	13	0
AFG-028	KOD	PROTECTD	SML VLG	1	65		?	X		24	2	0	0	5	0	12	0
AFG-030	KOD	PROTECTD	SML VLG	1				X		21	2	0	0	4	1	8	0
AFG-031	KOD	SEMI-PRO	SML VLG	5						19	3	0	0	4	1	13	1
AFG-034	KOD	PROTECTD	SML VLG	2						17	2	0	0	3	0	5	0
AFG-046	KOD	SEMI-PRO	SML VLG	3	750			X		9	0	1	0	1	1	13	2
AFG-047	KOD	EXPOSED	SML VLG	3				X		8	0	0	0	6	2	11	0
AFG-052	KOD	SEMI-PRO	SML VLG	1				X		9	0	1	1	3	1	8	0
AFG-054	KOD	SEMI-PRO	SML VLG	5						8	3	0	0	0	0	4	0
AFG-057	KOD	PROTECTD	SML VLG	3						15	4	1	0	5	2	10	1
AFG-069	KOD	PROTECTD	SML VLG	1				X		21	1	0	0	4	1	5	0
AFG-071	KOD	PROTECTD	SML VLG	2				X		23	3	0	0	5	1	5	0
AFG-072	KOD	PROTECTD	SML VLG	3	40			X		20	0	0	0	5	2	11	1
AFG-073	KOD	PROTECTD	SML VLG	1				X		20	0	1	0	5	0	10	0
AFG-075	KOD	SEMI-PRO	SML VLG	3	100			X		8	0	1	0	4	1	11	0
AFG-076	KOD	EXPOSED	SML VLG	4				X		12	0	1	0	4	1	10	1
AFG-077	KOD	SEMI-PRO	SML VLG	5	100			X		12	0	1	0	3	1	10	1
AFG-081	KOD	SEMI-PRO	SML VLG	4	20			X		14	0	1	0	1	0	15	1
AFG-082	KOD	SEMI-PRO	SML VLG	3				X		14	0	1	0	1	0	15	1
AFG-084	KOD	PROTECTD	SML VLG	2				X		19	2	0	0	3	0	13	0
AFG-086	KOD	EXPOSED	SML VLG	5				X		14	0	1	0	2	0	14	1
AFG-087	KEN	EXPOSED	SML VLG	2				X		0	0	3	1	3	0	5	0
AFG-090	KOD	SEMI-PRO	SML VLG	4					X	11	0	0	0	2	0	6	0
AFG-094	KOD	EXPOSED	SML VLG	5						5	3	0	0	1	1	0	0
AFG-102	KOD	EXPOSED	SML VLG	4						5	0	1	0	3	0	11	1
AFG-105	KEN	EXPOSED	SML VLG	3	28					0	0	5	0	3	1	5	0
AFG-112	KOD	PROTECTD	SML VLG	1						18	0	0	0	2	0	16	0
AFG-113	KOD	PROTECTD	SML VLG	2						16	1	0	0	2	0	16	0
AFG-119	KOD	EXPOSED	SML VLG	5	30		?	X		4	1	1	0	1	1	1	0
AFG-120	KOD	EXPOSED	SML VLG	5						4	0	1	1	1	0	3	0
AFG-121	KOD	EXPOSED	SML VLG	1						6	0	0	0	2	0	10	0
AFG-122	KOD	SEMI-PRO	SML VLG	4	100					0	0	0	0	2	0	14	0
AFG-124	KOD	PROTECTD	SML VLG	2						18	3	1	0	3	0	14	0
AFG-126	KOD	PROTECTD	SML VLG	4						18	0	0	0	3	1	15	1
AFG-127	KOD	PROTECTD	SML VLG	3						18	0	0	0	3	0	15	0
AFG-129	KOD	PROTECTD	SML VLG	5	100					13	0	0	0	3	1	17	0
AFG-132	KOD	EXPOSED	SML VLG	4						3	0	0	0	3	1	0	0
AFG-133	KOD	PROTECTD	SML VLG	2						10	0	0	0	1	0	0	0
