Recreation Impact Monitoring Analysis and Protocol Development

Glacier Bay National Park

Natural Resource Technical Report NPS/GLBA/NRTR—2013/XXX

ON THIS PAGE
Camper-placed rock rings and vegetation loss in Glacier Bay National Park & Preserve
Photograph courtesy of Glacier Bay National Park & Preserve

ON THE COVER
Campsite in Reid Inlet (Survey Area 7), Glacier Bay National Park & Preserve
Photograph by Kelly Goonan, Utah State University

Campsite Monitoring Analysis and Recreation Impact Protocol Development

Glacier Bay National Park

Kelly Goonan, MS[1], Christopher Monz, Ph.D.[2], Barbara M. Bruno[3], Tania Lewis[4]

[1]Ph.D. Candidate
Utah State University
Department of Environment and Society
Logan, UT 84322

[2]Associate Professor
Utah State University
Department of Environment and Society
Logan, UT 84322

[3]Wilderness Coordinator
National Park Service
Glacier Bay National Park and Preserve
Gustavus, AK 99826

[4]Wildlife Biologist
National Park Service
Glacier Bay National Park and Preserve
Gustavus, AK 99826

December 2013

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Technical Report Series is used to disseminate results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service mission. The series provides contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available in digital format from the Natural Resource Publications Management website (http://www.nature.nps.gov/publications/nrpm/). To receive this report in a format optimized for screen readers, please email irma@nps.gov.

Please cite this publication as:

Goonan, K, C. Monz, and B. Bruno, and T. Lewis. 2013. Recreation Impact Monitoring Analysis and Protocol Development, Glacier Bay National Park. Natural Resource Technical Report NPS/XXXX/NRTR—20XX/XXX. National Park Service, Fort Collins, Colorado.

Contents

Page

Tables vi

Abstract vii

Introduction 8

Purpose & Goals 8

Scientific Background 8

Approach 10

Results and Discussion 11

Historical Summary of Glacier Bay Campsite Assessments 11

Summary of 2012 Campsite Assessment 14

Comparisons to Historic Data 21

Testing the 2012 Assessment Protocol 23

Test Results *23*

Conclusions 27

Implementation Recommendations *28*

Literature Cited 30

Appendix I. Map of GLBA Survey Areas 32

Appendix II. Historical Campsite Assessment Summary 47

Appendix III: Number of full assessments completed per survey area each year 50

Appendix IV: Summary of Historical Assessments by Data Source 54

Appendix V: GLBA Data Collection and Handling Recommendations 59

Appendix VI: Glacier Bay National Park Recreation Impact Assessment Protocol v.5. 60

Overview 60

Goal of the Procedural Manual *60*

Application to Park Management *60*
Staff Training *60*
Materials for Collecting Field Data *60*
Description of Procedures *61*
Types of Assessments *61*
Survey Area 61
Campsites 61
Suspected Campsites 62
Visitor-Created Trails 62
Sensitive Species 62
Interstadial Wood 62
Rapid Assessment Backcountry Campsite Assessment Procedures 62
Survey Area *62*
Attributes 63
Campsite *64*
Attributes 64
Suspected Campsite *69*
Attributes 69
Sensitive Species *69*
Attributes 69
Vis Created Trail *70*
Interstadial Wood *70*
Taking Campsite Reference Photos Using the Trimble Nomad GPS 71
Vegetation Reference Photos 72
Cover On Site *72*

Cover Off Site..... *73*

Glossary of Terms..... 74

Tables

Page

Table 1. Historical summary of campsite assessments by year. Data sources: National Park Service..... 12

Table 2. Summary of campsite conditions in GLBA 2002/03 (Lewis and Drumheller 2004) 13

Table 3. 2012 site attributes, assessment methods and measurement scale..... 14

Table 4. Summary of 2012 GLBA Survey Area analysis. Values are means +/- SD for continuous measures and medians +/- range for ordinal measures (N = 265)..... 15

Table 5. Summary of 2012 Survey Area analysis by survey area. Values reported are counts[a]. Values reported represent data from both the Survey Area analysis and Campsite assessment[b]. 15

