Alaska Park Science

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Connections to Natural and Cultural Resource Studies in Alaska's National Parks

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Sharing Alaska's Natural and Cultural Heritage

Parks Featured in this Issue

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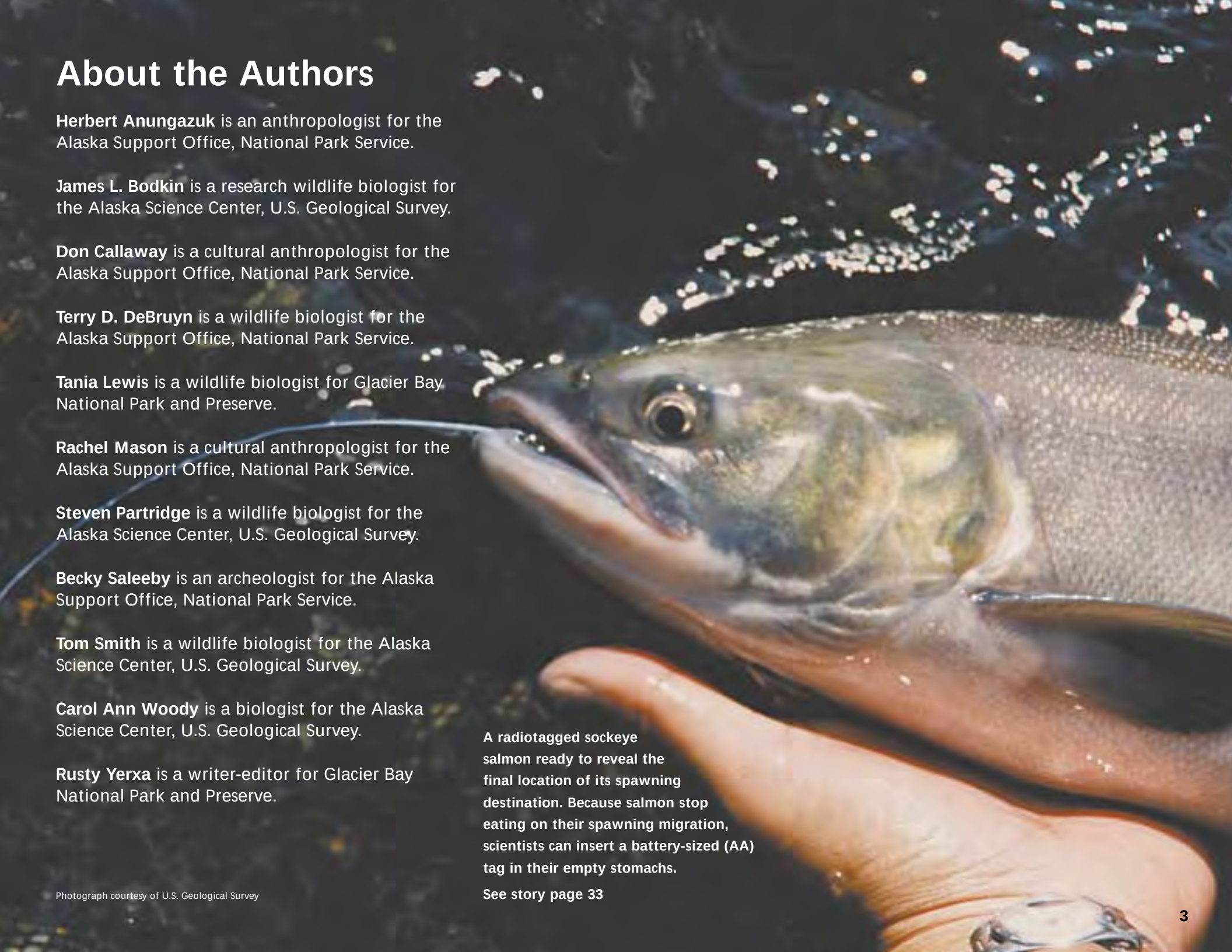

A radiotagged sockeye salmon ready to reveal the final location of its spawning destination. Because salmon stop eating on their spawning migration, scientists can insert a battery-sized (AA) tag in their empty stomachs.

See story page 33

Photograph courtesy of U.S. Geological Survey

Figure 1: Sea otters are in the first stages of recolonizing Glacier Bay. The red circles represent subtidal clam sites.

Sea Otter photos courtesy of Randall Davis © 2003

Kelp Forest photo courtesy of U.S. Geological Survey

Return to Glacier Bay

By James L. Bodkin

Introduction

A sound unheard for centuries is once again resonating above the turbid waters of Glacier Bay. The sound is one of rock hammering against clam in rapid-fire succession and it signals the return of the sea otter *(Enhydra lutris)* to its former habitats in Southeast Alaska. The sound also signals the beginning of a process that will, with little doubt, result in profound and persistent changes in the marine communities of Glacier Bay. Some of these changes are predictable, while others will be unanticipated. Without understanding the range of effects of sea otters, management of many marine resources may be severely impaired for decades to come. Fortunately, because sea otters are easily observed and their prey easily studied, methods and approaches to studying sea otters and their ecology are perhaps better developed than for any other marine mammal *(Riedman and Estes 1990)*.

For several reasons Glacier Bay National Park and Preserve provides an excellent laboratory for studying the effects of sea otters on marine communities. First and foremost, sea otters are in the early stages of recolonizing Glacier Bay. This provides the opportunity to describe the marine community, as it exists before sea otters exert their influence, and to document how the community changes as sea otters become established. Because Glacier Bay is large, it will take many years for sea otters to reoccupy all habitats in the bay. The opportunity to compare similar habitats in Glacier Bay, both with and without sea otters, and before and after sea otter colonization, provides an experimentally powerful design. This can then allow researchers to assign cause based on observed change *(Figure 1)*. In addition, the protected waters of Glacier Bay provide a laboratory that is, and will likely remain, relatively unaffected by human activities such as contamination, fishing, logging, and mining, which could potentially confound the interpretation of ecological study. It was under consideration of these attributes that we began our work nearly ten years ago to understand the effects of sea otters on the structure and function of near-shore marine communities in Glacier Bay.

The Decline and Recovery

At the end of the nineteenth century along nearly the entire shore of the North Pacific Ocean, the sound of sea otters foraging could no longer be heard. This was the result of a commercial fur harvest that began about 1750 and ended in 1900 with the near extinction of the species *(Kenyon 1969)*. The first efforts to conserve sea otters occurred in 1911. At that time sea otters received their first protection under the International Fur Treaty, and likely numbered just several hundred animals scattered in 11 populations between central California and Russia, with most individuals occurring in the Aleutian Islands. No sea otter populations persisted between Prince William Sound in Alaska and the Big Sur coast of California. During the twentieth century, extant sea otter populations exhibited a general pattern of recovery, with growth rates from about 5% to 13% per year and displaying concurrent patterns of range expansion *(Bodkin et al. 1999)*.

The next efforts to conserve and aid in the recovery of sea otter populations began in 1965 and consisted of translocations from Amchitka Island and Prince William Sound in Alaska to Oregon, Washington, British Columbia, and Southeast Alaska *(Jameson et al 1982)*. Between 1965 and 1969, 412 sea otters arrived at several loca-

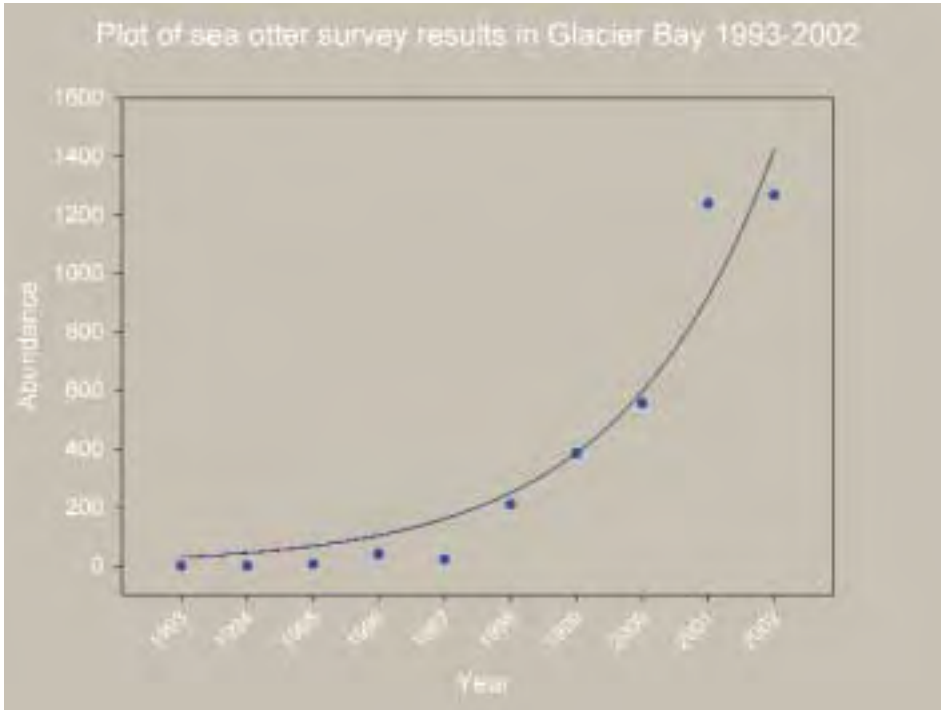

Figure 2: Since 1993, sea otter populations have increased dramatically.

Photo courtesy of U.S. Geological Survey

Figure 3: A diverse assemblage of animals reliant on the kelp forest characterize the kelp forest community.

Where sea otters are present, they effectively limit the abundance of sea urchins by actively consuming individuals larger than about one inch in diameter. As a result of this predation on urchins, which limits urchin size, abundance, and mobility, urchins do not have a large grazing effect and consequently kelp forests flourish.

tions in Southeast Alaska, including areas adjacent to Glacier Bay National Park and Preserve in Cross Sound. Although surveys of sea otter populations in Southeast Alaska were infrequent, results through at least 1988 indicated that the population was increasing about 20% annually with simultaneous expansion of range *(Pitcher 1989)*. By 1988 sea otters were common in Cross Sound and immigration into Icy Straits was evident. In 1993 the first sea otters were observed in Glacier Bay, although annual surveys indicate permanent residence was not established until 1998. Since that time, population growth in Glacier Bay has been phenomenal. It is almost certainly exceeding the reproductive potential of the species, and thus likely representing contributions from both births and immigration from outside the bay. *(Figure 2)*.

A "Keystone" Species

Our understanding of the role sea otters will play in modifying the Glacier Bay marine ecosystem will benefit from previous studies of the effects of sea otter foraging in other locales *(Estes and Palmisano 1974, Simenstad et al. 1978, Kvitek and Oliver 1988, Kvitek et al. 1992)*. Probably the best example of sea otter effects comes from the description of sea otters as ecological "keystone" species in kelp forest communities of the coastal North Pacific Ocean *(Estes and Duggins 1995)*. Within these shallow rocky habitats occur several species of sea urchin *(Stronglycentrotus sp.)*, marine herbivores that actively graze on algae. This includes the brown algae that often forms the conspicuous and productive kelp-forests that exist along many coastlines. Where sea otters are present, they effectively limit the abundance of sea urchins by actively consuming individuals larger than about one inch in diameter. As a result of this predation on urchins, which limits urchin size, abundance, and mobility, urchins do not have a large grazing effect and consequently kelp forests flourish. In turn, kelp forests provide habitat, refuge, and forage for a complex community of invertebrates, fishes, birds, and mammals. A high biomass of kelps and a diverse assemblage of animals reliant on the kelp forest characterize the kelp forest community. *(Figure 3)*.

Photo courtesy of U.S. Geological Survey

Figure 4: Urchin barren.

Alternatively, when sea otters are

absent, urchin populations respond to reduced predation by increased abundance and average size. As this happens, the level of grazing by urchins increases, which can eventually eliminate the forest and much of the associated animal community that is supported by the kelp forest. This urchin-dominated community is commonly referred to as an "urchin barren." It is characterized by large and numerous sea urchins, little algae or canopy-forming kelp forests, and the reduction or absence of kelp-associated fauna. *(Figure 4)*. Additionally, in the absence of sea otter predation, some of the other preferred prey species, such as abalone *(Haliotis sp.)*, crab *(e.g., Cancer sp.)*, and mussels *(Mytilus sp.)*, can also increase in abundance and average size *(Lowry and Pearse 1973, Garshelis et al. 1986, VanBlaricom 1988)*.

Although habitats suitable for supporting kelp forests exist in Glacier Bay, much of the shallow water habitats in Glacier Bay are soft-sediment, such as mud, sand, gravel and cobble that will not provide optimum substrate for kelp forests. We can expect the transformation of some urchin barrens into kelp forests. In order to determine what kinds of direct and indirect effects can be anticipated as sea otters occupy and forage in these soft-sediment marine communities, the U.S. Geological Survey's Alaska Science Center, in cooperation with Glacier Bay National Park and Preserve, initiated a program consisting of three integrated avenues of research. The first consists of documenting the distribution and abundance of sea otters in and around Glacier Bay and how that changes over time (see above). The second consists of describing the diet of recolonizing sea otters; identifying species, number and size of prey; and describing the diet as it changes. The third component of our program consists of estimating the density, sizes, and composition of species occurring in intertidal and subtidal habitats, before and after sea otter recolonization. The third part focuses initially on those species that sea otters consume directly.

The Diet of Glacier Bay Sea Otters

To date we have observed the results of more than 3,000 sea otter foraging dives in Glacier Bay *(Bodkin et al. 2001, 2003)*. The primary data that we collect while observing feeding sea otters includes: success or failure, and species, number and sizes of prey consumed. *(Figure 5)*. Sea otters successfully recover one or more prey on about 85% of their foraging dives in Glacier Bay. Although the number of prey types consumed by sea otters exceeds 150 species *(Estes and Bodkin 2001)*, the bulk of their diet can be classified into the general taxonomic groups of bivalve mollusks (clams and mussels), echinoderms (sea urchins

Photograph courtesy of U.S. Geological Survey

Figure 5: Researcher observing sea otter foraging dives.

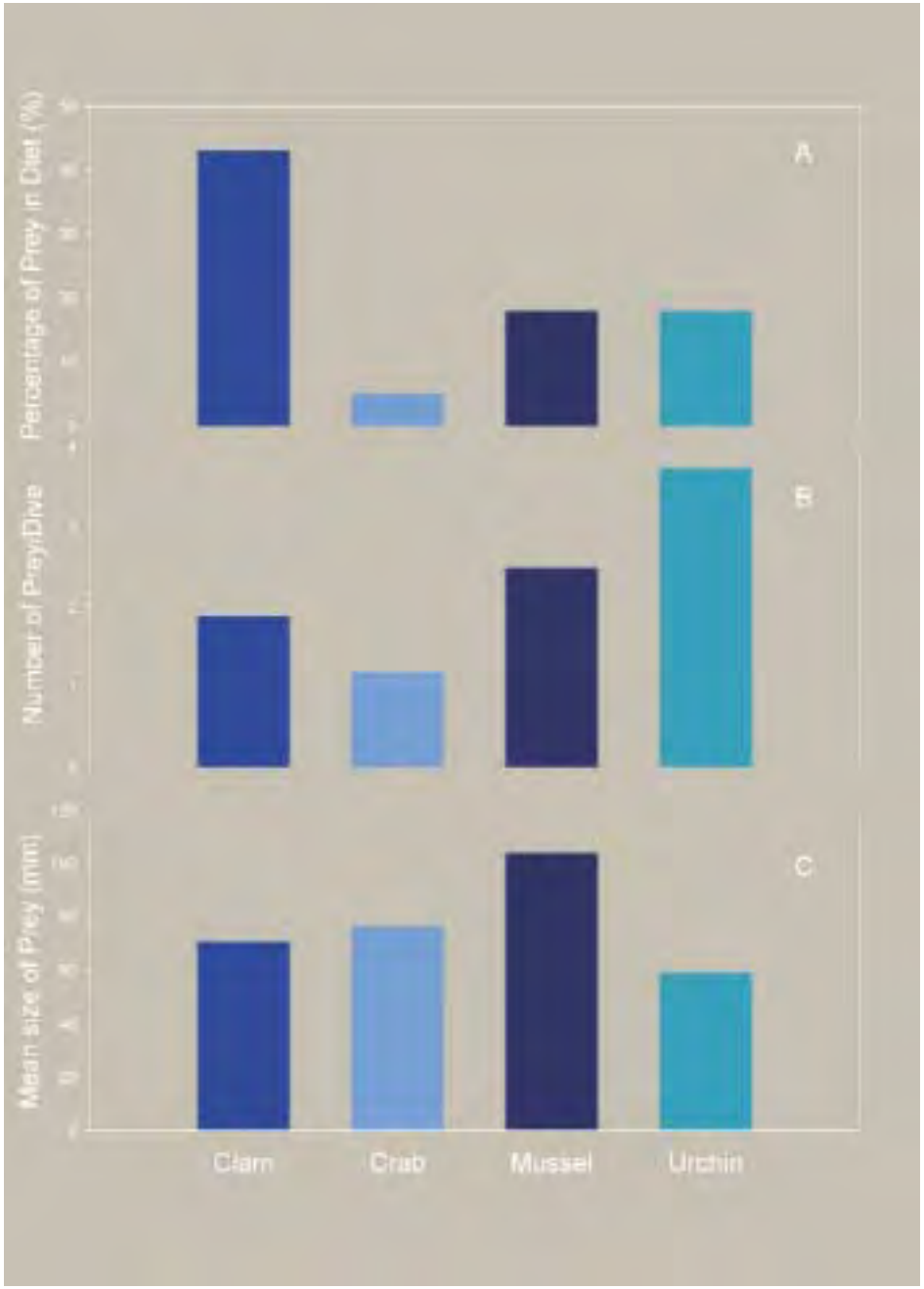

Figure 6: Sea otter diet composition (A), number of prey (B) and mean size of prey in mm (C) in Glacier Bay, Alaska, 1993-2002

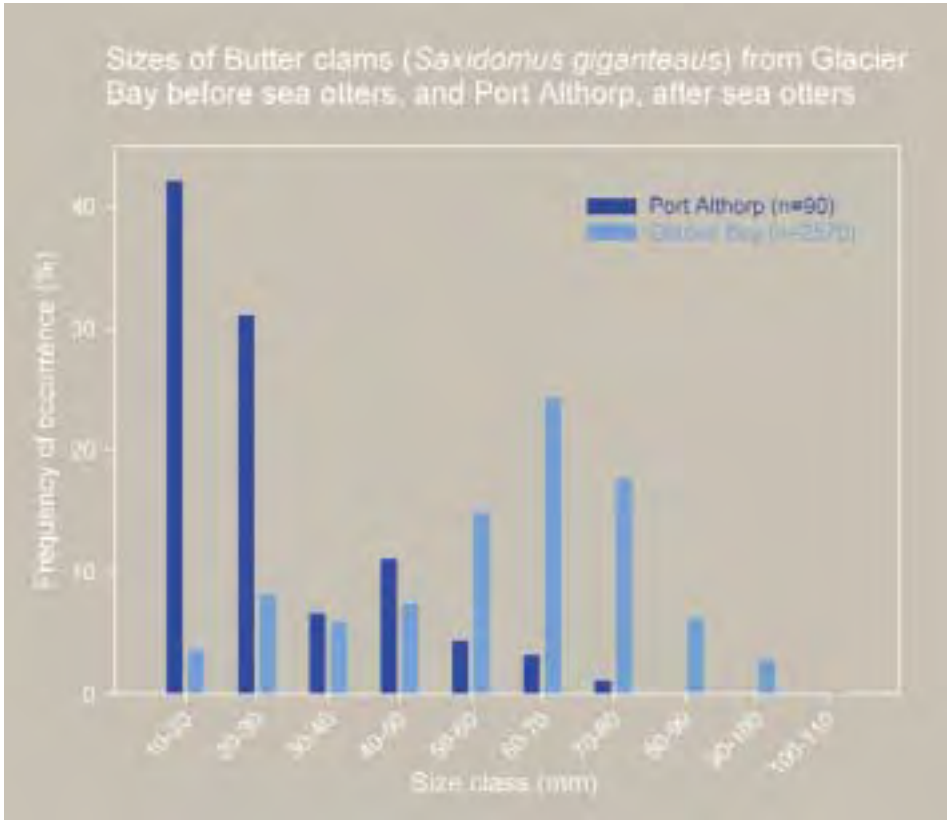

Figure 7: Dramatic declines in the size of butter clams have been observed.