AFG-139	KOD	SEMI-PRO	SML VLG	1						5	2	0	0	2	0	0	0
AFG-141	KOD	SEMI-PRO	SML VLG	1						10	0	0	0	1	0	0	0
AFG-143	KOD	PROTECTD	SML VLG	3						16	2	0	0	5	0	13	0
AFG-146	KOD	PROTECTD	SML VLG	2	130					17	2	0	0	3	0	5	0
AFG-148	KOD	SEMI-PRO	SML VLG	5	60			?		8	0	1	0	1	0	0	0

1990 Exxon Cultural Resource Program
Alutiiq Site Resource Scores

AHRS	Region	Envrn-mental Zone	Site Sub-Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Salmon	1 km Salmon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
AFG-150	KOD	SEMI-PRO	SML VLG	1						13	0	0	0	1	0	14	1
AFG-151	KOD	SEMI-PRO	SML VLG	1						14	0	1	0	1	0	15	1
AFG-154	KOD	SEMI-PRO	SML VLG	3						13	1	0	0	1	0	0	0
AFG-157	KOD	EXPOSED	SML VLG	4						11	0	0	0	1	1	15	1
AFG-183	KOD	PROTECTD	SML VLG	1						18	2	0	0	3	0	16	0
AFG-186	KOD	SEMI-PRO	SML VLG	4						13	0	0	0	1	0	14	1
AFG-188	KOD	SEMI-PRO	SML VLG	2						13	0	0	0	1	0	14	1
AFG-189	KOD	SEMI-PRO	SML VLG	2						16	0	1	0	2	0	13	0
AFG-190	KOD	PROTECTD	SML VLG	1						16	0	1	0	2	0	13	0
COR-080	PWS	PROTECTD	SML VLG	3				X		18	3	0	0	2	0	0	0
COR-081	PWS	SEMI-PRO	SML VLG	3						18	3	0	0	2	0	0	0
ILI-058	AKP	EXPOSED	SML VLG	1				X									
KAG-014	KOD	EXPOSED	SML VLG	2				X		5	1	1	0	4	0	3	0
KAR-028	KOD	SEMI-PRO	SML VLG	1				X		2	0	0	0	4	1	3	1
KAR-030	KOD	PROTECTD	SML VLG	4	125		X	X		4	1	0	0	1	0	1	0
KAR-040	KOD	PROTECTD	SML VLG	1				X		10	4	0	0	1	0	1	0
KAR-041	KOD	PROTECTD	SML VLG	5			X	X		10	4	0	0	1	0	1	0
KAR-042	KOD	PROTECTD	SML VLG	4			X			10	4	0	0	1	0	1	0
KAR-043	KOD	PROTECTD	SML VLG	1			X			10	4	0	0	1	0	1	0
KAR-044	KOD	PROTECTD	SML VLG	1				X		10	4	0	0	1	0	1	0
KAR-047	KOD	PROTECTD	SML VLG	4			X	X		10	4	0	0	1	0	1	0
KAR-049	KOD	PROTECTD	SML VLG	1				X		10	4	0	0	1	0	1	0
KAR-050	KOD	PROTECTD	SML VLG	1			X			10	4	0	0	1	0	1	0
KAR-051	KOD	SEMI-PRO	SML VLG	3	140		X			10	4	0	0	0	0	1	0
KAR-085	KOD	PROTECTD	SML VLG	1				X	X	10	4	0	0	0	0	1	0
KAR-091	KOD	PROTECTD	SML VLG	4	100			X	X	9	0	0	0	1	0	1	0
KAR-094	KOD	PROTECTD	SML VLG	1					X	9	3	0	0	1	0	1	0
KAR-095	KOD	PROTECTD	SML VLG	1				X		9	3	0	0	1	0	1	0
KAR-096	KOD	PROTECTD	SML VLG	2	50		X			9	0	0	0	1	0	1	0