Table 6. Summary of campsite conditions in GLBA in 2012. Values are means +/- SD for continuous measures and medians +/- range for ordinal measures (N = 265)..... 18

Table 7. Summary of campsite conditions by survey area in 2012. Values are means +/- SD for continuous measures and medians +/- range for ordinal measures (N = 265)..... 18

Table 8. Summary of campsite conditions by survey area in 2012. Values are frequencies of observed impact parameters (N = 265)..... 19

Table 9. Number and percentages of impacts found at campsites by survey area during 2002/03 and 2012 surveys..... 22

Table 10. Variability test for continuous measures: summary of campsite conditions by survey areas as surveyed by different field teams in 2012..... 24

Table 11. Variability test for ordinal measures: summary of campsite conditions by survey area as surveyed by different field teams in 2012. 26

Table 12. Variability test for campsite substrate: summary of campsites detected in different mineral substrates as surveyed by different field teams in 2012 (Pearson Chi-Square 31.131, *p*-value = .000; Cramer's V = .248, *p*-value = .000). 26

Table 13. Variability test for campsite substrate: summary of campsites detected in different vegetation types as surveyed by different field teams in 2012 (Pearson Chi-Square 56.057, *p*-value = .000; Cramer's V = .328, *p*-value = .000). 27

Abstract

This report describes a revised and updated recreation impact assessment protocol developed for Glacier Bay National Park (GLBA). It includes an analysis of historical campsite assessment data, a summary of data collected during development of the revised protocol, recommendations for implementation and all procedures necessary to conduct a baseline recreation impact assessment in coastal areas of Glacier Bay National Park.

.

Introduction

Purpose & Goals

This recreation impact assessment protocol is designed to measure backcountry campsite conditions in coastal areas of Glacier Bay National Park (GLBA). It will be the foundation of an ongoing monitoring program, should the park choose to establish a long-term inventory and assessment program for recreation impacts along the shores of Glacier Bay proper.

Specific objectives for an inventory and assessment program would be:

1. Provide initial recreational campsite condition information (current location, number, and condition of campsites and other recreation impacts) in a format conducive to the formation and the evaluation of decisions regarding the management of backcountry camping resources.
2. Provide cumulative and ongoing campsite information that monitors changes in campsite location, number, and condition over time.

Scientific Background

Recent trends in outdoor recreation in the United States suggest that public demand for nature-based recreation opportunities and appreciation of natural areas continues to grow (Cordell 2008). Associated with this increasing visitation are human disturbances and impacts to the environmental conditions of national parks, forests, and wilderness areas (Cole 2004; Monz et al., 2010). Understanding these resultant impacts and the thresholds of tolerance of ecosystems to human use are key components of contemporary park capacity management frameworks. Given these trends and concerns in wildland use, managers of protected areas often examine resource change due to wilderness/backcountry camping. Backcountry camping activities have 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 nodes of concentrated use. While 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, Monz and Twardock 2010) repeated examinations of trends of change over long periods are more rare (Cole and Hall 1992, Marion and Cole 1996, Cole et al. 2008, Twardock et al., 2010).

Campsite assessment studies are useful to managers as they often seek to minimize undesirable resource impacts and the associated aesthetic degradation of sites in order to maintain high quality wildland experiences for visitors. Although less common, other types of campsite studies have used experimental designs to examine functional relationships such as use-impact (Cole 1995, Cole and Monz 2004a) and spatial patterns of impact (Cole and Monz 2004b). Several generalizations about campsite conditions can be drawn from this literature. First, over time on established sites, changes in the number and areal extent of impact tend to be more pronounced than changes in intensity of impact. For example, Cole and Hall (1992) studied campsites over an 11-year period in the Eagle Cap Wilderness in Oregon, USA and found campsite size

increased substantially but mean vegetation cover was relatively stable. Similar results were found over a 20-year period in Grand Canyon National Park (Cole et al. 2008). Second, total impact (increased number of sites and total area of disturbance) tends to increase over time and may be more of a management concern than the level of degradation at individual sites. An assessment of three wilderness areas in the western U.S. found that over a 12-14 year period, the total number of sites increased substantially in each area, but degraded in resource condition quality in only one area (Cole 1993). A final generalization is that on a given site, most impact occurs at low use levels and subsequent increases in use do not tend to result in proportional increases in impact (Leung and Marion 2000, Cole and Monz 2004a, Cole et al. 2008). Overall, these findings support the importance of campsite assessment studies in informing management actions to maintain resource condition quality.