Photograph courtesy of Randall Davis © 2003

and stars), and crustaceans (crabs). Although the diet we observed in Glacier Bay varies within the area occupied by sea otters, it consists largely of invertebrates that reside in, or on, unconsolidated substrates such as mud, sand, gravel and cobble. Over all areas, bivalve clams (species of *Mya, Saxidomus, Protothaca* and *Serripes*) constitute 43% of the observed diet, urchins (*S. droebachiensis*) 18%, horse mussels (*Modiolus modiolus*) 18%, and crabs (species of *Cancer, Telmessus, Chionoecetes* and *Paralithoides*) 5%. *(Figure 6)*. Relatively rare species include octopus *(Octopus dofleini)*, snails *(Fusitriton oregonensis and Neptunea sp.)*, the fat innkeeper worm *(Echiurus sp.)*, the basket star *(Gorgonocephalus caryi)*, and the sea cucumber *(Cucumaria fallax)*.

Effects of Sea Otters on Clam Populations

Because sea otters have not resided in large numbers for a long period at our study sites in Glacier Bay, we were unable to compare our measures of prey populations before and after sea otter recolonization. As an approximation of changes we might expect in Glacier Bay, we have compared clam populations before sea otters arrived in Glacier Bay to a nearby and similar area in Port Althorp, where sea otters have been present for about 20 years. *(Figure 7)*. Although we have sampled crabs, mussels, urchins and other otter prey in Glacier Bay, the following example from our subtidal clam data serves as an example of the types of data obtained. In addition, through comparison with nearby Port Althorp, we can approximate what we might expect in Glacier Bay as a direct result of sea otter foraging.

Between 1998 and 2002 we sampled 13 subtidal clam beds in Glacier Bay before sea otters occupied those sites. For comparison, in nearby Port Althorp where sea otters have been foraging for more than 20 years, we sampled an additional 5 sites. We selected the sites based on the presence and high abundance of clam siphons in Glacier Bay and based on sea otter foraging and fresh clam shell fragments in Port Althorp. We used a diver-operated suction dredge to excavate 50 cm by 50 cm quadrats to depths of about 25 cm at each site to determine species composition and sizes of subtidal clams. *(Figure 8)*.

Average densities of all clams were about six times greater in our Glacier Bay sites (59 per quadrat) than at our Port Althorp sites (10 per quadrat). Densities of the butter clam *(Saxidomus gigantea)*, a large and preferred sea otter prey, were more than 10 times higher in Glacier Bay than at Port Althorp. Probably of equal or greater importance is that the average clam was much larger in Glacier Bay than in Port

… long-time residents of the community of Elfin Cove in Port Althorp observed dramatic declines in the abundance and sizes of clams concurrent with the arrival of sea otters about 20 years ago.

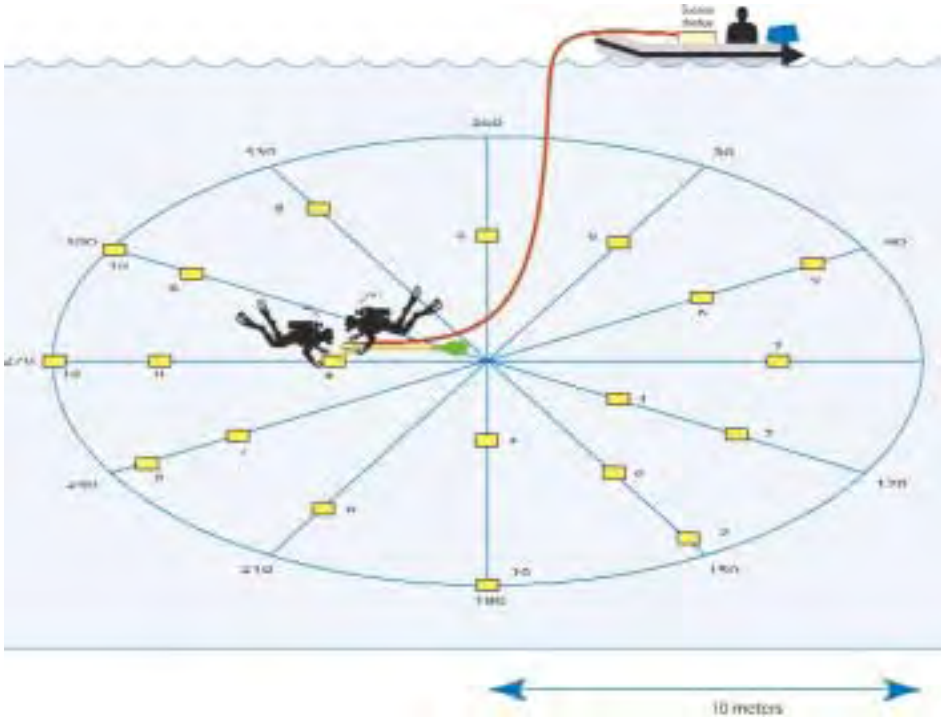

Figure 8: Schematic drawing showing excavation of quadrats utilizing the suction dredge.

Althorp: butter clams between 70 mm and 90 mm long (~3 in) were most common in Glacier Bay, compared to Port Althorp, where the majority of clams were 10 mm to 30 mm (~1 in). These differences in density and sizes resulted in estimates that placed the total butter clam biomass of the Glacier Bay sites about 75 times that of Port Althorp. Additionally, long-time residents of the community of Elfin Cove in Port Althorp observed dramatic declines in the abundance and sizes of clams concurrent with the arrival of sea otters about 20 years ago.

The pattern of higher densities and larger average sizes, of subtidal clams in Glacier Bay compared to Port Althorp, was consistent for intertidal clams, urchins, crabs, and mussels as well. These preliminary contrasts, while not unequivocal, suggest that the sea otter effect of reducing densities and sizes of preferred prey will likely also occur in Glacier Bay. Our ability to anticipate and understand both the direct and cascading effects of this predation will improve management decisions regarding marine resources in Glacier Bay. While predicting ecosystem level responses to a disturbance such as that imposed by recolonizing sea otters affords a broad suite of challenges, it also offers opportunities to advance our understanding of how these complex systems function.

Cascading Effects of Recolonization

The experimental and logistic situation offered in Glacier Bay has provided the opportunity to pursue and acquire many of the numerous data sets that will be required to document and understand the direct effects of sea otter foraging. In some cases, particularly relative to the effects of urchin removal, we will likely capture both the direct effect of reduced urchin densities and sizes, plus the cascading effect of increased algal production. However, it is also likely that other effects will be more difficult to understand, if at all. Two examples may serve to illustrate the potential breadth of effects induced by sea otter foraging.

One regards a species that is both competitor and prey for the sea otter, the octopus. Octopuses are likely near the top of the food web in Glacier Bay. We have observed "gardens" of emptied clams and other mollusks numbering into the hundreds that evidence the residence of one or more large octopuses. What will be the indirect effect on resident octopus populations of sea otters removing most of the clam biomass? What will the direct effects of otter predation on octopuses be? Reduced octopus densities may be a result. What might be the effect of reduced octopus densities on the marine communities in general?

Another example concerns several species of sea ducks that spend the winter in Glacier Bay in large numbers and who compete for many of the same prey. Sea ducks, including goldeneye *(Bucephala sp.)*, harlequins *(Histrionicus histrionicus)*, scoters *(Melanitta sp.)* and the long-tail duck *(Clangula hyemalis)*, are among the most abundant species of bird during the winter

What will be the indirect effect of sea otters removing most of the clam biomass on resident octopus populations? What will the direct effects of otter predation on octopus be? Reduced octopus densities may be a result, and what might be the effect of reduced octopus densities on the marine communities in general?

in Glacier Bay, numbering into the tens of thousands. Much of what these sea ducks forage for are bivalve mollusks, including many of those that sea otters will consume and eventually reduce in densities and average size. It is difficult to predict what the cumulative effects of reduced prey densities and sizes will be on sea ducks. On one hand, fewer clams and mussels would likely support fewer sea ducks. On the other hand, it is possible that sea otter predation will result in an increase in the abundance of smaller clams that could benefit sea ducks. Part of our challenge in preparing for the recovery of sea otter populations is

Photograph courtesy of U.S. Geological Survey

Commercial, recreational, and subsistence harvest of species in Glacier Bay such as crab, urchin, and clams compete directly with sea otters, resulting in less of those prey species.

anticipating the types of direct and indirect effects that sea otters will induce.

Implications to Humans

Economically, ecologically, and culturally important marine resources will unquestionably be altered in terms of abundance and size over the coming years in Glacier Bay, as sea otters continue to recolonize former habitat. Commercial, recreational, and subsistence harvest of species such as crab, urchin, and clams clams compete directly with sea otters, resulting in less of those prey species that sea otters and humans both seek. In this context, the return of sea otters may be regarded as undesirable. Alternatively, the marine ecosystems of Glacier Bay will once again contain a top-level carnivore that was part of the evolutionary history of this marine

ecosystem. As a result, the sound of the hammering rock against clam, can signify a step toward, rather than away from, an ecosystem that contains more of the components and functions of a complete ecosystem. And in this context, perhaps there is a trace of pride that we can collectively take from the return of the sea otter, that will help us strive toward the restoration, rather than continued degradation, of all ecosystems.

Acknowledgments

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The Wales/Deering Subsistence Producer Analysis Project

By Don Callaway

In 1994 the National Park Service entered into a cooperative agreement with the Alaska Department of Fish and Game (ADF&G) subsistence division to conduct social and cultural research in the communities of Wales and Deering. This article draws extensively from the original text found in the report *The Production and Distribution of Wild Food in Wales and Deering, Alaska, (Technical Paper #259)* authored by James S. Magdanz, Charles J. Utermohle and Robert J. Wolfe. The full text of the final report can be found on the ADF&G website—http://www.state.ak.us/adfg/subsist/download/TP259.pdf .

Regulatory Context and the Intent of this Research Project

The establishment of new national parks and preserves in Alaska under the Alaska National Interest Lands Conserva-tion Act (ANILCA) nearly doubled the park acreage in the United States. For those parks established or enlarged by ANILCA, subsistence uses by local residents are permitted in accordance with the provisions of Title VIII.

Paraphrasing Section 803 of Title VIII, we can define subsistence use as the customary and traditional use in Alaska of fish, wildlife, and other renewable resources for direct personal or family consumption, for the making and selling of handicraft articles from the non-edible by-products of fish and wildlife taken for direct personal or family consumption, and for customary trade, barter, or sharing for personal or family consumption.

The communities of Wales and Deering, the subject of this research, are affiliated with the Bering Land Bridge National Preserve (BELA). The establishment of the preserve includes protecting the viability

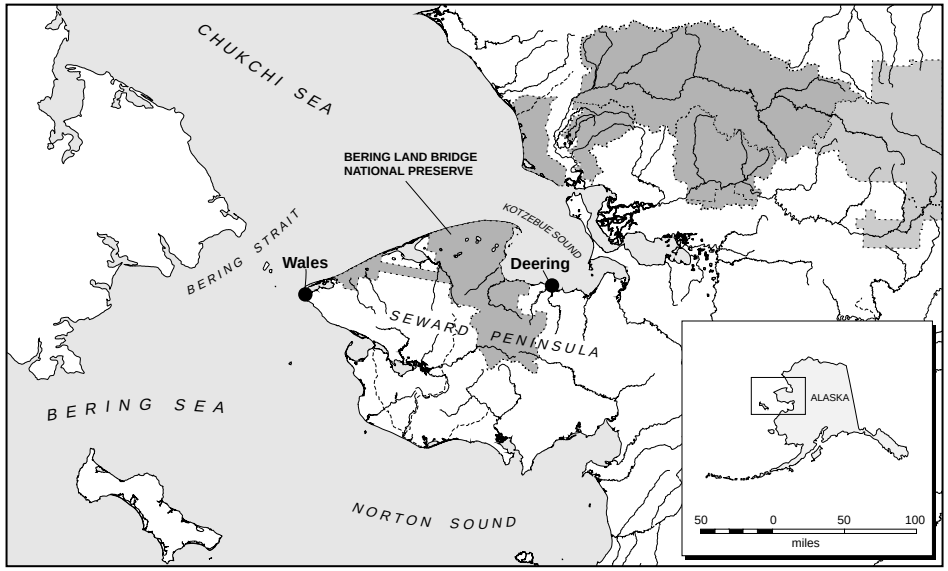

Figure 1. Northwest Alaska, including the study communities of Wales and Deering.

Left: Residents of Wales, in 1916, stand in front of a meat cache at Cape Prince of Wales. Numerous other caches in the background attest to Wales' population before the 1918 influenza epidemic.

Photograph from the Robert Steiner Collection, 91-164-64, Archives and Manuscripts, Alaska and Polar Regions Department, University of Alaska Fairbanks

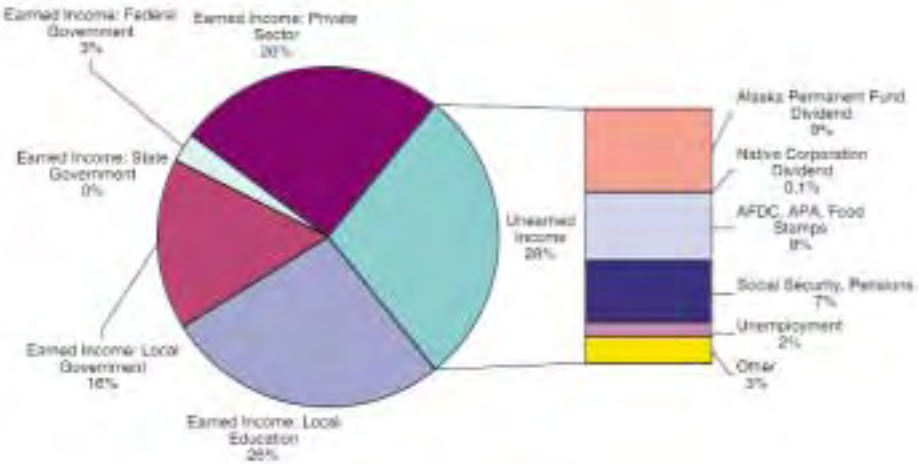

Figure 2. Sources of personal income, 1994.

of subsistence resources in addition to protecting habitat for fish and wildlife.

Two clear purposes of the park were involved in the development of the Wales/Deering analysis. First, information from each household in both communities details the amount of harvest for every species of natural resources used by that household. This information details the community's dependence on wildlife resources and in addition helps park managers gauge the impact of human harvest on resource populations. Critical to managing any natural resource is biological data on the size of a wildlife population and cultural information on the amount of human harvest.

Second, while the nutrition and economic aspects of wildlife harvests seem the critical issue, in fact, it is the social relations in the harvest, processing, and sharing of those resources that are of paramount concern to the rural Native Alaskans of the region. Subsistence resources, and the activities associated with their harvest provide more than food. Participation in family and community subsistence activities, whether it be clamming, processing fish at a fish camp, or seal hunting with a father or brother, provide the most basic memories and values in an individual's life. These activities define and establish a sense of family and community. They teach how a resource can be identified, methods of harvest, efficient and non-wasteful processing of the resource, and preparation of the resource into a variety of food items.

The sharing and distribution of resources establishes and promotes the most basic ethical values in Native and rural culture — generosity, respect for the knowledge and guidance of elders, self-esteem for the successful harvest of a resource, and family and public appreciation in the distribution of the harvest. No other set of activities provides a similar moral foundation for continuity between generations. The single most respected and reinforced role for young men in the community is to be a successful hunter who distributes the fruits of that success widely within the community. The documentation of these social relationships, a major intent of the research design, has several useful outcomes. Information gained from the project is used in the regulatory process. Positive regulatory findings ensure continued access to these wildlife resources for the communities in question. In addition, the findings of this project have substantial importance in answering a number of significant questions in the scientific literature and in interpreting the cultural values, ideals and behaviors of these Iñupiaq communities.

The Setting: Participating Communities

The communities of Wales and Deering are located in Northwest Alaska — a sparsely populated area bisected by the Arctic Circle *(Figure 1)*. Temperatures range from the minus 50s ºF [-50ºC] in winter with nearly no sunlight, to the high 70s ºF [25ºC] in summers that are characterized by little darkness. Permanent year-round settlement in one location is a relatively recent phenomenon in the region. The current locality of Wales *(Figure 3)*, though, has a long history of occupation due to its exceptional access to marine mammals and its strategic location for trade with Siberia. Wales, with 500 inhabitants at its peak, was one of the largest traditional settlements in northwest Alaska before the 1918 influenza epidemic. In contrast, Deering *(Figure 4)* was not occupied continuously during the nineteenth century. As many as 400 people may have been living in the Deering area prior to 1850, but this population lived in over a dozen small seasonal settlements. Currently each community has about 150 people, more than 90

Figure 3. Wales, 1998

percent of Iñupiaq descent.