KAR-097	KOD	PROTECTD	SML VLG	2				X		9	0	0	0	1	0	1	0
KAR-101	KOD	SEMI-PRO	SML VLG	5	50		X			9	3	0	0	1	0	1	0
KAR-104	KOD	PROTECTD	SML VLG	2	15		?			4	1	0	0	1	0	1	0
KAR-105	KOD	PROTECTD	SML VLG	1				X		4	0	0	0	0	0	0	0
KAR-106	KOD	PROTECTD	SML VLG	4			X	X		4	1	0	0	1	0	1	0
KAR-113	KOD	PROTECTD	SML VLG	1	12			X	X	9	3	0	0	1	0	1	0
KAR-114	KOD	PROTECTD	SML VLG	3						9	3	0	0	1	0	1	0
KAR-125	KOD	PROTECTD	SML VLG	1	30		X			9	3	0	0	1	0	1	0
KOD-009	KOD	SEMI-PRO	SML VLG	1						14	0	1	0	4	1	11	1
KOD-028	KOD	PROTECTD	SML VLG	1	50			X		11	2	1	0	5	1	16	1
KOD-033	KOD	SEMI-PRO	SML VLG	2	52			X		11	0	0	0	2	0	8	0
KOD-041	KOD	SEMI-PRO	SML VLG	3	33		X	X		16	0	0	0	3	1	7	0
KOD-042	KOD	PROTECTD	SML VLG	4	125			X		13	0	0	0	3	0	5	1
KOD-045	KOD	SEMI-PRO	SML VLG	4	12		X		X	13	0	0	0	3	0	5	1
KOD-051	KOD	SEMI-PRO	SML VLG	2	120					14	1	0	0	1	0	8	0
KOD-057	KOD	SEMI-PRO	SML VLG	1	14		X			10	0	1	0	5	0	14	0
KOD-058	KOD	PROTECTD	SML VLG	5	50		X	X		14	5	0	0	2	0	4	0

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AHRS	Re- gion	Envrn mental Zone	Site Sub- Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Sal- mon	1 km Sal- mon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
KOD-067	KOD	SEMI-PRO	SML VLG	1				X		14	3	1	0	6	0	5	0
KOD-087	KOD	PROTECTD	SML VLG	2						5	1	0	0	2	0	2	0
KOD-102	KOD	SEMI-PRO	SML VLG	2					X	14	0	0	0	3	0	8	0
KOD-105	KOD	PROTECTD	SML VLG	2				X		12	3	0	0	2	1	0	0
KOD-129	KOD	PROTECTD	SML VLG	1				X		16	1	0	0	2	0	11	0
KOD-146	KOD	PROTECTD	SML VLG	2			X	X		6	0	0	0	1	0	3	0
KOD-150	KOD	PROTECTD	SML VLG	1				X		6	0	0	0	1	1	2	0
KOD-156	KOD	PROTECTD	SML VLG	4			X	X		6	0	0	0	1	1	2	0
KOD-158	KOD	PROTECTD	SML VLG	3	60			?		6	0	0	0	2	0	3	0
KOD-159	KOD	PROTECTD	SML VLG	3	30			X		4	0	0	0	2	1	3	1
KOD-161	KOD	PROTECTD	SML VLG	4	80		X	X		8	2	0	0	1	0	3	0
KOD-162	KOD	PROTECTD	SML VLG	4			X	?		8	2	0	0	1	0	3	0
KOD-165	KOD	SEMI-PRO	SML VLG	4	100			X		3	0	0	0	5	0	9	0
KOD-167	KOD	SEMI-PRO	SML VLG	4				X		5	0	0	0	6	1	9	0
KOD-170	KOD	SEMI-PRO	SML VLG	5	100			X		5	0	0	0	4	0	11	0
KOD-178	KOD	PROTECTD	SML VLG	3			X	X		6	0	0	0	2	0	4	0
