



# Development of Campsite Monitoring Protocols in Kenai Fjords National Park

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## The coastal campsite experience

A night on the coast; it comes with spectacular waterfront views, peace and quiet, and fresh air. Camping on the Kenai Fjords National Park (NP) coast is an amazing experience that draws hundreds of visitors to the park each summer.

Although the park is comprised of over 500 miles of spectacular coastline, most of the coast is characterized by steep, rocky headlands, cliffs, and boulder beaches that are virtually inaccessible to boaters and campers. As a result, opportunities for camping are limited to only about 80 sheltered sand/gravel beaches scattered along the length of the park from Nuka Bay in the southwest to Resurrection Bay in the northeast (*Figure 2*). About half of these potential campsites are located in the more remote southern end of the park, the outer coast, and Nuka Bay, and consequently receive very little overnight use. As a result, nearly all backcountry camping is concentrated at about 40 beaches located in Aialik Bay and Northwestern Lagoon. These same areas also contain sensitive cultural, archeological, and natural resources, including

**Figure 1. Kayaks on the beach at Kenai Fjords National Park, where kayaking is one of the primary modes of transportation for visitors traveling between campsites.**

NPS photograph

**Figure 2. Map of landing beaches surveyed during a 2007 rapid assessment. Visitor (campsite) impacts are concentrated in Northwestern Fjord and Aialik Bay. Rapid assessment results are used to inform multiple management concerns, from campsite impacts to invasive species and marine debris accumulations.**

salmon spawning streams, ground-nesting marine birds, coastal sedge meadows and, bald eagle nests.

## Management need

Kenai Fjords has a history of periodic campsite surveys that dates to at least 1988 (*Tetreau 2004*). This work revealed impacts to park resources such as fire rings, charred wood, cut stumps, root exposure, vegetation trampling, trash, human waste, soil erosion, campsite proliferation, increased human-wildlife interactions, and social trails. Trends of increasing resource impacts raised concerns of altered ecologic condition, impacts to visitors' wilderness experience, and for visitor safety (*Figure 3*). From 1988 to 2004 various monitoring methods were used to document conditions, and a review highlighted the need to improve the consistency, accuracy, and efficiency of field assessment and data analysis (*Tetreau 2004, Monz et al. 2006*).

Former Kenai Fjords NP ecologist Meg Hahr turned the recommendations of *Tetreau (2004)* and *Monz et al. (2006)* into a collaborative effort that integrates science, mapping technologies, management, and visitor perspectives to inform and provide adaptive recommendations to park managers. Needed management information included details about condition of landing beaches, trends in visitor (camping) impacts at known campsites, size and number of tent sites, use and condition of bear-resistant food storage lockers, and other visitor impacts. Since the park does not require permits for camping or most other forms of visitor use, managers needed a clear understanding of changes in the spatial distribution of preferred camping locations in a landscape where tidewater glaciers can retreat at rates approaching 246 feet

(75 m) per year (*Giffen et al. 2009*), vegetation succession is equally as rapid, and shoreline or beach morphology changes are poorly understood due to the interaction of tectonic forces with sea level rise (*Pendleton et al. 2006*).

In 2007, Hahr led a rapid assessment of campsite impacts at 55 landing beaches between Nuka and Aialik Bays (*Figure 2*). From 2008 to 2010, Dr. Christopher Monz, a recreation ecologist from Utah State University, spent several weeks in the park testing, refining, and implementing campsite monitoring protocols. During this same time NPS Alaska Regional Office Geographic Information System (GIS) staff were enlisted to develop Geographic Positioning System (GPS) data collection tools, protocols, and databases for managing the collected data in a streamlined manner (*Figure 4*). Park staff involvement included resource, visitor and resource protection specialists to ensure diverse management perspectives.

## Science

Backcountry camping has the potential to affect resource conditions both intensively at the on-site scale and extensively due to site expansion and proliferation (*Leung and Marion 1999, Cole 2004*). Campsites are important from a managerial and visitor perspective as they serve as destinations and focal points for visitor activities, thereby creating areas of concentrated use. Although numerous studies of campsites in parks and protected areas have examined the degree to which visitor use can affect change on site conditions (*e.g., Frissell 1978, Cole 1983, Marion 1995*), studies examining change over long periods are few (*e.g., Cole et al. 2008, Twardock et al. 2010*).