Both communities have low per capita income. In 1994 both communities had a per capita income (from all sources) of about $7,000 which was about a third of the per capita income ($23,417) for the state during that year *(Figure 2)*. Both communities are heavily dependent on the harvest of wildlife resources with per capita harvests of about 700 pounds. By comparison the average U.S. per capita consumption of meat, fish and poultry is about 220 pounds. Although the per capita harvest for both communities is about the same, the composition of those harvests varies substantially due to differences in ecological setting. Wales is much more dependent on marine mammals, especially walrus, while Deering, located in a sheltered bay inside Kotzebue Sound, harvests about equal amounts of seal, fish and caribou *(Figure 5)*. In summary, we find two indigenous communities with very low incomes that are heavily dependent on traditional resources.

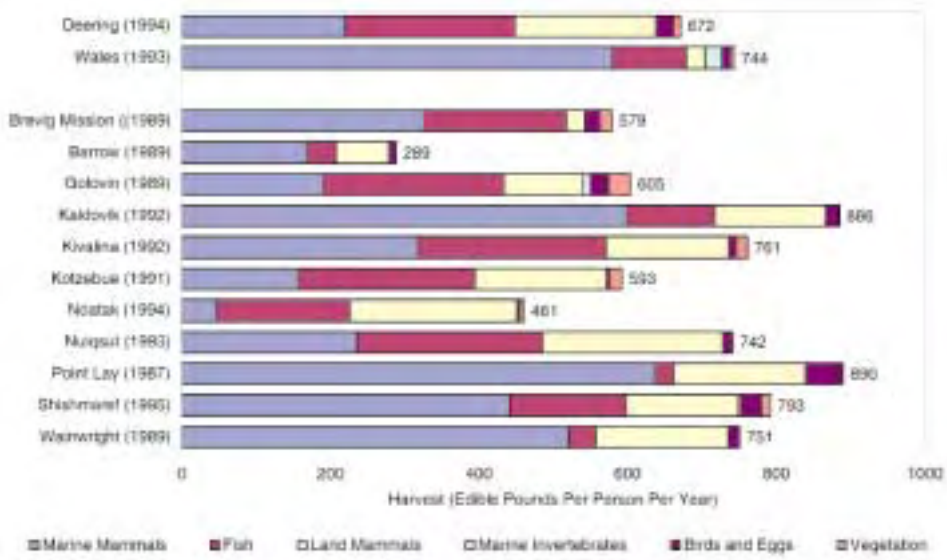

Figure 5. Estimated harvest in 14 northwest Alaska communities. Deering's and Wales' harvest of pounds per person per year were similar to other northwest communities.

Research Design

In both communities about 84% of available households were interviewed (42 in Wales, 37 in Deering). Before the research began, approval for the research was obtained from the respective local governments. The household survey form asked questions about the harvests of wild foods (by species) by the respondent's household during the previous year. The survey also obtained information on the age, sex, employment and income of each permanent resident of the respondent's household. In addition to the standard harvest inquiries, interviewers asked each household to identify the people who harvested, processed or distributed 12 categories of subsistence resources for the respondent's household, and whether or not these individuals lived in his or her household. Detailed genealogical data was also obtained from participating households and entered into "Legacy" software. Surveys required 15 minutes to two hours to complete. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) and Excel programs. The analysis employed a variety of statistical techniques, including hierarchical clustering.

Figure 4. Deering, 1998

Significant Findings:

The Long Term Continuity of Kin-based Production Groups

Since the nineteenth century indigenous groups in northwest Alaska have experienced tremendous dislocations — the advent of commercial whaling, which introduced diseases and social restructuring of traditional relationships; starvation due to the crash of the caribou herds in the late nineteenth century; and missionary impacts on indigenous beliefs especially after the terrible epidemics of the early twentieth century, which brought a devastating mortality to nearly a third of the population. However, many of the underlying beliefs, values and practices that are linked to subsistence activities have persisted.

The surveys demonstrated continuity between the organization of contemporary households and those documented by ethnohistorians during the mid-nineteenth century. Although contemporary households in 1994 were somewhat smaller and less complex, they essentially mirrored the subsistence networks described for "local families" in the 1850s. In essence the key elements of sharing, respect for elders, ethical treatment of "animals" and support for those in need have been sustained for at least 150 years.

In the larger American culture, families support themselves predominantly on the wages produced by the parents of small nuclear families. This research demonstrates that households in northwest Alaska rarely function as independent entities. The organization of the harvest, processing and distribution of wildlife resources on which these communities base their survival rely

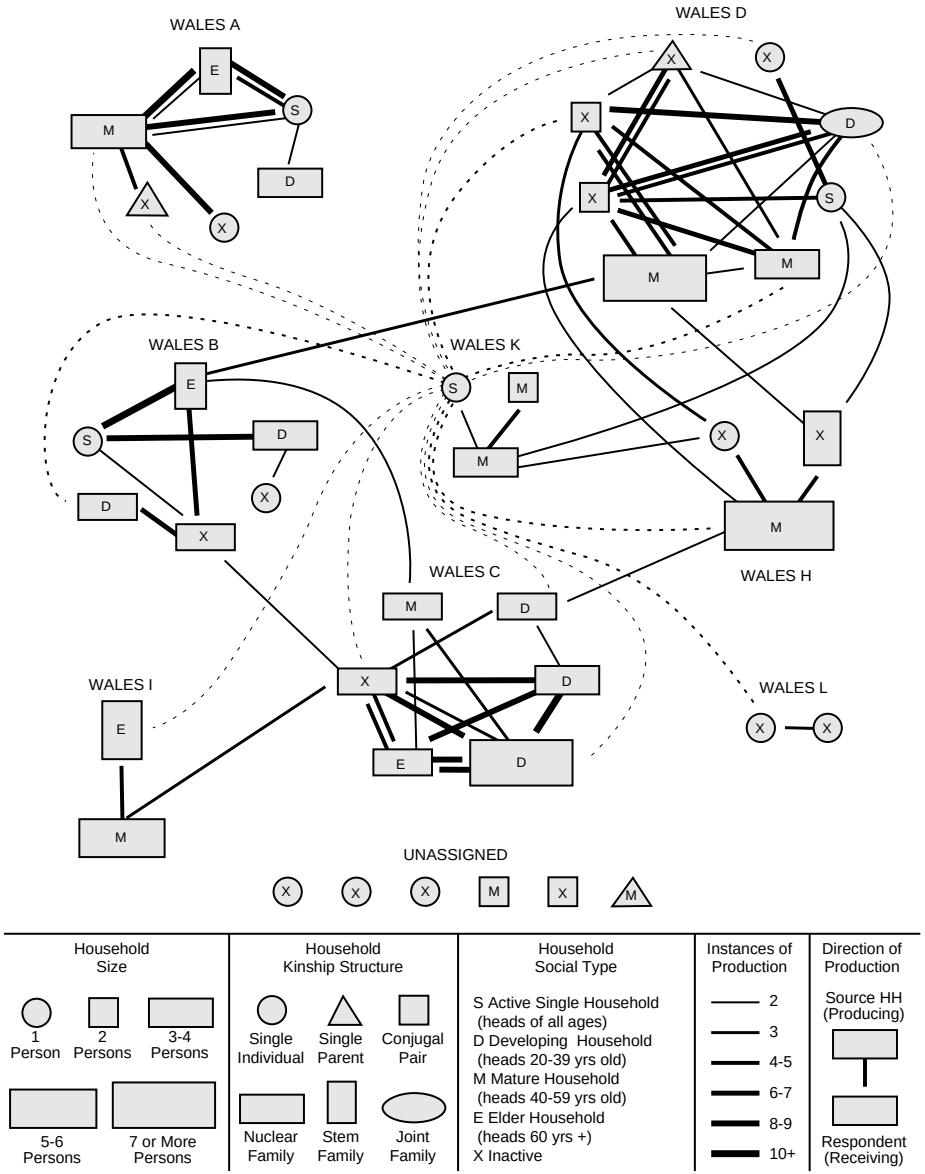

Figure 6. Wild food production and distribution networks in Wales, 1994. Each grouping (Wales A, B, etc.) represents a kinship network. Each polygon (rectangle, triangle, etc.) represents a household. The solid lines represent instances of harvesting, processing, and distribution of wild foods between households. The thicker the line, the more instances of production. The dotted lines link one man, who each summer harvests a considerable amount of salmon and distributes most of these fish throughout the entire community.

on extensive sharing between households in the community. In almost all cases, these households that share wildlife resources are linked through kinship. Most often these kinship linkages are between parents and children, grandparents and grandchildren, siblings (of either sex) or between aunts/uncles and nephews/nieces. Thus an elderly parent may have his/her wildlife nutritional needs met by children living in other households. These reciprocating households linked by kinship are called kinship networks.

Eight production and distribution networks were identified in Wales and six in Deering *(Figure 6)*. Networks ranged in size from 2 to 41 people, occupying 2 to 11 households. On average, networks harvested 12,723 pounds of wild foods (735 pounds per person). About 90% of inter-household sharing in Wales occurred within networks and about 75% of the inter-household sharing in Deering occurred within networks. Of the six different types of kin relationships, household heads related by parent-child relationships were most likely to be found in the same network. Networks organized around one elder parent household were more productive than networks organized around two elder sibling households.

It is noteworthy that in Wales, 79% of wildlife harvests came from marine mammals, principally walrus. Walrus are hunted by crews of men in locally made skin boats or with commercially manufactured boats. Perhaps because of this crew structure, relationships within networks were stronger and boundaries between networks more distinct in Wales than in Deering. In addition, the relatively high cost of maintaining the equipment and supplying the crew for marine mammal hunting meant that crews were more likely to be organized around higher income households in Wales.

By contrast, in Deering, the majority of the harvest (62%) came from land mammals and fish. Subsistence activities in Deering were less costly because land mammals could be pursued by a single man with a snowmachine and sled; an entire crew was not needed.

Generally and consonant with indigenous value systems, the flow of wild foods within the networks tended to be from the active single and active elder households to the inactive and developing households. While highly productive single-person households were important to network harvests, active elder households were more likely to make contributions in every economic sector: wild food harvest, earned income, and unearned income.

Six households in Wales and three households in Deering, either did not cooperate with any other households or did not harvest any wild foods, and thus were not included in any networks. All of these were short-term households occupied by teachers or other non-local government employees.

Resource Management Conflicts Resulting from Kin-based Production Groups

One key feature of these results with respect to National Park Service management of natural resources is the cultural conflict in expectations as to who provides for a family and what should be the entity

Photograph courtesy of James Magdanz © 2003

Rita Olanna, her son Percy, and her sister Pauline, skin a bearded seal at their extended family hunting camp near Brevig Mission. They live in three different households, but cooperate extensively in the production of wild food. All but one of the food productions networks in nearby Wales and Deering were based on extended family relationships.

connected with management regulations. Western game management practices come out of a tradition of managing the impacts of sport hunting. Buttressed by the cultural expectation that individuals provide for their nuclear families, most game management in Alaska focuses on limiting the amount of a resource (e.g., caribou) that one hunter can take in a day (or a given time period). This is called the individual bag limit. In contrast, a single male Iñupiaq hunter may harvest a number of caribou and distribute them to multiple households, related to him by kinship, within the community. Thus traditional practice, where a single hunter receives status and community approval for harvesting many animals and distributing them widely, comes into direct conflict with western game management practice.

The NPS and other agencies, in some instances related to decreasing animal populations, have modified some of their regulatory practices to allow for community bag limits or designated hunters. Community bag limits set a ceiling on the total community harvest of a resource (e.g., caribou), but limit no particular hunter within that community. "Designated" hunters are individuals selected by non-active or elderly households to harvest animals for their use. Thus the active hunter uses the designating household's bag limit and may harvest animals for a variety of households without exceeding his own individual limit. Without these provisions, the specialization in caribou harvesting observed in Deering families in 1994 (when the caribou bag limit was 15 per day) would have been illegal in 1977 (when the caribou bag limit was one per year). In times of resource shortages, the use of individual bag limits hobbles the most productive hunters. *(Figure 7)*.

On occasion the NPS, the Federal

Photograph courtesy of John Robson © 2003

Sharing of food is integral to Native and rural Alaskan communities. Here, whale blubber has been processed and prepared.

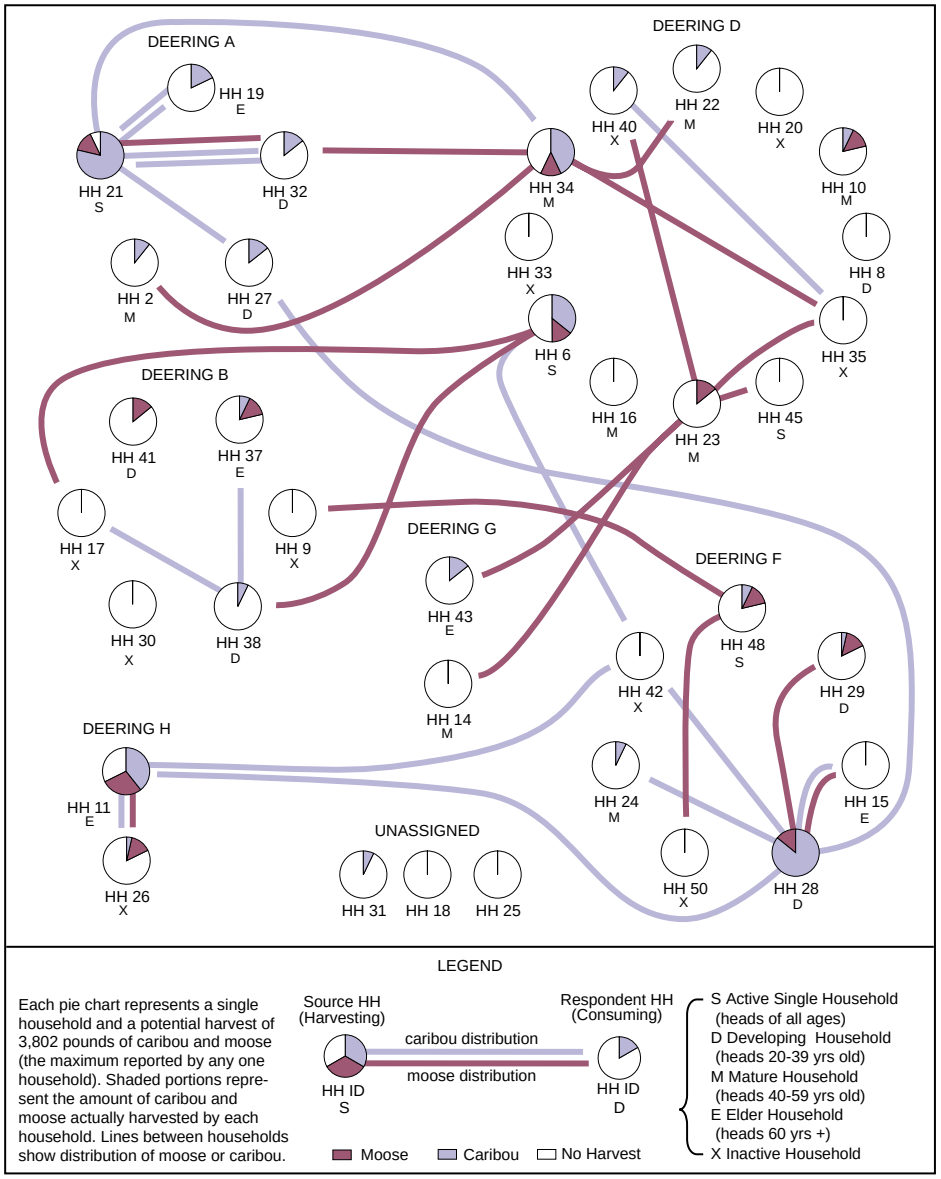

Figure 7. Harvest and distribution of large terrestrial mammals, Deering 1994. Two households were particularly important in the distribution of meat to other households. Household 21 and 28 reported harvesting one-third of Deering's total caribou harvest and distributed that harvest to eight other households in four networks.

Subsistence Board and the Alaska Board of Game have attempted, through the use of community bag limits and designated hunters, to preserve the traditional organization of the hunt in Iñupiaq communities. However, recently on state lands, urban hunters have used the courts to force the Alaska Board of Game to reorganize the hunt to favor individual rights on a statewide basis, instead of extended families and communities on a local basis.

Realistic game management requires local compliance. The results of this research clearly indicate the dynamics of contemporary subsistence practices for indigenous communities in the area and underscore the necessity of flexibility in western game management practices. Extended-family networks were not simply accommodated by indigenous management; they were part of indigenous management. These networks facilitate communication among members, encourage responsible harvests and use of fish and wildlife, and discipline members who fail to comply with group norms.

In essence much of western game management in Alaska highlights an equity issue. Euro-American regulations regarding individual bag limits reflect who has political and legislative power within the state. Non-indigenous Alaskans hold different beliefs about whether individuals or families and communities should be the basis for allocation.

Factors That Sustain Local Family Networks

In these Iñupiaq communities, local family networks have survived when so much else has changed. A strong local family network provides its adult members with a high degree of individual freedom: to work or not work, to hunt or to fish, to raise children or grandchildren — such freedom is all but impossible for adults in an economically independent nuclear family. In most areas of rural Alaska, dependence on a cash economy is risky, especially for men who work in construction, for jobs tend to be temporary. Jobs in the schools and health clinics are more permanent, but even those jobs are subject to changes in public funding priorities that are out of local control. Given distance from markets, limited skills in a small labor pool and a variety of other factors, it is extremely difficult to operate a private business.

There is no guarantee that current levels of public spending — upon which most jobs depend — will continue. In the daily business of subsistence living, people who are part of a local family network seem better prepared to survive the uncertainties of life in Alaska. A household without employment can depend on other households for food, equipment, and supplies. When hunting is poor, every household in a network benefits from the success of even a single hunter in the network. Wild foods play an essential role in maintaining the physical and emotional health of thousands of Alaskans. This is a tremendous responsibility for the agencies that participate in the management of those resources.