This research examined the important issue of resource impact as a consequence of at-large camping in Glacier Bay National Park (GLBA). Glacier Bay National Park encompasses a vast wilderness of 3.2 million acres, but the majority of backcountry use occurs along the shoreline within Glacier Bay proper. Glacier Bay National Park currently has approximately 3500 annual wilderness visitor use nights occurring in Glacier Bay proper. This visitation level is about two/thirds of that experienced in the late 90s when visitation was at its peak. All wilderness visitors to Glacier Bay proper are required to acquire permits and receive an orientation, but there is no quota, nor are routes or campsites prescribed. Wilderness visitors choose their campsites on an "at-large" basis. Most visitors to Glacier Bay's backcountry travel by sea kayak and do most of their camping, cooking, and hiking in the relatively narrow belt of terrain between the ocean and dense upland vegetation. Some of these areas receive more use than others due to proximity to drop off locations and destinations such as tidewater glaciers, ease of access for kayaks, flat areas for camping and often a readily available stream or other freshwater source. There are unique geologic and biotic aspects of the Glacier Bay shoreline that affect how long human impacts persist. Isostatic rebound causes new land to emerge from the intertidal zone while old beach meadows become shrub covered, erasing old campsites and trails. Vast differences in ecosystems across the length of the bay based on the number of years since deglaciation have relevance to soil type and depth, vegetation type, and human impacts. Additionally, the shoreline of Glacier Bay also supports important biophysical park resources. The same wide beaches and flat open meadows that are most attractive to campers are also prime foraging and travel habitat for many animals and birds. It is important for park planning efforts to understand the location, number and condition of campsites and to be able to assess trends in resource conditions and ecological impacts that occur from recreation in Glacier Bay's backcountry in relationship to areas of critical resource concern.

The ecological issues, visitor use patterns, and managerial challenges in GLBA are similar to other areas of the south central and southeast Alaska coast where campsite and visitor use assessment studies have been conducted. For example, an extensive study in Prince William Sound, AK, concluded that impacts such as multiple trailing, tree and shrub damage and large sites were prevalent (Twardock et al., 2010). The intensity and extent of impact tended to vary by environment, with campsites on soil substrates in upland forests exhibiting less vegetation cover loss, but also being more sensitive to continued disturbance, compared to sites on beach gravel. Impact trends over time showed increases in areal extent of impact, including the development of new sites, but decreases in impact intensity. The study findings suggest that an

at-large camping strategy may not be effective at containing site spread and proliferation, impacts often considered the most important to limit.

In addition, another context for this work is that campsite assessments conducted in previous years in GLBA utilized protocol parameters and impact definitions that proved difficult to duplicate and resulted in significant variation between observers (Unertl 2011). This project was initiated in an effort to develop and test a campsite condition assessment protocol that reduces variation between observers and provides a rapid and accurate assessment of campsite locations, numbers and impact parameters. GLBA staff favored a rapid assessment protocol, as it requires less time to assess any given campsite when compared to more intensive measurement-based methods and is a way to quickly acquire baseline inventories. Rapid assessments maximize staff and resource efficiency while yielding accurate assessments of campsite condition, whereas intensive measurement-based methods yield more precise information and require more staff time and resources to conduct. To forward this goal, we reviewed the existing campsite assessment protocol, suggested new and more effective protocols based on previous work on the Alaskan coast (Twardock et al., 2010; Monz and Twardock 2010), conducted an on-site workshop with park staff to refine the protocol in a field setting, and in this report we present an analysis of the protocol developed and data collected by field staff during the 2012 summer season.