KOD-180	KOD	PROTECTD	SML VLG	1				X		6	4	0	0	2	0	3	0
KOD-185	KOD	SEMI-PRO	SML VLG	2				X		10	0	0	0	2	0	3	1
KOD-188	KOD	PROTECTD	SML VLG	2				X		8	0	0	0	2	0	1	0
KOD-196	KOD	PROTECTD	SML VLG	1					X	13	3	0	0	2	1	8	1
KOD-224	KOD	PROTECTD	SML VLG	1	40	X	X			7	0	0	0	4	1	3	0
KOD-230	KOD	EXPOSED	SML VLG	2			X			6	3	0	0	6	1	6	1
KOD-231	KOD	PROTECTD	SML VLG	4				X		7	3	0	0	0	0	3	0
KOD-232	KOD	PROTECTD	SML VLG	3						7	0	0	0	0	0	5	0
KOD-234	KOD	SEMI-PRO	SML VLG	5				X		5	2	0	0	4	0	11	2
KOD-238	KOD	PROTECTD	SML VLG	1						8	4	0	0	2	0	2	0
KOD-240	KOD	PROTECTD	SML VLG	5			X			7	0	0	0	4	1	3	0
KOD-241	KOD	PROTECTD	SML VLG	5						2	0	0	0	7	1	4	0
KOD-244	KOD	PROTECTD	SML VLG	5						6	0	0	0	5	1	3	0
KOD-245	KOD	PROTECTD	SML VLG	4				X		7	0	0	0	4	1	3	0
KOD-253	KOD	SEMI-PRO	SML VLG	2						8	0	0	0	3	0	1	0
KOD-256	KOD	PROTECTD	SML VLG	2			X			7	0	0	0	4	1	3	0
KOD-258	KOD	PROTECTD	SML VLG	4						6	0	0	0	5	1	3	0
KOD-260	KOD	PROTECTD	SML VLG	4	35			X		4	0	0	0	3	0	4	0
KOD-261	KOD	PROTECTD	SML VLG	5			X			4	0	0	0	2	0	4	0
KOD-262	KOD	PROTECTD	SML VLG	3				X		4	0	0	0	2	0	4	0
KOD-264	KOD	PROTECTD	SML VLG	3			X			6	0	0	0	2	0	4	0
KOD-268	KOD	PROTECTD	SML VLG	1						4	0	0	0	7	0	4	0
KOD-270	KOD	PROTECTD	SML VLG	2						2	0	0	0	8	0	5	1
KOD-277	KOD	SEMI-PRO	SML VLG	5	40			X		3	0	0	0	5	0	6	0
KOD-278	KOD	PROTECTD	SML VLG	3				X		6	0	0	0	3	0	3	0
KOD-279	KOD	PROTECTD	SML VLG	3				X	?	5	2	0	0	0	0	1	0
KOD-281	KOD	PROTECTD	SML VLG	4				X		11	0	0	0	1	0	3	0
KOD-282	KOD	PROTECTD	SML VLG	4			?	X		6	0	0	0	3	0	5	0
KOD-287	KOD	EXPOSED	SML VLG	4				X		7	0	1	0	2	0	2	1
KOD-288	KOD	EXPOSED	SML VLG	3				X		3	0	1	0	3	0	5	0

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AHRS	Region	Envrnmental Zone	Site Sub-Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Salmon	1 km Salmon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
KOD-289	KOD	EXPOSED	SML VLG	2	150			X		3	0	0	0	3	1	5	0
KOD-290	KOD	EXPOSED	SML VLG	1	6			X		3	0	1	0	3	1	5	0
KOD-291	KOD	EXPOSED	SML VLG	1	2			?		3	0	1	0	3	1	5	0
KOD-292	KOD	SEMI-PRO	SML VLG	1						3	0	1	0	3	1	5	0