Regulatory Conflicts Associated with the Use of Modern Technology in Subsistence Activities

In 1850, the six to eight local families in the study communities probably would have spent much of the year living in separate, small, local family-based settlements spread across each "society's" territories. In

Photograph courtesy of John Robson © 2003

Participation in family and community subsistence activities provide the most basic memories and values in an individual's life.

1994 Wales and Deering represented permanent, localized-year-around settlements. The permanent settlements are a product of a number of social, economic and historical factors. Permanent settlements were often localized around stores that provided western technology and a stable source of foodstuffs. Fragile elders and the infirm, who formerly may have faced considerable difficulty keeping up (especially during periods of scarce resources), found increased security in permanent settlements. Thus the advent of commercial whaling and "trading posts" provided considerable incentive for some form of permanent settlement.

The numerous epidemics which caused precipitous declines in human populations accompanied by the crash of the caribou herd were also localizing forces. The most important contemporary reason for the creation of permanent settlements, however, is the demand of outside institutions that require children attend school on a nine month basis. Parents were faced with the choice between occupying traditional seasonal camps and losing their children or living with their children in permanent settlements established by the government and/or religious institutions. The factor that made this latter choice more palatable was the use of increasingly efficient western technology in their subsistence pursuits.

In 1994 there was less need to disperse. With modern transportation, families could fish, hunt, and gather throughout their traditional territories, yet return to their permanent homes in a matter of hours. Children could attend school and every family member could appreciate the benefits of local services, such as electricity and running water, which were not available in seasonal camps. Despite this, the nineteenth century settlement pattern was still in evidence seasonally, when some family members moved to temporary hunting and fishing camps. This contemporary settlement pattern presents some difficulty and requires sensitivity on the part of western land managers, particularly the NPS. The use of snowmachines during the winter months presents little impact to the environment; however, spring and summer use of all terrain vehicles may impact park aesthetic and resource values. The key to mitigating these potential conflicts is sustained dialogue between both parties with a foundation of empirical evidence, as represented by this study, to facilitate the discussion.

The Long Term Impact of Subsistence Activities on Wildlife Populations

In some quarters there is the perception that growth in Alaska Native populations threaten to outstrip Alaska's fish and wildlife. The data from this project do not support this conjecture, neither from a harvesting or a population growth perspective. For example, analysis from this project when coupled with time series data from Kivalina, a nearby community, suggests that total subsistence harvests have not increased in recent decades. While the population of Kivalina has doubled during the latter half of the twentieth century, per capita harvest of wild foods have declined by half, resulting in a stable level of subsistence demand. The factors in Kivalina's declining per capita harvests — the replacement of hungry dog teams by mechanical transportation, increased availability of imported foods and a variety of other technological changes— are present in Wales, Deering and throughout much of rural Alaska.

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Bear-Human Interactions at Glacier Bay National Park and Preserve: Conflict Risk Assessment

National Park Service photograph

Figure 1.
To the Tlingit and Haida, the grizzly was a Spirit Messenger, a source of power. The grizzly was portrayed in ceremonial dances and symbolically worn on clothing. Tribes honored the bear with names such as Elder Brother and Old Man with the Claws.

Figure 2.
Left: From the safety of deep water, a kayaker observes a brown bear fishing for sockeye salmon *(Oncorhynchus nerka)* on the Alsek River near the Park/Canadian border.

Photograph courtesy of John Hyde © 2003

By Tom Smith, Terry D. DeBruyn, Tania Lewis, Rusty Yerxa, and Steven Partridge

Many bear-human conflicts have occurred in Alaska parks and refuges, resulting in area closures, property damage, human injury, and loss of life. Human activity in bear country has also had negative and substantial consequences for bears: disruption of their natural activity patterns, displacement from important habitats, injury, and death. It is unfortunate for both people and bears when conflicts occur. Fortunately, however, solutions exist for reducing, and in some instances eliminating, bear-human conflict. This article presents ongoing work at Glacier Bay National Park and Preserve by U.S. Geological Survey (USGS) and National Park Service scientists who are committed to finding solutions for the bear-human conflicts that periodically occurs there.

People and Bears at Glacier Bay: A History of Coexistence and Conflict

Paleontological investigations reveal that both American black *(Ursus americanus)* and brown/grizzly *(U. arctos)* bears have continuously inhabited the Alexander Archipelago for at least the last 35,000 years *(Heaton et al. 1996)*. The oldest evidence of humans in this region dates approximately 10,000 years before present (BP). Native peoples throughout Southeast Alaska, primarily the Tlingit and Haida, integrated the bear into their myth, legend, and art, as well as depended upon them as sources of food, medicine, tools, and clothing. Tlingits preferred brown bear blankets for children's bedding not only for their warmth, but because the hides were believed to protect against illness. Tlingit social and ceremonial life emphasizes the close relationship between humans and bears, and traditional Tlingit bear hunters believed that adherence to certain behaviors was necessary to ensure the success of the hunt *(Figure 1)*.

Native people and bears undoubtedly experienced conflict in Glacier Bay proper, although specific occurrences are now lost to time. The earliest written record of bear-human conflict in what is now the park occurred in August 1912 when frontiersman Allen Hasselborg nearly lost his life to a grizzly along the Bartlett River *(Howe 1996)*. Tasked by C. Hart Merriam, then director of the Smithsonian Museum's mammal collections, to collect bear specimens in the region, Hasselborg met up with a Tlingit hunting party. While talking with them, he boasted that he was not afraid of bears — a bravado deemed reckless and dangerous by the Tlingits. An elderly Tlingit man, Albert Jackson, sharply warned Hasselborg that if he kept boasting, he would anger a bear that would attack him. The next day, several miles up the Bartlett River, Hasselborg saw a large grizzly bear, fired four shots into it, and then pursued the wounded animal. The bear hid on a ledge, ambushed Hasselborg, and nearly killed him. Severely injured, Hasselborg was barely able to make his way back to the hunting party campsite. Upon his arrival, Hasselborg was told by Jackson that he deserved what happened *(Howe 1996)*.

Nearly a century has passed since Hasselborg disregarded the Tlingit hunter's advice. The area has since become a national park, and bears are no longer hunted within its boundaries. People have discovered the unparalleled beauty of Glacier Bay National Park and Preserve, many exploring its pristine shorelines by sea kayak *(Figure 2)*. As backcountry use increases in popularity, so do the reports of skirmishes between bears and people *(Figures 3)*. Conflicts between bears and

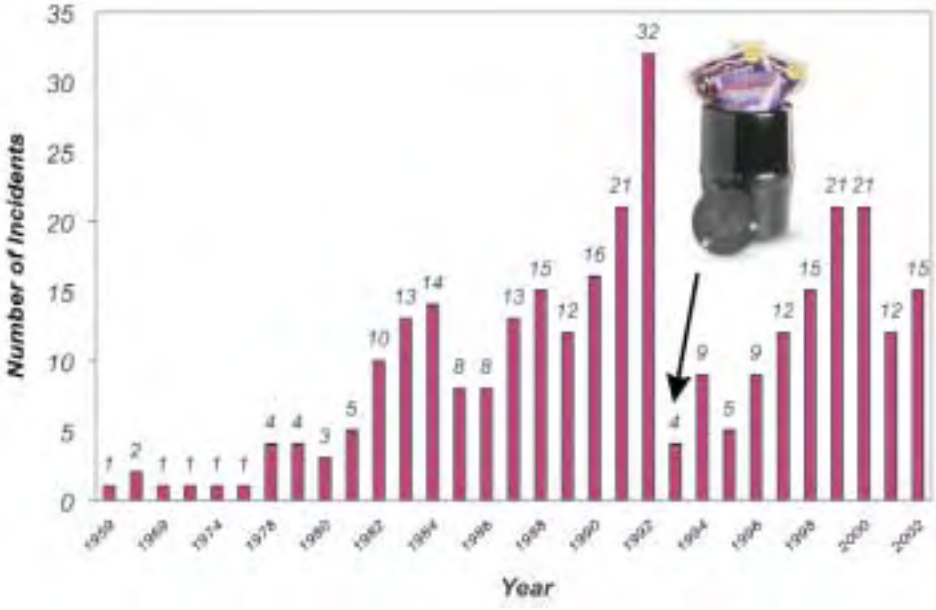

Figure 3. Trends in bear-human incidents at Glacier Bay National Park and Preserve, 1959-2002.

people in North America increased through the twentieth century *(Herrero 2002)*. During that time, bear-human conflicts in Alaska resulted in 52 documented fatalities, hundreds of injuries, and extensive property damage *(Smith unpublished, Middaugh 1987)*.

Notably, a sharp decline in bear-human conflicts occurred at Glacier Bay in the early 1990s as a direct result of a new policy that required campers to store all food in bear-resistant food containers.

This illustrates the impact well-informed management decisions can have in reducing bear-human conflict.

Today, sea kayaking is the predominant recreational activity in Glacier Bay's extensive marine backcountry. Kayakers frequently stay several nights in the backcountry, camping within the narrow ribbon of terrain bordered by ocean and steep-walled mountains. Both brown and black bears inhabit and seasonally occupy these same areas. Beaches not only provide bears with unrestricted movement corridors, but also important foraging opportunities. Seaside habitats are among the earliest to provide bears with new plant growth and access to intertidal areas that host a variety of marine forage items (e.g., mussels, barnacles, and other invertebrate species). Consequently, the potential for bear-human interaction at Glacier Bay's campsites is likely higher than for other areas of the backcountry. It is also more likely that human activity in these areas will displace bears from important forage resources, or interfere with their movement. The majority of bear-human interactions occurring at Glacier Bay are resolved without incident. Nonetheless, there have been two human fatalities, two maulings, and thousands of dollars of property damage. Although no one has been injured in the park since 1980, bear-human conflict is still of great concern to park managers.

Notably, a sharp decline in bear-human conflicts occurred at Glacier Bay in the early 1990s as a direct result of a new policy that required campers to store all food in bear-resistant food containers. This illustrates the impact well-informed management decisions can have in reducing bear-human conflict *(Figure 3)*. Consequently, the National Park Service solicited the aid of bear biologists to find ways to reduce, or even eliminate, bear-human conflict as well as the disturbance of bears by campers. By devising, applying, and evaluating a predictive model for bear-human interactions it may be possible to reduce bear displacement from important habitats, as well as minimize bear-human conflict through education and directives.

The more times people and bears interact, the more likely displacement and bear-human conflicts will occur *(Figure 4)*. We cannot predict when a bear encounter will escalate to a conflict without knowing something about the past behavior of the bear around people, or about how people will behave around bears. We can, however, estimate the potential for bear-human encounters — understanding that the best way to avoid bear-human conflict is to avoid bears, by staying away from places they frequent.

Photograph courtesy of Kent Fredriksson © 2003

Figure 4. Like the proverbial moth to flame, visitors' fascination with bears occasionally brings the two unreasonably close together. Even when bears receive no food reward, seemingly benign close encounters habituate them to people. Bears unafraid of people, like the ones shown here at Geographic Harbor on the Katmai coast, are more likely to get into trouble.

Devising a Research Approach

We decided to first construct an accurate history of bear activity and conflict at Glacier Bay before attempting to devise research that would provide insight regarding bear-human conflict. Glacier Bay National Park staff have carefully documented instances of bear-human conflict (approximately 300 incidents between 1960-2002), bear sightings (>3700 sightings from 1932-2002), and backcountry campsite use (>8000 records from 1996-2000). Next, we created a computer database into which these records were entered

(Figure 5). This database of 'bear sightings and incidents' presents the distribution of sightings and incidents that have occurred in the bay and enables users to query for specific information through the use of key words. We also used geographic information system (GIS) software to perform spatial analyses of camper and bear use of the bay. This information, in turn, was used to create a temporal-spatial profile of bear and human activity and conflict in the backcountry.

To assess the potential for bear-human interaction at campsites, this research built upon the work of Herrero et al. *(1986)* and MacHutchon and Wellwood *(2002)*. The assumption underlying these previous research efforts was that bears are not randomly distributed across the terrain, but rather that the temporal-spatial pattern of bear whereabouts is largely a function of seasonal forage characteristics.

If this assumption is correct, an assessment of bear habitat quality at campsites should provide a relative index of the amount of seasonal bear activity at those sites. It follows then that if campers avoid areas seasonally important to bears, the number of bear-human encounters will decline. The chance of an encounter escalating to conflict is also affected by campsite characteristics that reduce the ability of bears and people to detect each other early enough to avoid conflicts and by terrain features that reduce options for bears and people to avoid each other. For example,

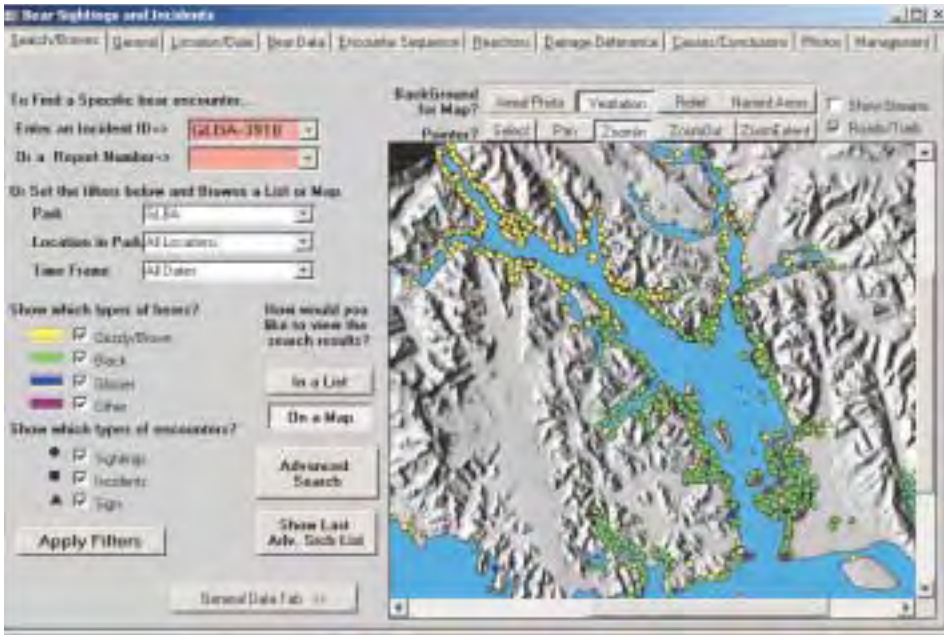

Figure 5. A computerized database contains Glacier Bay's bear sightings and incidents information.

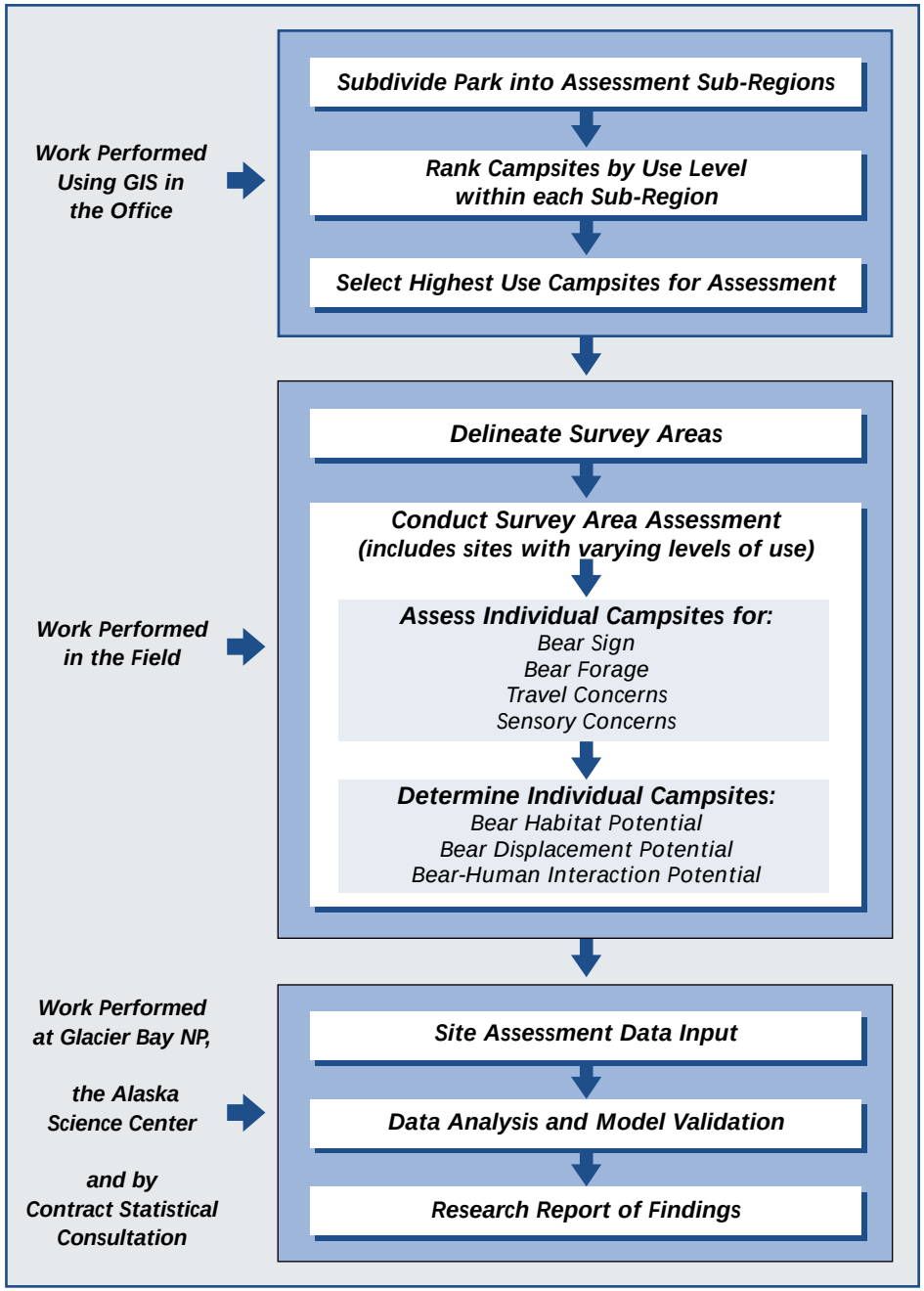

Figure 6. Steps in the campsite risk assessment process, Glacier Bay National Park, Alaska.

National Park Service photograph

Figure 7. Bear 'mark-trail' in Reid Inlet, Glacier Bay.

very brushy sites reduce visibility and increase the chance of surprise encounters. Also, steep cliffs may restrict bear movements such that bears are funneled into campsites, thus increasing the odds of bear-human encounters.