The discussion of findings in this report is presented in the context of continued protocol development and refinement, not necessarily on the ecological, managerial or visitor experience significance of the existing conditions. This report summarizes the development of a protocol which can be used to inventory baseline conditions. This baseline would serve as a foundation of a possible longer term and perhaps more intensive monitoring effort. Additional studies could use this information and these could include, aspects of visitor use monitoring, visitor survey research examining standards of resource and social conditions, visitor impacts to sensitive wildlife species, and spatial modeling of the locations of campsite occurrence.

Approach

As mentioned previously, considerable work has been conducted on the development of campsite assessment and monitoring protocols. Historically, protocol development can be traced back to the early work of Frissell and Duncan in the 1960's (Frisell and Duncan 1965) with more recent advancements contributed by Cole (1989) and Marion (1995). These methods, along with some area-specific modifications have been used extensively in wilderness and backcountry areas, including several long-term studies in coastal Alaska (Twardock et al., 2010; Monz and Twardock 2010; Klasner et al., 2011). Moreover, a significant literature also exists on "ecological parameter" selection (e.g., Belnap 1998) and these approaches have been applied to visitor impact assessment approaches, including in Alaska (Monz and D'Luhosch 2005). The review of the protocol integrated the above approaches with GLBA's current experience and findings with the existing protocol and the PI's experience with long-term studies in Alaska.

In this effort we first reviewed each specific impact parameter in the current protocol in light of the aforementioned developed protocols. This review developed a comprehensive list of possible parameters that could be included. A second step was to take the existing and suggested

protocols in the field and examine them critically in collaboration with field staff. This process was iterative and resulted in "on the fly" modifications to the protocol with both experienced and new seasonal staff alike. Third, protocol suggestions were presented to GLBA staff in a workshop format in June 2012 and suggestions incorporated as needed. Last, the protocol tested during the summer 2012 field season and included an examination of inter-rater variability, where different groups of evaluators examine campsites in the same survey areas for a comparison of impact parameters.

Results and Discussion

Historical Summary of Glacier Bay Campsite Assessments

Campsite assessments have been conducted at GLBA for the past four decades, and the methods used have evolved substantially (See Appendix II). Assessments began in the 1970s, with backcountry rangers focusing attention on structures in the backcountry and recording general descriptive information about site conditions and locations on survey sheets and on paper maps. In the early 1980s, rangers began to turn their attention away from structures and began recording evidence of human use (e.g. number of tent sites, fire rings) and recording descriptive information about the condition of vegetation within the vicinity of the site. A more formal assessment protocol was instituted and utilized in 1986 and 1987. Specific indicators of disturbance were measured, and each site was assigned a "pass/fail" rating based on the observer's judgment of site conditions. Survey sheets and paper maps were used for field data collection through the 1980s. While these early campsite assessments were fairly limited in terms of the areas surveyed, new protocols developed in the early 2000s were intended to measure camping impacts throughout GLBA's extensive coastal backcountry (see Lewis and Drumheller 2004). These protocols utilized modern GPS and GIS methodologies to more accurately map the location of campsites and areas of potential camping activity, while information about sites was recorded on paper survey sheets. *Survey Areas* – locations where camping activities where known, suspected, or likely to take place – were established to help organize field sampling efforts and data management (see maps in Appendix I). These areas were defined by creating 100 m buffers surrounding 8000 campsite locations from 1996 – 2000 backcountry visitor surveys and identifying sections of beach known to contain 10 or more camping visits. The GPS-based protocol was administered in 2002 and 2003, and a revised version of this protocol was used to assess campsites in 2011. The survey area numbers and boundaries established in 2002-2003 remain constant to provide the ability to compare future survey data when possible.

Data presented in the following discussion of historical campsite assessments at GLBA is limited to the 2002/03 survey. Assessments conducted in the 1970s and 1980s are excluded from the summary of historical data due to the limited ability to identify the locations of sites surveyed in the 1970s and 1980s within the modern survey Areas. The 2011 campsite survey is also excluded from the following analyses due to the poor condition of the data (Table 1). Where appropriate, the 2011 data and assessment protocol are referenced in the discussion to highlight the evolution of the methods used to measure campsites and provide context for the work completed in 2012 when the protocol was reconsidered and updated.