KOD-294	KOD	PROTECTD	SML VLG	2				X		4	0	0	0	3	0	4	0
KOD-298	KOD	PROTECTD	SML VLG	2				X		10	0	0	0	1	0	3	0
KOD-300	KOD	PROTECTD	SML VLG	3				X		2	0	0	0	4	0	4	0
KOD-325	KOD	SEMI-PRO	SML VLG	3	90		X	X	X	5	0	0	0	4	1	6	0
KOD-330	KOD	PROTECTD	SML VLG	1						8	0	0	0	2	0	3	0
KOD-331	KOD	PROTECTD	SML VLG	1				X		8	0	0	0	2	0	3	0
KOD-333	KOD	PROTECTD	SML VLG	3						10	0	0	0	3	0	4	1
KOD-334	KOD	PROTECTD	SML VLG	4				?		10	0	0	0	3	0	4	1
KOD-337	KOD	PROTECTD	SML VLG	2					X	13	0	0	0	3	0	7	1
KOD-340	KOD	PROTECTD	SML VLG	4			X			6	0	0	0	2	0	3	0
KOD-341	KOD	PROTECTD	SML VLG	3				X		4	0	0	0	2	0	3	0
KOD-344	KOD	PROTECTD	SML VLG	2				X		6	0	0	0	1	1	2	1
KOD-345	KOD	PROTECTD	SML VLG	3				X		6	0	0	0	1	1	2	1
KOD-346	KOD	PROTECTD	SML VLG	1				X		6	0	0	0	1	1	2	1
KOD-347	KOD	PROTECTD	SML VLG	3	30		X			6	0	0	0	2	0	3	0
KOD-348	KOD	PROTECTD	SML VLG	2			X	X		6	0	0	0	2	0	3	1
KOD-349	KOD	PROTECTD	SML VLG	2	30			X		4	0	0	0	2	1	3	1
KOD-350	KOD	SEMI-PRO	SML VLG	1	40			X		9	4	1	0	4	0	6	0
KOD-358	KOD	SEMI-PRO	SML VLG	2	20		?	?		11	0	0	0	3	0	4	1
KOD-362	KOD	SEMI-PRO	SML VLG	1	20		X			11	0	1	0	3	0	16	3
KOD-370	KOD	EXPOSED	SML VLG	3						13	3	0	0	2	1	8	1
KOD-372	KOD	SEMI-PRO	SML VLG	1						13	3	0	0	2	1	8	1
KOD-373	KOD	PROTECTD	SML VLG	1						13	3	0	0	2	1	8	1
KOD-382	KOD	SEMI-PRO	SML VLG	4	50					12	1	0	0	2	1	9	2
KOD-383	KOD	EXPOSED	SML VLG	2	40					15	2	1	0	7	0	10	0
KOD-398	KOD	PROTECTD	SML VLG	4						23	0	0	0	5	1	1	1
KOD-399	KOD	PROTECTD	SML VLG	2	25			X		16	0	0	0	4	0	1	0
KOD-400	KOD	SEMI-PRO	SML VLG	5	30			?		6	0	1	0	4	0	4	1
KOD-401	KOD	PROTECTD	SML VLG	1				?		12	0	0	0	4	0	2	0
KOD-402	KOD	PROTECTD	SML VLG	4						12	0	0	0	4	0	2	0
KOD-404	KOD	PROTECTD	SML VLG	2	50					25	3	0	0	4	0	8	0
KOD-405	KOD	PROTECTD	SML VLG	4	260			X		25	0	0	0	3	0	2	0
KOD-407	KOD	PROTECTD	SML VLG	4	100				X	7	0	0	0	2	0	8	1
KOD-409	KOD	SEMI-PRO	SML VLG	1													
KOD-420	KOD	PROTECTD	SML VLG	2						4	0	0	0	3	0	9	1
KOD-423	KOD	SEMI-PRO	SML VLG	1						6	3	0	0	6	1	6	1
KOD-424	KOD	EXPOSED	SML VLG	1						6	3	0	0	6	1	6	1
KOD-429	KOD	EXPOSED	SML VLG	3	50			X		7	0	1	0	2	0	4	0