We incorporated this information into a research plan that enabled us to estimate bear habitat quality and bear encounter and conflict probabilities at the most frequently used campsites in the bay. Because Glacier Bay is comprised largely of steep-walled fjords, level areas that produce high quality bear forage are relatively rare and are important to bears. The presence of camping activity may displace bears from these areas; hence a rating of displacement potential was deemed an important aspect of this work. An overview of the steps in the campsite risk assessment process is presented in *Figure 6*.

Status of Research

During the summers of 2001-2002, we evaluated 162 campsites, traveling to campsites by kayak. We estimated bear habitat quality, bear displacement potential, and bear-human conflict potential at each site. Additionally, all bear sign (e.g., tracks, scats, digs, rubs, marked trees and trails) observed at each site was recorded and entered into the geographic information system *(Figure 7)*. In the future, we will determine if the level of bear sign observed during our evaluations and the number of sightings in the historic database correspond. Subjective ratings for bear habitat quality will also be compared to the level of bear sign and sightings in the database.

Many coastal habitats in Glacier Bay, particularly the upper reaches of the glacial fjords, appear to be marginal habitat for bears. Dominated by barren rock, sheer cliffs, alder scrub (Alnus spp.), and dryas (Dryas spp.), these areas offer inferior foraging opportunities and difficult travel conditions for bears. Nonetheless, bear sign was found in all of these places.

Preliminary Research Findings

The Glacier Bay bear sightings and incidents database was completed in 2001. Campsite evaluations were completed in August 2002. Campsite data were analyzed during the winter of 2002-2003 and findings are to be released in 2003. Our analysis of 70 years of bear sightings and bear-human conflict from the database has revealed a number of interesting facts.

Bear Conflicts Database Findings

We found that in more that 98% of all reported encounters, bears did not injure people. Although black bear sightings (2100) outnumbered brown bear sightings (1300) nearly 2 to 1, both black and brown bears were almost equally involved in conflicts with people (56% vs. 44%). Eighty-five percent of bear conflicts occurred between 6 a.m. and 6 p.m., and human foods were a factor in conflict nearly half the time (42%). We also found that single campers were more often involved in bear conflicts than

camps with 2 or more people, and red pepper spray was successful in deterring bears in 5 of 8 instances reported. Our assessment of information supplied by those involved in bear conflicts suggests that people were responsible for precipitating conflicts twice as often as were the bears.

Preliminary Campsite Assessment Findings

Bears are ubiquitous at Glacier Bay. Backcountry users should realize that bears might appear anywhere at anytime, including islands. Indeed the saying, "Bears are where they find you," is particularly true at Glacier Bay. The West Arm of Glacier Bay has more abundant and diverse bear habitat than the East Arm. Consequently, more bear sign are present on West Arm beaches. The greater number of bear sightings and bear-human conflicts on the West Arm than on the East Arm support this finding. Many coastal habitats in Glacier Bay, particularly the upper reaches of the glacial fjords, appear to be marginal habitat for bears. Dominated by barren rock, sheer cliffs, alder scrub *(Alnus spp.)*, and dryas *(Dryas spp.)*, these areas offer inferior foraging opportunities and difficult travel conditions for bears. Nonetheless, bear sign was found in all of these places. Bears using these areas likely travel constantly in search of food, suggesting that camper use of higher quality foraging areas here may have a pronounced negative effect on bears.

Implications

The Glacier Bay bear sightings and incidents database is a tool that can aid park managers in the management and analysis of bear information. Efforts are underway to implement a version of the database in the National Park Service's Regional Office in Anchorage. When completed, the database will enable park managers to track bear-human interactions at all Alaska National Park units. In addition to placing bear-human interactions that occur into a regionwide perspective, we anticipate that information from this system will help identify future research needs. Additional information may be accessed at: http://www.absc.usgs.gov/research/brownbears/glacierbay/glba.htm .

Photograph courtesy of Kent Fredriksson © 2003

Acknowledgments

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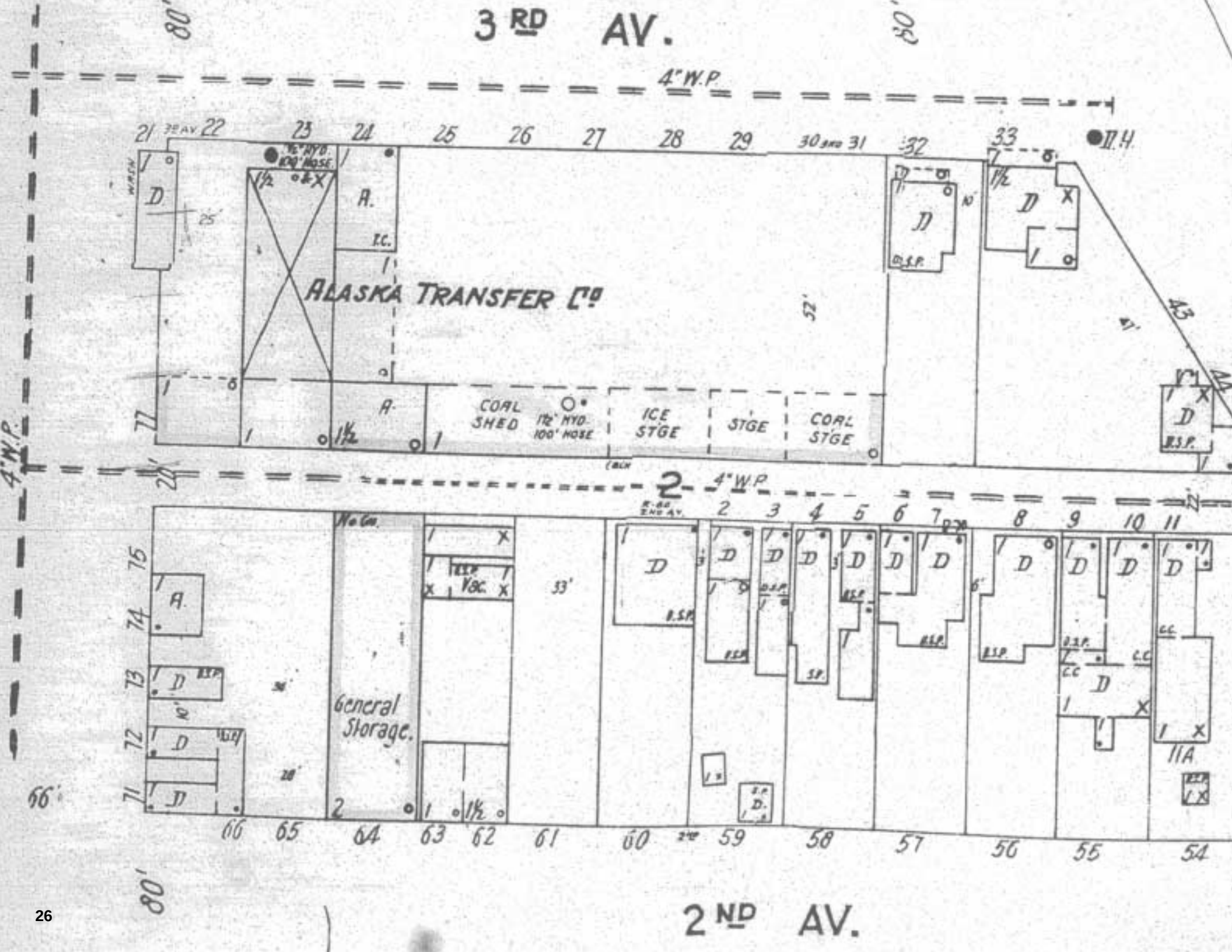
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4" W.P.
ALASKA TRANSFER Co
COAL SHED
ICE STGE
STGE
COAL STGE
General Storage.
2ND AV.

Red Light District Ethnohistory in Seward, Alaska

By Rachel Mason

National Park Service photograph

Line of trees in Seward where the Line once was.

Left: 1927 Sanborn map showing the properties on the Line.

National Park Service photograph

In 2002, a team of National Park Service historians, architects, archeologists, and cultural anthropologists began a compliance study for a new visitor center in Seward associated with Kenai Fjords National Park. The proposed site of the new visitor center was in the same area of Seward as the Line, a red light district that closed in 1954. The ethnohistorical section of the study involved interviewing local residents about their memories of the Line. The enthusiastic responses both to requests for interviews and to public lectures was amazing. The community's appetite for hearing and talking about the Line seemed insatiable.

Both while the Line was open and long afterward, people in Seward thought the prostitutes who worked there provided a necessary commercial service to transient men. Respectable women supported the Line, in an effort to confine vice to a single part of town. The Line women usually did not socialize with respectable women or even appear in public except at certain times. Despite the prostitutes' isolation, though, one of the main conclusions drawn from researching their history is that one can not talk about the Seward Line without talking about the whole community.

Local historians have documented much of Seward's early history. Mary Barry's three volume history gives detailed year-by-year accounts through 1993. John Paulsteiner, Barry's father, wrote a somewhat different book called *Seward, Alaska: The Sinful Town on Resurrection Bay,* published in 1975. Focusing on bootlegging, prostitution, and other illegal activities, the book shares personal vignettes of the characters that populated the town.

The interviews for this ethnohistory were conducted with several people who were children during the days of the Line. While some were delighted to help piece together the history of the Line, others were more hesitant. One woman was quite reluctant to contribute to a study that might ridicule or romanticize the prostitutes. She had known several of them personally and emphasized that they were just ordinary people trying to make a living.

Seward, founded in 1903, has seen several employment and population booms during its 100 years. A large number of military personnel were stationed there during World War II, most of them young, single men. During those busy days, soldiers on leave stood in line for admission into the Line houses; the prostitutes did not have time to provide much companionship to their customers.

Then, at other times when transient male workers swarmed the community, residents tolerated and indeed supported prostitution. From 1914 to 1954, a row of small houses along Alley B was the city's recognized red light district. Although prostitutes typically move from town to town, many of the Seward ladies stayed for the rest of their lives, buying property and businesses, and sometimes marrying local men.

While most of the adventurers who came to Seward were men, female travelers arrived as well. Working on the Line was only one of the moneymaking opportunities an ambitious, independent woman might find. Respectable single women worked as nurses and teachers. Other women established small businesses, such as laundries. A likely business venture for a prospective madam was to buy real estate. The records of lot sales on the Line show a rapid turnover of ownership among people whose names we recognize as those of prostitutes or madams.

Opening the Line

Many towns in the Alaska Territory, as elsewhere in the American West, had

Photo courtesy Seward Community Library

Panoramic view of Seward in about 1915. The Line is the small row of houses on the far right.

special red light districts. Often, the prostitutes' quarters were a line of little houses, or cribs, along a road or alley. The Seward Line consisted of a row of houses along Alley B between Second and Third Avenues, and between Railroad on the south and Washington on the north. Its location near the dock made it convenient for seafaring customers. While numerous immoral and illegal activities were thought to take place on the Line, its central function was prostitution. The houses averaged perhaps 16 by 20 feet. While archeologists have identified as many as 26 houses along Alley B, not all were occupied at the same time. Some interviewees remembered only five or six women working on the Line at one time; however, most agreed that usually two girls resided in each house. Undoubtedly the number of prostitutes increased or decreased depending on the demand for services.

In 1914, Seward became the official terminus of the Alaska Railroad. Days before President Wilson signed the Alaska Railroad Bill, a member of the Seward City Council requested that the city provide a restricted district to accommodate "denizens of the underworld" (Seward Gateway, March 7, 1914). The Council enacted an ordinance making keeping a bawdyhouse a misdemeanor, with a punishment of five days in jail or a $25 fine — similar to the punishment for raising a false fire alarm *(Bateman 2002)*. Collected each month, the fines were a regular source of revenue for the city.

Women of the Line

Below are descriptions of some of the memorable women from the Seward Line:

Lydia Griffiths, a madam, bought several lots on the Line soon after it was established in 1914. She married Al Peel, who had been the town marshal *(Capra 1996:11)*. Lydia appears in the 1920 census as a 53-year-old woman, and, curiously, as a 52-year-old in 1930. The latter seems more correct, as Lydia died in 1947 at age 68. The Peel-Griffiths house, spared in the 1964 earthquake, remained standing until it was burned as a fire department training exercise. The house's interior was ornately decorated with red velvet brocade furniture.

Stella Brown, a well-known prostitute in the 1930s, was from a prominent East Coast Jewish family. Stella sometimes asked Lee McAnerny, then a teenager, to help write letters to Stella's young daughter in New York. Lee and stepfather Sol Urie also prepared Stella's income tax returns, which showed her income to be one of the highest in the Territory.

Dutch Emma, whose real name was Marie Hadley, was probably the best known prostitute and madam. She owned several houses on the Line, one of which was moved to Second Street and is still standing. In the mid-1940s, Dutch Emma bought the Mile Seven Roadhouse and ran it with her husband or boyfriend Hooligan Slim Gunners. She died in 1950 at age 69 and is buried as Marie Hadley in the Seward cemetery.

Helen Williams, also known as Irene Nussbaum, was an important madam in

A man who had been a young GI in Seward during World War II remembered being terrified by Francie when he went over to the Line to meet a friend. He was sitting in one of the chairs outside Francie's house when she came out and bellowed, "Who's next?" — and he took off running.

the 1940s. She employed Emilio the Greek, who was really Italian, as her chauffeur. He would wear a leather bow tie and spats and drive her around in a fancy maroon Buick. In 1956 Irene bought a laundry *(Barry 1993:235),* later renting it to a young couple, Duane and Sanna LeVan.

Carol Erwin was one of the last ladies on the Line. Her autobiography, *The Orderly Disorderly House (1960)* talks of the bawdy-houses she operated in Texas and elsewhere before coming to Alaska, where her adventures briefly included Seward. A talented artist, she usually painted landscapes. In the 1940s, the Seward Women's Club sponsored one of her art shows, marking an unusual rapprochement between respectable women and Line ladies *(Erwin 1960:210)*.

Elnora or **Francie Jones** was an African-American woman who worked on the Line and also ran a barbecue restaurant called Elnora's. A man who had been a young GI in Seward during World War II remembered being terrified by Francie when he went over to the Line to meet a friend. He was sitting in one of the chairs outside Francie's house when she came out and bellowed, "Who's next?" — and he took off running. Elnora remained in Seward after the Line closed, but was arrested by the Vice Squad in 1957.

Lives of the Line Women

Most of the prostitutes were white. Several people remembered one black woman on the Line, but no Alaska Natives or Asians. Residents did recall that the prostitutes in Seward seemed unusually old, far above what they imagined were the normal peak years for prostitutes. Perhaps because of the ladies' advanced age, none of the people we interviewed remembered seeing pregnant women or women with small babies on the Line.

Prostitutes on the Seward Line did not find it necessary to dress very provocatively to vend their wares, supporting the local idea that prostitution was a practical way to satisfy a natural urge, and not one that needed to be sold. One woman said that the prostitutes dressed well, in fact much better than the average woman in Seward.

In the early days, women who worked on the Line were practical entrepreneurs. They were not drug addicts, had not suffered traumatic childhoods, and were not especially impoverished. Other than for prostitution, they did not often run afoul of the law. No one remembered any local women who joined the Line; all the women came from somewhere else.

According to one person, the women's fees were $2 or $5, depending on the services performed. Another thought they charged $5 in summer and $3 in winter. The main status distinction was based on whether the women were independent operators who owned their houses. If they worked for madams, they turned over a portion of the money they made. There is little mention of pimping in the accounts of the Line. Also, there was no evidence of turf battles between the woman-owned businesses.

Some of the best clues about the lives of the Line women come from the seemingly mundane details our oral history informants dredged from their memories. A woman remembered bicycling through the Line as a girl, and hearing boys her age tittering about seeing a naked woman in one of the houses. Mary Barry, for a brief period, walked Dutch Emma's dog. She remembered that Dutch Emma had a garden, and used to give vegetables to Barry's family.

When Lee McAnerny was a teenager, she worked at her stepfather's bakery and remembered talking with some of the women from the Line. She was impressed by their stylish clothes, bought in New York, and by the fact that the ladies had the latest fashion magazines and sometimes gave her make-up tips. Often the women ordered fancy pastries to be delivered to the Line, and Lee's brothers usually made the deliveries, although they were much younger than her.

One man said he had paid $20 for the coveted paper route in Seward's red light district. A woman who, as a young, embarrassed public health nurse, said she had the task of making house calls to prostitutes to check them for venereal diseases. Beverly Dunham remembered that the ladies from the Line would come to the store where she worked and buy records to play during their rendezvous. The most requested song

Photo courtesy Resurrection Bay Historical Society

Lydia Griffiths and Al Peel, date unknown.

National Park Service photograph

Rachel Mason giving public lecture about the Line in Seward in May 2002.

Photo courtesy of Duane and Sanna LeVan

Irene Nussbaum, early to mid 1950s.

National Park Service photograph

Dutch Emma's house in 2002. It had been moved from the Line to Second Street.

was "Embraceable You," a popular song in the early 1950s.

Beverly Dunham also told a story about Dutch Emma. Beverly's brother-in-law was a practical joker. When her mother was in town looking for some property, her brother-in-law fixed it so that Dutch Emma showed her around town in a big black car, complete with driver. They even went together to one of the bakeries to have coffee and donuts. When her mother arrived home, the brother-in-law informed her that her afternoon companion was a prostitute. She was mortified and refused to leave the house for weeks. Dutch Emma was either unaware of the joke or too gracious to identify herself to her guest. In fact, since she owned so much real estate in Seward she was an appropriate person to show houses. However, at the time a respectable woman did not want to be seen in a car with women like her, regardless of how much money or land they had.

Seward's Moral and Social Climate

We get some sense of the moral climate in Seward from the newspapers of the time. Even in the early days of the city, there was a practical, unabashed attitude toward sex, at least in some circles. A 1914 advertisement in the Seward Gateway for a 320-page illustrated *Book of Sexual Knowledge* touted it as a comprehensive work useful to doctors, lawyers, Sunday school teachers, and anyone else who needed to know about sex matters. It was delivered in a plain wrapper for only $1.00.

The 1930 census data for Seward show a total population of 504, of whom 150 were female. Again, few adult women were unmarried. While married women were generally listed as housekeepers or homeowners, single women's occupations included teacher, waitress, store clerk or manager, laundress, tailor, cook, and servant.