Campsite assessment methodologies have a long



**Figure 3.** Campsites, such as these at Pedersen Lagoon, include impacts from tents, trails, cooking areas, as well as beach activities.

history of use in parks and protected areas, dating back to the work of Sumner (1942) and Frissell and Duncan (1965), to the more recent contributions of Cole (1989), Marion (1995) and Newman et al. (2006). While campsite studies are commonplace in the lower 48 states, relatively little work has been accomplished in Alaska environments with the exception of long-term studies conducted in Prince William Sound (Twardock et al. 2010, Monz and Twardock 2010). Lake Clark National Park and Preserve has maintained backcountry campsite inventories as early as the 1980s, but protocols and quantitative measurements have not been standardized.

Based on reviews of the historical campsite work in Kenai Fjords NP and consultation with park staff, the development of new assessment protocols was initiated with four overall goals. First, the protocols needed to be more clear in definition of terms and descriptions of ratings-based procedures. Second, campsites needed established reference points that could easily be relocated. Relocation of sites had been problematic by the lack of established reference points and consequently site area re-



**Figure 4.** A campsite monitoring team discussing methods at a training session.

measurement was not possible. Third, efficiently planning field work needed to be addressed in terms of staff time during an assessment trip and integrating program work into park operations. Last, protocols must withstand a changing field staff without sacrificing accuracy and repeatability.

We were able to accommodate these concerns in several ways. We relied on contemporary campsite protocols developed in intervening years (e.g., Marion 1995) and on the extensive work conducted in Prince William Sound (Twardock et al. 2010) to make wholesale revisions to the methods. Improvements occurred to condition class ratings criteria and definitions, use of radial transect methods for termination of site areas, and to ratings-based systems for visual estimation of various impacts. Next, we conducted two extensive assessments with a large team that brought researchers, field staff and resource managers together in the field to refine and troubleshoot the methods. Last, we incorporated the best available camera and GPS technology to streamline and enforce consistency in data collection, site relocation, and data processing.



**Figure 5.** Alaska Regional Office database programmer Greg Daniels collects GPS data and records campsite attributes in the field. Photograph watermarks embed site and date information, helping ensure collected information is retained and accessible.

### Technology

The technological aspects of establishing protocols were daunting. We developed standardized, electronic data templates to ensure consistent data collection and integration with GPS data. Collection of photographic documentation, a critical component for comparisons with previous work, was also standardized, and its collection was integrated with GPS data (Figure 5). A geodatabase compatible with GIS was developed, serving as a shell to organize and manage this diverse information. One noteworthy benefit of integrating data collection into protocols is that multiple components of collected data are linked in GIS, in database applications, and in reporting tools. For example, electronic campsite maps coded by condition class and linked with site photographs are easily generated.

Limited GPS reception in the steep-sided fjords of the park, wet conditions necessitating waterproof electronics, and the need for tools that can be used by staff with a range of technical knowledge were challenges encountered. Having the technical experts experience

first-hand the field data collection and data management challenges proved essential to bridging these challenges.

### Applications of campsite assessments

One of the opportunities that came with revising campsite monitoring methods has been to encourage park staff participation in monitoring efforts. The monitoring protocols provide a structure and clarity of purpose to field efforts, providing field staff with specific monitoring objectives integrated into other responsibilities while still allowing for opportunities to interact with visitors. Additional opportunities include invasive plant and coastal mortality (avian influenza and sea otters)

surveys that can occur alongside campsite assessments.

Direct improvements to campsite management were the intent of and are an outcome of this process. One example is the bear-resistant food storage lockers, which are one of the main tools the park has to promote or direct use to selected areas. The systematic visits and documentation of campsite and food storage lockers identified high visitor use areas with missing or sub-standard lockers. Since implementing updated campsite monitoring methods, Kenai Fjords National Park has been able to rapidly respond to changes in visitor use patterns, with data in hand to support management directed changes to campsite amenities.

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