SEL-172	KEN	SEMI-PRO	SML VLG	5						8	0	0	0	1	0	3	0
SEL-178	KEN	PROTECTD	SML VLG	2						16	5	0	0	2	1	2	0
SEL-207	KEN	PROTECTD	SML VLG	1						14	0	0	0	1	0	3	0
SEL-208	KEN	SEMI-PRO	SML VLG	1						14	0	1	0	2	0	3	0

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AHRS	Re- gion	Envrn mental Zone	Site Sub- Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Sal- mon	1 km Sal- mon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
SEL-209	KEN	PROTECTD	SML VLG	1						9	0	0	0	0	0	5	0
SEL-211	KEN	SEMI-PRO	SML VLG	1						16	0	1	0	1	0	5	0
SEL-223	KEN	EXPOSED	SML VLG	1						8	1	3	0	2	1	3	1
SEW-056	PWS	PROTECTD	SML VLG	1	63	X	X	X									
SEW-332	PWS	PROTECTD	SML VLG	2													
SUT-003	AKP	SEMI-PRO	SML VLG	2			X	X		11	1	1	0	1	0	1	0
SUT-004	AKP	SEMI-PRO	SML VLG	1						11	1	1	0	1	0	1	0
SUT-005	AKP	SEMI-PRO	SML VLG	1						11	1	1	0	1	0	1	0
SUT-016	AKP	SEMI-PRO	SML VLG	5					X	15	4	0	0	0	0	1	0
UGA-059	AKP	SEMI-PRO	SML VLG	4				X		7	0	0	0	3	0	1	0
XBS-014	KEN	SEMI-PRO	SML VLG	4					X	4	0	1	0	2	0	6	0
XMK-017	AKP	SEMI-PRO	SML VLG	4				X		9	2	1	0	3	0	2	0
XMK-020	AKP	EXPOSED	SML VLG	4		X	X			4	0	1	0	2	0	4	1
XMK-030	AKP	EXPOSED	SML VLG	3						2	0	1	1	1	0	3	0
XMK-047	AKP	SEMI-PRO	SML VLG	5						14	0	1	0	2	1	3	0
XMK-058	AKP	EXPOSED	SML VLG	3	100					6	0	2	0	3	0	3	0
XMK-063	AKP	SEMI-PRO	SML VLG	4						10	0	1	0	2	0	3	0
XMK-064	AKP	EXPOSED	SML VLG	4						10	0	1	0	2	0	3	0
XMK-065	AKP	SEMI-PRO	SML VLG	2				X		10	1	0	0	2	1	3	0
XMK-067	AKP	EXPOSED	SML VLG	3						3	0	1	0	1	0	4	0
XMK-068	AKP	PROTECTD	SML VLG	2						12	2	1	0	5	0	2	0
XTI-017	KOD	EXPOSED	SML VLG	2	15			X	X	0	0	0	0	6	1	1	0
XTI-055	KOD	SEMI-PRO	SML VLG	1						5	0	0	0	4	1	3	0
XTI-059	KOD	PROTECTD	SML VLG	3						3	1	0	0	3	0	4	0
XTI-060	KOD	EXPOSED	SML VLG	5	175			X		3	2	0	0	2	0	2	0
XTI-065	KOD	SEMI-PRO	SML VLG	3						3	1	0	0	3	0	4	0
XTI-066	KOD	PROTECTD	SML VLG	2						3	1	0	0	3	0	4	0
AFG-008	KOD	SEMI-PRO	LG SITE		160	X				12	4	0	0	2	0	5	0
AFG-009	KOD	PROTECTD	LG SITE		1000			X	X	12	4	0	0	2	0	4	0
AFG-017	KOD	EXPOSED	LG SITE		200			X		11	0	0	0	2	1	7	0