In a 1985 interview, the late Virginia Darling told of the prostitutes' self-imposed isolation from respectable society. When Virginia was a small baby, her mother came to Seward from Seattle on a boat. Virginia's mother was terribly seasick, and a nice woman helped her with her baby. The nice woman turned out to be Lydia Griffiths, who owned several houses on the Line. After that, Virginia's mother said hello to Miss Griffiths when she saw her at the beauty shop. Later the beauty operator delivered a message from Miss Griffiths that she appreciated the greeting but she preferred not to be acknowledged in public.

While the prostitutes themselves were segregated from society, the community accepted the institution of prostitution as a necessary part of life. Herman Leirer, now deceased, used to run a dairy. In a 1994 report, Leirer said that after the Line closed, there was no more control over prostitution. The prostitutes were good citizens, he said. In all the years that he delivered milk to them, he was only swindled out of $8.25. He thought that was "pretty damned good" *(Mobley 1994:22)*.

Periodically, ministers and churches tried to close down the Line or made other efforts in the name of morality, though not all did. One of the ministers, in fact, was occasionally found down on the Line with some of the other businessmen, because the Line was the only place to buy a drink after one o'clock in the morning.

The Line was not physically walled off from the city, but most of the time the upstanding residents preferred to ignore it. A citywide cleanup in the spring of 1950 sent Boy Scouts to gather up debris in the alleys between First and Second Avenues, and between Third and Fourth Avenues. Conspicuously, they did not clean in the alley between Second and Third, where the Line was located *(Seward Seaport Record 1950, May 2)*.

The Closure of the Line

Mystery shrouds the closure of the Line in the 1950s. The only reference definitely dating its closure came in the Seward Seaport Record on March 19, 1954. In a front-page article, the mayor denied flatly that he had ever told Police Chief Don Balmat to "re-open" the Line. Mr. Balmat had resigned as police chief after an altercation on the Line: one of his officers had caused a disturbance by trying to help a naked prostitute retrieve her clothes from the house where another prostitute and a bartender were celebrating their wedding night. Subsequently, Balmat placed charges against the city for legalizing the Line — a futile effort, since the city had no record of officially endorsing prostitution. Sometime

in 1954, however, the city stopped even informally allowing prostitutes to operate. The women of the Line left town, took up other businesses, or became freelancers.

There's not much left of the Line in Seward today. Long ago, the little houses burned down, were destroyed in the 1964 earthquake, or fell to urban renewal. Now, a north-south line of trees marks where Alley B was *(Mobley 1994:22)*.

Changing Memories

Many of those who remember the Line were children when the prostitutes were there, and did not fully realize what was occurring. Some of the young wives made it their business not to know about the Line. Also, men and women have different memories: men remember the prostitutes with hearts of gold; women remember the part of town where they were not supposed to go.

The story of the Line is part of the story of Seward. The prostitutes were separated from the community, but their segregation appeared voluntary. They were not supposed to mingle with the "good" people except during certain hours. They were a buffer between the real outsiders —the military, the railroad men — and the core community. As Willard Dunham said,

Well, in the first place, they were part of the community...And they were in business. And, I doubt that if there's any, or very many, old businesses that go back into the early days that the girls of the Lines of the various cities weren't connected to financially. They were where you went to get money when the banks or the rest of them didn't want to loan money, or didn't want to loan the amount that you wanted. A big share of the old madams all dabbled in real estate. They were just part of the community...

In the good old days, the prostitutes did not steal, at least not from locals. They brawled with each other, but did not injure any Seward residents. There were no pimps, only good-hearted madams. They may have been addicted to alcohol or drugs, but did not appear as hardened as later prostitutes. For all the sin it describes, Paulsteiner's book tells of Seward in an innocent day. Even the bad guys seemed somehow harmless. The fates of bootleggers and prostitutes are intertwined with the fates of the upstanding citizens of the town.

Seward residents who remember the Line disagree on details, such as the exact number of prostitutes, their stage names or real names. What emerges from their memories, though, is a strong sense of community that included both the Line and the people around it. Through unspoken understandings and city ordinances, Seward's citizens not only tolerated but actively embraced the women of the Line.

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Photograph courtesy of Carol Ann Woody

Figure1. Sockeye salmon complete their life-cycle by homing from the ocean to freshwater natal habitats where they lay their eggs in rocky nests and die soon after.

Figure 2. Left: After salmon die, nutrients released from their carcasses increase productivity at all levels of the food chain.

Photograph courtesy of U.S. Geological Survey

Unlocking the Secrets of Lake Clark Sockeye Salmon

By Carol Ann Woody

Sockeye salmon are a cornerstone species in many Alaska watersheds. Each summer, adults lay eggs in rocky nests called "redds," and they die soon after. In spring, their fry emerge from gravels and then rear in a nearby freshwater lake for one year or more before migrating as smolt to the sea. During this smolt phase, an olfactory map of their route is imprinted on their memories. Sockeye salmon spend one to four years in the ocean feeding and growing. Then, some innate cue sends them back in a mass migration to their natal lake systems, which they find using the olfactory map made years before. They complete their life cycle by spawning, then dying in habitats of their birth.

Sockeye salmon transport millions of tons of nutrients from the rich marine environment to Alaska's nutrient poor freshwaters. The annual nutrient influx links aquatic and terrestrial environments through species that feed on them such as gulls, eagles and brown bears. Nutrients from spawned-out salmon carcasses increase production at all levels of the food chain and play a crucial role in sustaining productivity of Alaska's ecosystems, including the perpetuation of future salmon runs. Salmon have been shown to play a key role in the distribution and abundance of more than 40 species of fish, birds, and mammals. Humans are among the many species relying on salmon for sustenance.

One of the world's largest and most productive sockeye salmon systems is the Kvichak River watershed *(Figure 4)*. Lake Clark National Park and Preserve is part of this watershed and was established, in part, to protect freshwater habitats important to sustained sockeye salmon production. Most of Kvichak salmon production is attributed to fish originating in Lake Iliamna, even though one study indicated up to half or more of the return may sometimes originate in Lake Clark.

Sockeye salmon originating in the Kvichak watershed have been a primary protein resource for Native Alaskans for

Photograph courtesy of U.S. Geological Survey

The outlet of Lake Clark, Kvichak watershed.

Photograph courtesy of Kent Fredriksson

Figure 3. Research indicates from 30-90% of a coastal brown bear's body can be traced to marine derived nutrients brought into freshwaters by salmon.

thousands of years and remain an integral part of their diet and culture. Salmon preservation techniques such as salting, drying and smoking fish allowed early peoples to stockpile food and survive the long winters. Today, sockeye salmon comprise up to 75% of local subsistence users' diets and are an incredibly rich food resource, high in lecithin and Omega 3 fatty acids.

Sockeye salmon have been commercially fished in Bristol Bay since 1883. This multi-million dollar ($60-$400 million) industry is the economic backbone of the region. The sockeye salmon from the Kvichak watershed are the dominant producer, although the number of fish returning is highly variable (0.23 to 55 million fish). The Kvichak return exhibited a cyclic abundance pattern of three high years in five during 1900-1930s, then a fairly predictable one to two high years in five during the mid-1930s to mid-1990s. Since 1996, returns to the Kvichak have become unpredictable and consistently lower than historical levels. Return per spawner (R/S), or the number of fish returning for each fish that spawns have also been low, indicating the breeding population is not replacing itself.

Continued declines in sockeye returns to the Kvichak watershed resulted in the region being declared an economic disaster area for multiple years. The commercial and sport fishing industries are struggling to remain economically viable. Native Alaskan subsistence users are fishing longer yet catching fewer fish; some have had to move traditional subsistence fishing sites for lack of fish. Subsistence fishers are concerned that their main protein resource will continue to decline. In addition, they will have to replace it with inferior, expensive sources just as the dominant employer, the commercial fishing industry, is in severe decline.

Ecological repercussions from the salmon decline to the Kvichak watershed are currently unquantified, but production at all levels of the food chain is likely diminished. Once comprising over 50% of the salmon caught in the multi-million dollar Bristol Bay fishery, in 2002 Kvichak sockeye salmon made up 0% of the catch. For the last three years, sockeye originating in the Kvichak watershed have continued to decline, and a minimum escapement goal (the number of fish not harvested) of two million has not been attained, although neighboring sockeye salmon systems are increasing in abundance.

Photograph courtesy of Carol Ann Woody

Figure 5. June Tracey of Nondalton puts up fish for the winter, following techniques developed by her ancestors.

Figure 4. Location of Lake Clark relative to Bristol Bay and the Kvichak drainage.

Concern for sockeye populations in the Kvichak watershed, and a lack of basic biological information, led to a cooperative research program in Lake Clark National Park and Preserve. Five primary objectives were defined with input from tribal councils, academics, federal and state managers, and local residents. The overall goal is to provide better scientific information to managers to aid in the conservation and perpetuation of sockeye salmon originating in Kvichak.

Research Objectives

Objective 1: Estimate annual abundance and monitor trends in the number of sockeye salmon returning to the

Newhalen River and Lake Clark National Park and Preserve.

Sockeye salmon migrate close to riverbanks *(Figure 6c)* where water flows are reduced due to friction; fish save energy needed for spawning by swimming near shore. This means one can estimate the number of returning sockeye salmon by counting from towers *(Figure 6a)* placed on riverbanks, 24 hours a day, 10 minutes per hour. The hourly counts are multiplied by six and summed to estimate escapement. In addition, researchers also monitor the age and size of the escapement for long-term population studies *(Figure 6b)*.

Escapements into the Kvichak have been monitored since the 1950s, while escapements to the Newhalen River and Lake Clark National Park and Preserve have been monitored sporadically since the 1980s *(Table 1)*. Researchers resumed escapement estimates into the Newhalen River in 2000. Counts from the last three years indicate Newhalen River and Lake Clark escapements are depressed but relatively stable at about 200,000 fish, compared to the Kvichak escapement, which continues to decline *(Table 1)*. This indicates sockeye salmon populations originating in Lake Iliamna are experiencing a more severe decline than Lake Clark sockeye salmon populations. Continued monitoring is essential to reveal long-term trends between the two lakes of the Kvichak watershed.

Objective 2: Examine historic salmon abundance by looking at annual layers of a marine isotope ($\delta^{15}N$) left in lake sediments from sockeye salmon carcasses.

A study of long-term changes in salmon abundance will help place the more recent trends into a larger perspective. Scientists can reconstruct long-term changes in salmon abundance, over thousands of years, from lake sediment core analysis. Every year, salmon carcasses release marine derived nutrients into their freshwater environments, forming a layer of a marine derived isotope on the lake bottom. Changes in the abundance of nitrogen isotopes as you move down the core (back in time) reflect changes in the numbers of returning fish. Lake Clark sediment cores were collected last winter *(Figure 7)* and are being analyzed to evaluate fluctuations in salmon returns relative to climate and fishing.

Objective 3: Identify and map sockeye spawning habitats in Lake Clark.

Because Lake Clark is most turbid when sockeye salmon return to spawn, historic aerial surveys were ineffective in identifying spawning habitats. The solution to identifying glacial spawning habitats proved to be radio telemetry. In 2000 and 2001, 332 sockeye salmon were captured at the outlet of Lake Clark and tagged with a small radio tag. Every ten days fish were tracked by air or boat and their movements mapped. Of the sockeye salmon tagged, 282 were successfully tracked to 35 distinct spawning habitats, of which 18 were newly identified.

Table 1: Total Kvichak River returns, commercial catch, percent harvest and escapement estimated by the Alaska Department of Fish and Game. Escapement estimates for Lake Clark are made from towers in the upper Newhalen River.

Kvichak River					Lake Clark	
Column 1 Year	Column 2 Run (millions)	Column 3 Catch (millions)	Column 4 Harvest Rate catch/run (percent)	Column 5 Kvichak escapement (millions)	Column 6 Lake Clark escapement (millions)	Column 7 Lake Clark contribution to Kvichak escapement (in percent)
1978	7.94	3.79	48%	4.15		
1979	24.63	13.41	54%	11.22		
1980	35.16	18.16	52%	17	1.5	8.80%
1981	6.98	5.23	75%	1.75	0.23	13.10%
1982	2.94	1.8	61%	1.14	0.15	13.20%
1983	20.09	16.52	82%	3.57	0.7	19.60%
1984	22.78	12.29	54%	10.49	3.09	29.50%
1985	13.33	6.12	46%	7.21		
1986	1.95	0.77	39%	1.18		
1987	9.56	3.49	37%	6.07		
1988	6.75	2.69	40%	4.06		
1989	19.83	11.51	58%	8.32		
1990	17.43	10.46	60%	6.97		
1991	8.05	3.83	48%	4.22		
1992	10.4	5.67	55%	4.73		
1993	9.26	5.24	57%	4.02		
1994	22.18	13.84	62%	8.34		
1995	27.55	17.51	64%	10.04		
1996	3.46	2.01	58%	1.45		
1997	1.68	0.18	11%	1.5		
1998	3.37	1.07	32%	2.3		
1999	12.59	3.39	27%	9.2		
2000	2.85	1.02	36%	1.83	0.17	9.30%
2001	1.42	0.32	23%	1.1	0.22	20.00%
2002	0.7	0	0%	0.7	0.2	28.60%

Photograph courtesy of U.S. Fish and Wildlife Service

Figure 6(a). Biologists count fish from towers as they migrate near shore.

Photograph courtesy of U.S. Fish and Wildlife Service

Figure 6(b). Age and size samples collected from the subsistence harvest and seine samples allow monitoring of reproductive success.

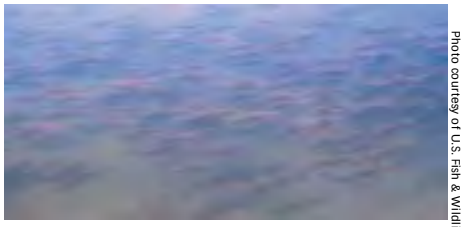

Photo courtesy of U.S. Fish & Wildlife Service

Figure 6(c). Sockeye salmon migrating close to the river bank.

Of the radio tagged fish, more spawned in glacial (~66%) compared to clear water (~34%) habitats. This was surprising because glacial water can suffocate developing embryos and therefore is not considered important habitat. However, the recent data indicates many of the glacial spawning sites are associated with clear water tributaries *(Figure 8)*. Embryos likely survive by being bathed in clear upwelling from these tributaries or some spring source. Most spawning (>50%) took place along beaches of Lake Clark and Little Lake Clark, and most tagged fish spawned in habitats associated with privately owned lands (51-76%).

Objective 4: Determine genetic population structure of Lake Clark sockeye salmon relative to Lake Iliamna and other Bristol Bay populations.

Sockeye salmon that return to a given watershed, such as the Kvichak, are not a homogenous group of fish. Because they follow an olfactory map that leads them back to the habitats of their birth (e.g. beaches, streams, rivers), through time, populations may diverge from each other in genetic traits. Scientists can detect such divergence using molecular genetic markers called microsatellites. In order to understand the genetic population structure of Lake Clark sockeye salmon, and relate it to other Bristol Bay populations, fin tissue was collected and analyzed from 1,442 sockeye salmon representing 15 spawning populations of Lake Clark and Lake Iliamna.

Photograph courtesy of U.S. Geological Survey

Figure 7. Dr. Patricia Heiser and Andrea Krumhardt, geologists from the University of Alaska, display a Lake Clark sediment core collected and hauled through a hole in the lake ice.

The study found a significant genetic break, or divergence, occurring at the outlet of Lake Clark. Salmon sampled below the outlet grouped with Lake Iliamna samples, while Lake Clark samples grouped together. A reduced number of genes were observed in most Lake Clark populations compared to Lake Iliamna, suggesting bottlenecks, or periods of low population abundance. Possible causes of these bottlenecks include reductions in effective population size associated with recent poor returns or from few fish originally colonizing Lake Clark. Further studies are now being conducted to better understand when the bottlenecks occurred.

Compared with other Bristol Bay populations, Lake Clark fish are different genetically and therefore identifiable, which is a valuable conservation aid to managers. For example, if returns to Kvichak continue to decline, managers of the mixed stock fishery in Bristol Bay may want to limit harvesting of fish originating in Kvichak. Rapid analysis of microsatellite markers will help determine when and where Lake Clark fish move through Bristol Bay. Fishing can then be regulated to allow more Kvichak fish to return to spawning grounds. More precise identification tools for lake-originating stocks will allow for more precise conservation decisions and measures.

Genetic tools are useful in distinguishing between populations; however, important genetic differences between populations are not all revealed through genetic analysis. Adaptive traits, or the suite of traits that natural selection favors in different habitats, have not yet been linked to easily analyzed

genes. This means scientists cannot detect some important differences between populations through genetic analysis. For example, fish spawning in different natal habitats often exhibit differences in important life history traits — time of spawning, age and size at spawning, number and size of eggs, etc. — though, we do not know which genes code for these traits. Genetic research in Lake Clark also focuses on identifying important adaptive differences between populations by estimating spawn timing and measuring age and size at maturity. Analysis of this component of the study will be completed this year and will complement the microsatellite analysis.

Objective 5. Establish a community-based research program.

Tribal leaders in villages near the proposed study revealed that they wanted better education and job opportunities for people in their communities. Beginning in 2000, a Fisheries Internship Program aimed at youth ages 17-20 was initiated and geared toward training, employing, and recruiting young people to the field of fisheries science. Interns from local villages receive intensive safety and job training. They assist with all aspects of the research program including escapement counts, radio tagging and tracking, genetic sampling, age and size monitoring, data entry and report preparation. Eight students have participated in the program to date.

The National Park Service has initiated a Biotechnician Training Program, which complements the USGS internship by providing a wide diversity of fisheries science course offerings. Students continue to gain valuable hands on training from the ongoing research program. Students that excel in the Biotechnician program receive preferential treatment for summer employment in the USGS Fisheries Internship Program.

Conclusions

The cooperative sockeye salmon research program in Lake Clark has provided both the National Park Service and state fishery managers with valuable scientific information with which to conserve sockeye salmon for future generations. Research to better understand factors contributing to the current decline in the Kvichak is ongoing. Rebuilding of the Kvichak watershed sockeye salmon populations and conservation of their genetic diversity will help ensure population productivity, resiliency and perpetuation into the future.

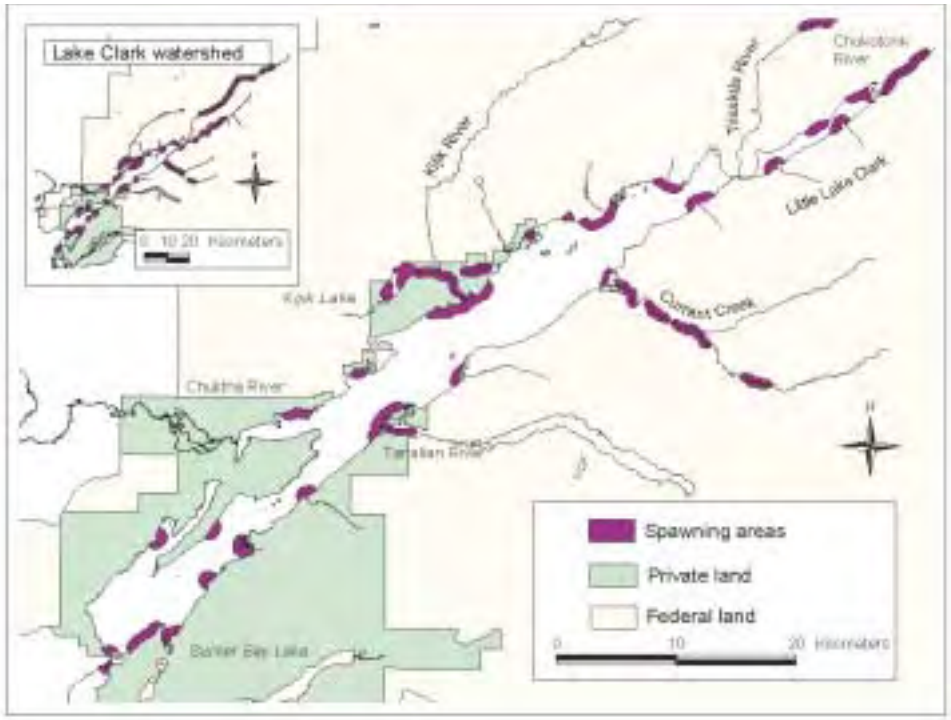

Figure 8. Sockeye salmon spawning habitats identified through radio telemetry and visual observation. Habitats are depicted relative to land ownership in Lake Clark, 2000 and 2001.

Acknowledgments

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Pioneer Arctic Archeologist J. Louis Giddings

Courtesy of Haffenreffer Museum of Anthropology (49-19)

The Nakarak family washing artifacts on the beach at Iyatayet, Norton Bay. Photograph by J.L. Giddings.

Left: J. Louis Giddings and Almond Downey at the Battle Rock site, Cape Krusenstern. Photograph by Douglas Anderson.

Courtesy of Haffenreffer Museum of Anthropology (61-DA-149)

By Becky Saleeby

J. Louis Giddings dedicated his professional life to understanding the people and the prehistory of Northwest Alaska. During almost three decades of prolific scientific fieldwork (1936-1964), he made discoveries that greatly changed prevailing views on the antiquity and complexity of Arctic cultures. As a result of his work, notably on the Kobuk River, Norton Bay, the Choris Peninsula, and Cape Krusenstern, he authored several books and a long list of journal papers about these cultures. His legacy is far greater than the sum of these scientific studies, however, and is nowhere more evident than in the vast expanse of Cape Krusenstern National Monument, designated in 1978 primarily to protect and interpret its incredible archeological resources. It was there some 20 years earlier that Giddings, with the assistance of his Iñupiaq boatman, Almond Downey, discovered a long sequence of ancient beach ridges. Preserved on the ridges was evidence of Arctic prehistory from about 6,000 years ago up through recent times.

National recognition of the scientific significance of the area first came in 1973, when the Cape Krusenstern archeological district, composed of hundreds of sites on 114 beach ridges, was designated as a National Historic Landmark. Two other sites Giddings excavated, the Iyatayet site on Norton Bay and the Onion Portage site on the Kobuk River, were also designated National Historic Landmarks. Beyond Giddings' contributions on the national scale are those on a more personal level. The bonds of cooperation and mutual respect he forged with his Iñupiat crew and friends are still remembered today by elders—Almond and Ruth Downey, Nelson Greist and Wilson Tickett. In his book, *Ancient Men of the Arctic*, he credits their knowledge of the land and its people as essential to his success throughout his years of Alaskan fieldwork.

Born in Caldwell, Texas in 1909, Giddings heeded the call to the northland early in life. He completed his undergraduate degree at the University of Alaska Fairbanks (UAF) in 1932 and ventured farther north in 1934 to spend a winter in Kotzebue, which would later be the staging point for many of his expeditions. Although his graduate education and later teaching positions took him away from Alaska, his research interests always brought him back to the far north.

One of his early scientific interests was in the field of dendrochronology — the dating of wood samples based on growth rings. The variations in the tree rings occur in a living tree as a response to local environmental conditions as the tree grows. Giddings' work with tree rings initially pertained to the study of past climates; however, archeology also benefitted from the cross-dating of logs or wood samples. When a tree is newly cut, its rings can be dated to a modern calendar. This information can then be correlated to similar patterns of rings in wood, long dead, found within prehistoric sites. Giddings learned these techniques from the father of dendrochronology, A. E. Douglass, at the University of Arizona and successfully applied them in the Arctic.

In order to have adequate comparative material for his studies, Giddings began collecting wood samples from placer gold operations around Fairbanks in 1936 and continued this research when he returned to UAF to teach in 1938. At that time, prior to the application of radiocarbon dating, it was difficult to accurately date artifacts collected from sites. Radiocarbon dating, based on the half-life of carbon from

His map of the region showed a blank space of some 50 miles between the Koyukuk and his destination on the Kobuk. Setting off with a 40-pound pack, a compass, and a rifle to shoot birds and small game for food, he proceeded on foot across the uncharted territory. Six days later he arrived on the gravelly bank of the Kobuk, and with great ingenuity, considering he had no axe or hatchet, constructed a makeshift raft to float the river.

organic materials preserved within sites, did not become the standard means of archeological dating until the 1950s. In the 1930s, Giddings' research must have appeared "state of the art" to his colleagues at the university, so it is not surprising that in 1939 UAF anthropology professor Froelich Rainey invited Giddings to participate in an archeological project at Point Hope. Until then, St. Lawrence Island, with artifacts similar to those from Siberia, had been the focus of much of the archeology in northern Alaska. Giddings was introduced to field archeology that summer, and the experience proved to be a turning point in his career.

It was during the 1939 field season that Giddings, Rainey, and Danish archeologist Helge Larsen discovered the enigmatic Ipiutak culture. In Giddings' words, "The discovery of the original Ipiutak site at Point Hope, one hundred miles northwest of the Cape Krusenstern beaches, will always seem more dramatic to me than the opening of Tut-ankh-amen's tomb." *(Giddings 1977:102)*. After working late at the nearby Jabbertown site, the site first appeared to them in the low, red, midnight sun, as a series of shallow, rectangular depressions on low beach ridges south of Ipiutak Lagoon *(Giddings 1977: 113)*. Some 575 depressions, identified as semi-subterranean house pits, were eventually mapped, making it one of the largest known prehistoric settlements in the Alaska Arctic. Flourishing in northwestern Alaska around the beginning of the Christian era, the Ipiutak culture was vastly different in artifact types from previously known Arctic cultures and striking because of its elaborate burial goods. The following summer Larsen and Rainey continued their work at the Ipiutak site (which became a National Historic Landmark in 1961), while Giddings turned his attention toward the Kobuk River.

Today a trip from Anchorage to one of the Kobuk River villages is a few hours flight by jet to Kotzebue and then a brief trip by small plane to Kiana, Shungnak, or Ambler. Giddings' first trip to the Kobuk area in 1940, in contrast, took many days of slogging over the tundra and a great deal more stamina. His journey began with a flight to Allakaket, a village on the Koyukuk River. His map of the region showed a blank space of some 50 miles between the Koyukuk and his destination on the Kobuk. Setting off with a 40-pound pack, a compass, and a rifle to shoot birds and small game for food, he proceeded on foot across the uncharted territory *(Giddings 1977: 294)*. Six days later he arrived on the gravelly bank of the Kobuk, and with great ingenuity, considering he had no axe or hatchet, constructed a makeshift raft to float the river.

His first encounter with civilization came at fish camp of people from Shungnak. Mrs. Daisy Tickett was a young girl when Louis Giddings appeared at the camp of her parents, Susie and Henry Stocking, in 1940. In a taped interview with NPS personnel, Mrs. Tickett remembers that day over 60 years ago.

The arrival of Mr. Giddings..., I always thought it may have been July or August, but he arrived at the time we were in summer camp...His raft was remarkable in that it was very short and small and seems like it was constructed to sit on it by placing several pieces of wood. It was in the afternoon when we see a stranger in view on a raft. The stranger stopped in front of us and got off. So that was Louis Giddings who arrived. (Ramoth and Ridington 2001)

The people of the Kobuk River were of particular interest to Giddings because they, as Iñupiaq-speaking Eskimos, occupied a forested environment usually associated with the Interior Athapaskan people. He believed that studying their prehistoric sites might shed light on possible inland origins for the Ipiutak culture *(Giddings 1977: 292)*.

The first year on the Kobuk, Giddings collected wood samples, recorded ethnographic accounts, and conducted limited site excavation. He returned the following year with a graduate student and hired eight local men from Shungnak and Kiana to excavate the house pits at several sites, including Onion Portage. The great age and significance of Onion Portage, however, would not be known until he returned to the site two decades later.

One man on his crew was a young Nelson Greist, now a patriarch in the Kobuk River village of Ambler, who recalls the early days.

He saw how raw I was. Louie let a young man interpret and told me that I would not be excavating but I was to start from the bottom, doing dishes and watch the tents, equipment etc. and I would be with him, that was in 1940...When we met again the next summer his impression of me changed quite a bit. He already put on the top of the list. Yeah my friend Louie was a very good man. When I start to be with him he take time to teach me how to excavate, very much like on the job training and I got to the point of teaching other workers that did know how, when he was satisfied that I can do it. (Ramoth and Ridington 2001)

Giddings returned in 1942 to traverse almost the entire Kobuk River on snowshoes with a dog team for the U.S. Army Engineers. After a four-year stint in the military during World War II, he returned to the Kobuk in 1947 and eventually published the results of his fieldwork in two books. In *The Arctic Woodland Culture of the Kobuk River* (1952), he describes the results of archeological fieldwork, highlighting similarities of artifacts between the inland Iñupiat of the Kobuk and their Athapaskan neighbors, the Koyukon; while *Kobuk River People* (1961) is an ethnographic account.

Always searching for more evidence to answer his questions about the origins of the Eskimo cultures in Alaska, Giddings conducted fieldwork in Norton Bay during the summers of 1948 through 1952. Along the edge of a small bay near Iyatayet Creek, Giddings and his crew discovered a site that had three separate periods of human occupation. At the bottom they found a new culture, the Denbigh Flint complex. Giddings recognized the small, beautifully chipped stone tools as ancestral to later expressions of Eskimo culture in Alaska. His discovery of the Norton culture, the middle layer, at Iyatayet was also significant as it marked the first appearance of pottery and large permanent winter villages in the Arctic. The upper level, named Nukleet, was dated to the last millennium.

The date of the Denbigh Flint complex was not known until his final trip to Iyayet in 1952, when he collected radiocarbon samples from the site and dated the bottom layers at approximately 5,000 years before present *(Giddings 1964: 248)*. Giddings' discovery did not only represent a local culture, but was later recognized as a variation of the Arctic Small Tool tradition, a prehistoric way of life found along the entire coastline of North America from the Bering Sea to the northernmost tip of Greenland *(Dumond 1987)*.

Meanwhile, Giddings was carving out a niche for himself on the academic front in the 1950s. After receiving his Ph.D. from the University of Pennsylvania in 1951, he moved on to Brown University in Providence, Rhode Island, where he was appointed professor of anthropology as well as director of the Haffenreffer Museum of Anthropology in 1956. Those

Courtesy of Haffenreffer Museum of Anthropology (64-238)

Excavation crew at Onion Portage in 1964. Photograph by J.L. Giddings.

National Park Service photograph

Nelson Greist, Ambler, Alaska.

National Park Service photograph

Wilson Tickett, Shungnak, Alaska.

National Park Service photograph

Ruth and Almond Downey, Kotzebue, Alaska.

duties did not prevent him from returning to Kotzebue during that summer. There, he hired Almond Downey, a resident of Noatak, to be his boatman, and the crew set off for the Buckland River. En route they were waylaid by gale-force winds, and they were forced to stop on the Choris Peninsula. This event proved fortuitous because it led Giddings to the discovery of large oval-shaped house pits on one of the many narrow beach ridges. After testing, he attributed the house pits to the Choris culture, intermediate in terms of artifact and house types to the Denbigh and Norton cultures *(Giddings 1977: 201)*.

Downey became an essential member of the summer crew for the next several years, and in 1958 he guided Giddings to Sealing Point on Cape Krusenstern. Under the frozen sod covering old beach terraces, they found a horizontal succession of cultures — Birnirk, Western Thule, Ipiutak, Old Whaling, Denbigh — with the most recent at the modern shoreline and the most ancient, some 3 miles (4.8 km) inland. Ancient people abandoned each successive beach ridge as changing ocean conditions caused a new beach ridge to be formed in front of it. Eventually, Almond's wife, Ruth, and their young children joined the crew, along with Giddings' student, Douglas Anderson, and Giddings' own family.

Almond and Ruth Downey, who now live in Kotzebue, were interviewed about their fieldwork with Giddings. Ruth Downey recalls:

When the ice break we come down from Noatak. Then maybe in June 10 or 12. 10, 11, 12 Giddings come. Later on we went to Sealing Point, and there were bunch of us there. There was some young men that follow us like Murphy, brother of Almond, Bobby Lee and Julian Tauqsaiq to stay with us...they would be gone all day looking for old things and me and the kids would be home all day too. We stay over there for all summer, June, July and August. (Ramoth and Ridington 2001)

In 1964, his last year of fieldwork and the last year of his life, Giddings returned to Onion Portage on the Kobuk River for a large-scale excavation. Three years earlier, during a break from work on the coast, he had discovered that the site was well stratified, with layers of human occupation evident beneath the upper house pits. He hoped that Onion Portage would provide a vertical succession of Arctic cultures, in the way that the Cape Krusenstern beaches had provided a horizontal one.

The site, along with the field camp where the excavators lived, was a bustling place in 1964. It included the entire Giddings family (wife Bets and three children), Almond Downey and his family, graduate students, and a local excavation crew. Wilson Tickett of Shungnak remembers that summer:

When he was here for the last time that summer, that's when I work for him...I can't recall how many feet deep we excavated, I found out that each level of dirt do tell the tale of when people live there. Some are a foot or more apart that indicate the time when people lived there. It is very interesting to know that generations can be determined

this way...One time he said it indicated that people lived here before Christ, by carbon dating the burned pieces of wood from fire here at Onion Portage. (Ramoth and Ridington 2001)

Also joining in the excitement that summer of 1964 was Giddings' old friend, Nelson Greist, who was hired to build a cabin on the bluff, with a commanding view of the Kobuk River, above the Onion Portage site, for the Giddings family.

When Louie found out I was here (Ambler) he come up from Onion Portage to see me. He told me and made plans to have a log cabin built there and I am to build it for him...I complete the cabin in one month. After the cabin was done he ask for cache. I hustle for material to build it...he told me he will retire pretty soon. We had become good friends. According to what he says we would live here in the same place when he retires. (Ramoth and Ridington 2001)

In December of 1964, Louis Giddings died unexpectedly while recuperating in the hospital after an automobile accident. His mentorship of so many, however, allowed the fieldwork at Onion Portage to continue. Douglas Anderson, Giddings' assistant, and his crews were eventually able to identify eight different cultures at the site, ranging from the Akmak complex (over 8,500 years old) through the Arctic Woodland Eskimo culture (A.D. 1000-1700), thus fulfilling Giddings' vision of the unique scientific potential of Onion Portage. Like his mentor, Anderson depended on the expertise of the local people for his excavation crews, crediting Tommy Lee, Nelson Greist, Shield Downey, Arthur Douglas, Arthur Gray, Shield Downey, Jr., Willie Goodwin, Oscar Greist, Don Williams and John Blower with providing much of the on-site archeological interpretations (Anderson 1988).

Two of Giddings' books were published posthumously: *Ancient Men of the Arctic*, a wonderful narrative filled with stories about fieldwork and archeological theories of the day, was published in 1967 (reprinted in 1977); and *Beach Ridge Archeology of Cape Krusenstern*, co-authored by Douglas Anderson, in 1986. Perhaps even more important is Giddings' spirit of scientific inquiry and dedication, which lives on today through the work of his team of archeologists, their students, and students' students, still actively involved in Arctic research. The legacy of Giddings' work on Cape Krusenstern and the Kobuk River has been handed down to numerous National Park Service archeologists. His other legacy — the spirit of cooperation he shared with his Iñupiat fieldworkers and friends — is one that all Alaskan archeologists would be wise to emulate. Only through such partnerships can we hope to achieve a lasting sense of stewardship for the sites so important in understanding the history and prehistory of our state.

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NPS Fire Management Creates Unique Partnership

NPS Fire and Aviation at the National Interagency Fire Center collects, compiles, posts online (http://www.nps.gov/fire), and publishes a booklet, *People, Parks and Fire...Better Together* on success stories of the National Fire Plan. This year the Alaska submission highlighted the uniqueness of Alaska: which resides in its sub-arctic and arctic ecosystems, expansive geography and cultural history. The Alaska Interagency Wildland Fire Management Plan was born from these unique factors. In the late 1970s, land and fire management professionals realized that not all fires could be put out because of Alaska's immense size as well as the cost. In some cases, the effort to extinguish the fire was more harmful to the environment than the fire itself.

Objectives of the wildland fire plan were to: 1) protect human life and specific resources and 2) allow fire to fulfill its natural ecological role. Along with these objectives, the interagency fire plan demanded constant communication and long-term partnerships between six agencies. The Alaska Bureau of Land Management—Alaska Fire Service, US Forest Service, and State of Alaska Division of Forestry work together as the three "fire suppression" agencies. Personnel from U.S. Fish and Wildlife Service, Bureau of Indian Affairs and the National Park Service are called upon when needed to assist in fire suppression. The National Park Service also sets fire suppression priorities for the suppression agencies and conducts hazard fuel mitigation, prescribed burns, fire prevention, and education.

Fire at Taylor's Cabin on the Yukon River

In 2001 NPS Eastern Area Fire Management reflected the interagency ideals of partnerships through effective communication and forged a new partnership with NPS Cultural Resources. The partnership was formed to protect Alaska's cultural resources from wildland fire by giving the suppression agencies fire suppression priorities for cultural resources. **Visit http://www.nps.gov/fire/success/2002/akro.htm** to read the complete story and view a map and photos.