AFG-020	KOD	SEMI-PRO	LG SITE		100					11	4	0	0	2	0	8	0
AFG-024	KOD	SEMI-PRO	LG SITE		120			X		16	4	0	0	4	1	13	1
AFG-033	KOD	SEMI-PRO	LG SITE		150					13	0	0	0	3	1	7	1
AFG-070	KOD	PROTECTD	LG SITE		100			X		18	0	0	0	2	1	5	0
KAR-001	KOD	SEMI-PRO	LG SITE		125			X	X	10	4	0	0	0	0	2	0
KAR-031	KOD	SEMI-PRO	LG SITE		300	X	X	X	X	10	4	0	0	0	0	2	0
KOD-022	KOD	EXPOSED	LG SITE		200		X	X		4	0	1	0	4	0	10	2
KOD-025	KOD	SEMI-PRO	LG SITE		130			X		10	1	1	0	5	0	14	0
KOD-026	KOD	SEMI-PRO	LG SITE		130		X	X		10	0	1	0	5	0	14	0
KOD-030	KOD	SEMI-PRO	LG SITE		160			X		15	0	0	0	3	0	11	1
KOD-032	KOD	EXPOSED	LG SITE		200			X		6	0	0	0	1	0	5	0
KOD-036	KOD	SEMI-PRO	LG SITE		117			X		11	0	0	0	3	0	9	0
KOD-046	KOD	SEMI-PRO	LG SITE		100					14	0	0	0	3	1	8	1
KOD-049	KOD	SEMI-PRO	LG SITE		130					14	2	0	0	1	0	8	0
KOD-054	KOD	SEMI-PRO	LG SITE		120					13	3	0	0	2	1	8	1
KOD-076	KOD	SEMI-PRO	LG SITE		100			X		21	2	0	0	5	0	8	0

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AHRS	Re-gion	Envrn mental Zone	Site Sub-Type	House pits (#)	Midden length (meters)	Early period	Middle period	Late period	Histrc period	10 km Sal-mon	1 km Sal-mon	10 km Sea Lion	1 km Sea Lion	10 k Seal	1 km Seal	10 k Bird	1 k Bird
KOD-085	KOD	SEMI-PRO	LG SITE		100			X	X	7	0	0	0	5	0	5	0
KOD-110	KOD	EXPOSED	LG SITE		250		X		X	10	0	0	0	4	0	3	0
KOD-115	KOD	SEMI-PRO	LG SITE		300		X			8	0	1	0	4	0	7	0
KOD-116	KOD	EXPOSED	LG SITE		100				X	5	1	1	0	4	0	3	0
KOD-121	KOD	EXPOSED	LG SITE		109			X	X								
KOD-252	KOD	SEMI-PRO	LG SITE		150			X		5	0	0	0	3	0	1	0
KOD-368	KOD	SEMI-PRO	LG SITE		130			X		20	1	0	0	4	1	16	3
KOD-384	KOD	SEMI-PRO	LG SITE		100		?			8	0	1	0	4	0	7	0
KOD-385	KOD	EXPOSED	LG SITE		300		X										
KOD-389	KOD	EXPOSED	LG SITE		100					15	2	1	1	7	1	6	1
KOD-418	KOD	SEMI-PRO	LG SITE		150		X			12	0	0	0	5	0	4	0
KOD-425	KOD	EXPOSED	LG SITE		150					4	3	0	0	5	0	4	0
XMK-074	AKP	EXPOSED	LG SITE		130					3	0	1	0	2	0	4	0
XTI-025	KOD	EXPOSED	LG SITE		150			X	X								
XTI-027	KOD	EXPOSED	LG SITE		500												
XTI-028	KOD	EXPOSED	LG SITE		170			X									