Photograph courtesy of Karen Ward

There are an estimated 60 wolves that spend at least some of their time within the boundaries of Yukon-Charley Rivers National Preserve.

Wolves On-Line

The recently published 2002 study titled: *Ecology and Demography of Wolves in Yukon-Charley Rivers National Preserve, Alaska* by John Burch is available online. The study provides a synopsis of research and work on the wolves of Yukon-Charley (YUCH) over the last decade.

In 1994 the Fortymile Planning Team was formed and plans for wolf reductions in conjunction with curtailed harvest by humans of Fortymile caribou were made.

During the winters of 1995-96 and 1996-97 a privately funded wolf trapping effort was initiated. This private wolf trapping incentive program paid $400 for the hide of any wolf trapped within a specified area. At the time, local fur buyers were paying an average of about $200 for wolf hides. Most of these trapped wolves were outside of the calving range, but included packs within some of the Fortymile Caribou Herd's (FCH) summer and winter ranges.

From November 1997 through April 2001, 15 packs were reduced to sterilized pairs by Alaska Department of Fish and Game and maintained that way for five years. In the five year period, 41 wolves were sterilized and 120 were relocated; however, no wolves living primarily within the preserve boundaries were sterilized or relocated. The wolf reduction effort effectively reduced the wolf population by 80% throughout much of the calving grounds of the FCH. Five packs of wolves were excluded from the sterilization and relocation program because the Planning Team decided that they lived primarily within the preserve. Ten to 12 packs of wolves have some or most of their home range within Yukon-Charley, but only the five packs inhabiting the Charley River drainage had the potential to have been sterilized and relocated. Members of those five packs were not sterilized or relocated no matter where or how far they ranged outside the preserve boundary.

The FCH has long been a subject of interest to biologists. In 1920 biologist Olaus Murie estimated the herd to number 568,000 caribou, ranging from Whitehorse, Yukon Territory to the White Mountains north of Fairbanks. In the 1930s, the population dropped to an estimated 10,000 to 20,000 caribou. The cause of that dramatic decline is unknown, but suspicions include overharvest and food limitations due to range depletion and fires.

During the 1940s and 1950s the herd increased again to perhaps as many as 60,000. From an estimated 50,000 animals in 1963, the herd size dropped dramatically to 6500 animals in 1973 and stopped crossing the Steese Highway. The cause of this decline was attributed to a combination of overharvest by people, bad weather conditions and heavy predation by wolves and bears. Starting in 1976 the herd began to increase slowly to over 22,000 by 1990 and were roughly stable at 22,000-23,000 through 1995. Following the Fortymile Planning Team's 1994 plan of reduced wolf population and harvest by humans, from 1995 through 2001 the herd grew to nearly 40,000 animals.

The study can be found at the following **site: http://www.nps.gov/yuch/Expanded/key_resources/2002_wolf_report/2002wolfreport.htm .**

Photograph courtesy of Kenman Ward

Although rarely seen, these beautiful animals range throughout Yukon-Charley Rivers National Preserve and are a part of a large, continuous wolf population that range throughout most of Alaska and Canada.

Alaska connection to New Bedford Whaling National Historical Park in Massachusetts

Herman Melville enthusiasts dropped anchor in New Bedford, Massachusetts on January, 2003 to recite the novel *Moby Dick* in the 7th Annual *Moby Dick* Marathon. The marathon has been held annually since its creation in 1997, commemorating New Bedford's most famous former resident, Herman Melville, who wrote the classic in 1851. People of all walks of life, professions, and languages participated in the 25 hour event. Not everyone is merely an enthusiast, or classics fan — Melville's great grandson has attended every reading since its onset. The marathon reading is the brainchild of Irwin Marks, a volunteer octogenarian of New Bedford.

The 2003 reading was in English, Iñupiaq, Portuguese, German, Japanese, and Danish. The novel has been translated and printed into all the languages represented at the reading this year with the exception of Iñupiaq. After a partnership was formed in 1999 between the Alaska Regional Office and the New Bedford park, Herbert Anungazuk, a cultural anthropologist for the Alaska Regional Office, was tasked with translating sections of the novel into Iñupiaq, in order to have an Alaska Native language represented at future marathons. The translation was hampered by the fact that Melville's English and the English of today are so dissimilar. Translating into Iñupiaq became even more difficult. Finally, after realizing that *Moby Dick* is about whaling and that Iñupiaq whaling is whaling in truth form, Anungazuk was able to paste Iñupiaq ways over the ways of Melville. At this year's marathon, Anungazuk read from the final pages of chapter 48, The First Lowering, since the launching of a boat in chase of a whale is always a period of high expectation for the Iñupiaq people.

National Park Service photograph

Herbert Anungazuk reading his Iñupiaq translation.

Whaling is an activity that interests man, woman, and child alike, especially in northern latitudes because of the continuance of indigenous whaling. It is an activity that is indelibly etched into a whole community. When the time to whale comes, those who are masters of the hunt do so with quietude and respect. They honor the mammal that is seen as the ultimate of species, which provides for their community's sustenance. *Whale, whale; an amulet or an icon, not of worship, but of respect. Whale, whale; ancient stories, ancient beliefs.* To sight a whale is a stunning experience, and it must have been just as much so for Captain Roys whose expressed purpose in his whaling endeavors was monetary gain.

In July 1848, Captain Thomas Roys of the whaling bark Superior, located a new whaling field for New Bedford ships in the Bering Strait, Chukchi Sea, and Arctic Ocean. Numerous ships sailed from New Bedford to these new areas, often hiring local men as guides, general help, or for other positions aboard the whaling ships. At the completion of the whaling season in the fall, the weather did not allow some men to return home. Many men, including Anungazuk's namesake, told stories of far away places — San Francisco, Honolulu, or other ports-of-call.

Anungazuk was interested in learning about ancestors who may have been aboard whaling vessels during the time that whaling was actively pursued in northern seas. The logs of whaling ships may contain information formerly unknown to the descendants of men who accompanied the whaling vessels. The book, *Whales, Ice, and Men,* by John R. Bockstoce contributed to this effort since it describes the history of the ships that plied northern waters in quest of whales. The Kendall Institute Library in New Bedford has immense volumes of information about whaling history. It even has sailing logs of ships that may have dropped anchor in Wales, Anungazuk's community.

"So", "So"! The excitement arose quickly as one of the crewmen announces a whale sighting. "So"! Again, yet almost a whisper. All of the crewmen moved quickly and quietly near their assigned locations so that an orderly launching of the omiak can be done. They are not tense, but they anticipate a successful harvest because they have gone through the proper rituals, the proper ceremony until what must be done is

Whaling is an activity interests man, woman, and child alike, especially in northern latitudes because of the continuance of indigenous whaling. It is an activity that is indelibly etched into a whole community. When the time to whale comes, those who are masters of the hunt do so with quietude and respect.

Photograph courtesy of University of Alaska Fairbanks, Samuel Call Collection, #A66-10

Two commercial whalers at Barrow, Alaska, late 19th century.

National Park Service photographs

ingrained in them. What must be done and followed is orderly because the way it must be done has been shown, generation for generation. The thought has always remained that from the ancient generation to the new, the youngest crew member may one day lead the hunt.

Portraits of a Port

The Portraits of Ports interactive website is a distance learning endeavor developed by the New Bedford Whaling Museum and the Artfx Group (a website design company in Ottawa, Canada). It is designed to provide a rich environment in which to explore the stories, voices, and objects pertaining to American whaling. The site represents the stories of whaling worldwide: it places the historical sites of whaling in a current context through artifacts, museums, objects and places. The Affiliated Areas of the National Park Service's Alaska Region worked on this project in conjunction with the Iñupiat Heritage Center in Barrow, Alaska. The site includes three sections: conservation and collections data describing the museum's archival, book, and object collections; interpretive and on-line resources about whaling; and interpretive products specific to the collections — oral histories and education program materials. Visit the site at: **http://www.artfxgroup.com/nbwm/flashmain.html .**

Photograph courtesy of John Robson © 2002

Iñupiaq whalers on the pack ice with their umiak (skin boat).

Very few people will ever be able to visit all 39 of America's volcano-related parks and monuments, but this book is an excellent source of ideas and inspiration for exploring more of them.

New Book On Volcanoes Available

After distinguished academic and government careers, Bob and Barbara Decker have established productive second careers as authors of popular guide books to America's national parks. They have managed to travel extensively for research on books yet to be published. The Deckers have identified 39 volcano-related national parks and national monuments in the United States, and offer *Volcanoes in America's National Parks* to introduce readers to most of them.

This attractive, soft-cover book (ISBN 9622176771) begins with a concise 48-page introduction to modern volcanology, with lucid explanations of eruptive processes,

National Park Service photograph

An aerial view of Aniakchak Caldera, Alaska Peninsula.

volcanic features, and why volcanoes form where they do. The descriptions of individual parks that follow are brief, but they give essential information about the geologic and human history of each park, with explanations of how individual volcanic features of scenic interest formed. The park descriptions are organized into three sections: parks with active volcanoes, parks with dormant volcanoes, and parks built on or around extinct volcanoes or their roots. The parks and monuments described include not only those that are well-known, such as Mount St. Helens, Hawaii Volcanoes, and Yellowstone, but also lesser-visited parks in Oregon and New Mexico, as well as four remote but beautiful parks in Alaska: Aniakchak, Katmai, Lake Clark, and Wrangell-St. Elias.

Geologists will enjoy the "Volcano Facts" summaries for each park, which provide typical rock types and dates for the latest eruptive activity. An up-to-date reading about each park is given, as well as valuable government web sites at which visitor information is available for most parks. Very few people will ever be able to visit all 39 of America's volcano-related parks and monuments, but this book is an excellent source of ideas and inspiration for exploring more of them. Reviewer: John P. Lockwood, Geohazards Consultants International.

National Park Service photograph

Katmai National Park

National Park Service photograph

Major volcanic eruptions at Katmai National Park have deposited ash throughout the area.

Robert Winfree

"Sandy (his wife) and I are very excited about the move to Anchorage. We've lived throughout the Lower 48 states and have worked and traveled internationally. Our visit to Alaska last year made it clear to us that Alaska would be in our future, and this is exactly the opportunity that we were hoping for."

New Science Advisor for the National Park Service in Alaska

Robert Winfree is the new Alaska Region Science Advisor for the National Park Service. Bob has a Ph.D. in Wildlife and Fisheries Science and managed research laboratories for the U.S. Fish and Wildlife Service and the National Biological Survey before joining the National Park Service in 1995. At Grand Canyon National Park, he provided leadership and oversight for a multi-disciplinary research program of nearly 100 research studies a year. Bob also recently completed the federal Executive Potential Program through the U.S. Department of Agriculture Graduate School. Regional Director Rob Arnberger said, "His experience, broad operational knowledge of the NPS programs and mission, and extensive network of contacts, will be significant assets in the position."

Winfree noted that "Sandy (his wife) and I are very excited about the move to Anchorage. We've lived throughout the Lower 48 states and have worked and traveled internationally. Our visit to Alaska last year made it clear to us that Alaska would be in our future, and this is exactly the opportunity that we were hoping for. There will be a lot to see, discuss, and absorb in the coming months. We look forward to many great experiences here."

Ecoregions Map Available

A great gift idea for anyone intrigued with Alaska's vast landscapes: a new map has been published that for the first time brings together a wide variety of up-to-date environmental data about Alaska and neighboring portions of Canada and Russia. The "Ecoregions of Alaska" map shows major ecosystems based on climate and terrain, with details about vegetation, rivers, glaciers and natural wildfires.

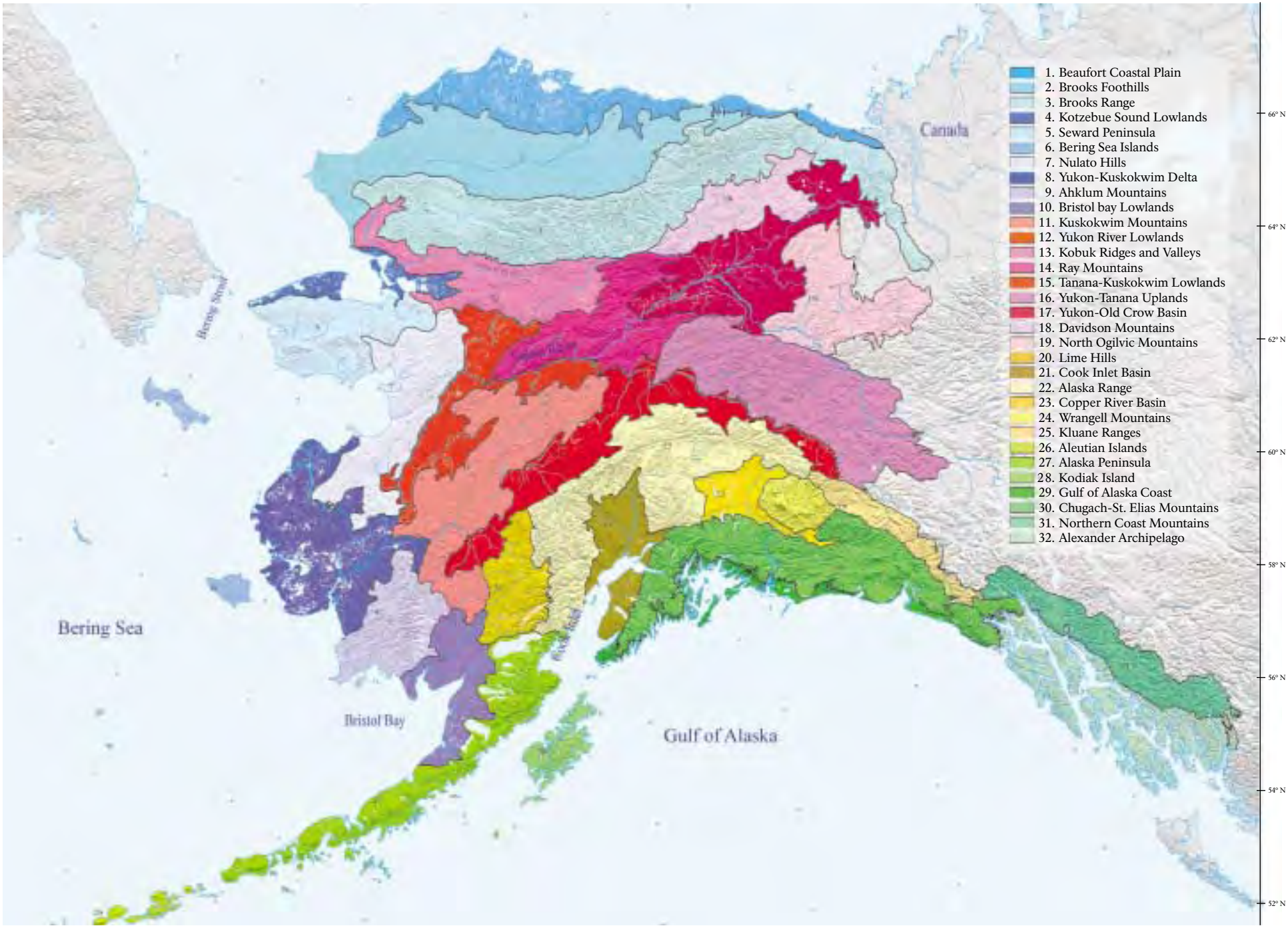
The mapping effort, led by National Park Service ecologist Page Spencer and U.S. Forest Service ecologist Gregory Nowacki, brought together scientists and existing data from several land managing and science agencies. Earlier maps tended to use data gathered by one or two agencies and have become outdated as more detailed information became available from satellites and computer mapping. The latest result is a 36-by-54 inch, full-color map showing 32 ecoregions, descriptive text and photographs for each of the ecoregions on the front, and comprehensive tables and charts of vegetation, geology and climate on the back.

"It shows the incredible variety in Alaska and what makes these areas unique," Spencer said. "When you look at Alaska on this map, you see that we really have the ecological spread of a whole continent. For people who like to explore, you can also map the places you've been to, and the places you want to visit next...It also provides a common language and spatial framework across agencies and political boundaries," she said.

The map will be useful in scientific and management applications, as well. "When we're designing inventory and monitoring projects, or looking at where phenomena such as the spread of spruce bark beetle, or the habitat for a goose population, this synthesis of information is very valuable," Spencer explained.

The map is available for $7.00 from the U.S. Geological Survey's Earth Science Information Center in Anchorage. Visit their website at **http://mapping.usgs.gov/esic/esic_index.html for ordering information.**

The "Ecoregions of Alaska" map is available for $7.00 from the U.S. Geological Survey's Earth Science Information Center. Part of the map is shown here. Earlier maps tended to use data gathered by one or two agencies and have become outdated as more detailed information became available from satellites and computer mapping.


1. Beaufort Coastal Plain
2. Brooks Foothills
3. Brooks Range
4. Kotzebue Sound Lowlands
5. Seward Peninsula
6. Bering Sea Islands
7. Nulato Hills
8. Yukon-Kuskokwim Delta
9. Ahklum Mountains
10. Bristol bay Lowlands
11. Kuskokwim Mountains
12. Yukon River Lowlands
13. Kobuk Ridges and Valleys
14. Ray Mountains
15. Tanana-Kuskokwim Lowlands
16. Yukon-Tanana Uplands
17. Yukon-Old Crow Basin
18. Davidson Mountains
19. North Ogilvic Mountains
20. Lime Hills
21. Cook Inlet Basin
22. Alaska Range
23. Copper River Basin
24. Wrangell Mountains
25. Kluane Ranges
26. Aleutian Islands
27. Alaska Peninsula
28. Kodiak Island
29. Gulf of Alaska Coast
30. Chugach-St. Elias Mountains
31. Northern Coast Mountains
32. Alexander Archipelago
Canada
Bering Sea
Bristol Bay
Gulf of Alaska
66° N
64° N
62° N
60° N
58° N
56° N
54° N
52° N

Alaska Park Science

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Photograph courtesy of U.S. Geological Survey

National Park Service photograph

Kristy Balluta and Janell Kukaruk, USGS Fisheries Interns, select a sockeye salmon to radiotag.

Top-Right: Dan Young, a biologist with the National Park Service, holds up a beach spawning fish from Kijik Lake in the Lake Clark watershed. Beach spawning fish tend to be older, longer, and deeper bodied compared to fish spawning in nearby shallow streams.