Table 1. Historical summary of campsite assessments by year. Data sources: National Park Service

	2002/03[a]	2011	2012
Number of Complete Campsite Assessments	257[b]	76[c]	265
Number of Survey Areas Represented	134	20[d]	50[e]

[a] 142 sites measured in 2002; 133 sites measured in 2003, 18 sites measured in both years (not included in analysis)
[b] Measured sites using 1 assessment per site only.
[c] 6 sites not measured in 2011
[d] Survey Area was not specified for 47 sites
[e] 56 survey areas were assessed as part of the 2012 assessment (see Table 5). Campsites were located in 50 survey areas.

While at first glance the data in Table 1 appear to show that the number of campsites has remained relatively constant over the past decade, it is important to note that campsite assessments took place in different locations in the park each year. The 2002/03 assessments covered 133 survey areas; whereas the 2012 assessment covered 50 survey areas (see Appendix III). The 2002/03 and 2012 assessments have 34 survey areas in common. However, the 2002/03 assessments measured a *main core* site and its associated *satellite* sites: a main core site with multiple satellite sites was considered one campsite under this procedure. New definitions and protocols tested in 2012 specify that each individual site (including previously defined satellite sites) be counted and measured. In addition, in 2002/03, field crews measured human impacts in at least one campsite per survey area. If no evidence of camping was found within a survey area, a campsite was chosen that seemed the most likely to be used by campers within the survey area. In 2012 campsites were only measured if there was evidence of camping. It is reasonable to hypothesize that a campsite assessment effort utilizing the 2012 protocol in the 133 survey areas represented by the 2002/03 assessments would result in a much larger number of campsites being detected. Thus we cannot draw reliable inferences concerning trends or changes in the number of backcountry campsites at GLBA.

Due to differences in assessment parameters and the variety of methods used, statistical comparisons over time in the condition of campsites are difficult. In 2002/03, human impacts were measured only in presence or absence at each campsite with no attempts to quantify amounts. Campsite size was categorical (small or large including satellite sites), and were not consistently measured. Campsites were given observer ratings which were then used combined with presence/absence of short and long-term impacts to calculate a Final Impact Rating. Descriptive summaries of the 2002/03 campsite assessments are presented in Tables 2 and 3 below. It should be noted that substantial differences among data sources for these years was observed (Appendix IV); several data sources were incomplete or lacking attribute information. Most of the pertinent information on individual campsites was recorded in the "comments" field. Comments were read and, where possible, information was extracted and coded into new variables or attributes. However, lack of specificity within the comments did not enable us to reliably extract new variables. For example, some comments would specify that a campsite had 3 (or any given number of) satellite sites, while other comments would merely indicate that a campsite had "several satellite sites." These inconsistencies limit analyses to descriptive

summaries in the current analysis. Quantitative summaries in Tables 2 and 3 were derived from the 2004 Camper Impact Report (Lewis and Drumheller).

Table 2. Summary of campsite conditions in GLBA 2002/03 (Lewis and Drumheller 2004)

	2002/03 (N = 257)	
Site Attribute	**Frequency**	**Percent**
Trailing	41	16
Supratidal fire	22	9
Intertidal fire	14	5
Rock ring	191	74
Trash	57	22
Human waste	12	5
Firewood	8	3
Structures	11	4
[1] Size – small	208	81
[1] Size – large	49	19
[2] Observer rating – 0	123	48
[2] Observer rating – 1	64	25
[2] Observer rating – 2	47	18
[2] Observer rating – 3	23	9
[2] Observer rating – 4	0	0
[2] Observer rating - 5	0	0
[3] Impact rating – None	36	14
[3] Impact rating – Low	152	59
[3] Impact rating – Med	60	23
[3] Impact rating - High	9	4

[1] Campsite areas were measured and categorized as small or large. A small site is less than 250 square meters in size with two or less satellites. A large campsite is ≥ 250 square meters and/or has three or more satellites. The area of the campsite included all satellites.

[2] Impacts to vegetation were rated by observers on a scale of 0-5 using comparisons between vegetation in the campsite versus vegetation outside the campsite. Off-site vegetation was considered to be natural and thus the control. These ratings, called "observer ratings," were assigned in the field while observing the campsite. The observer rating classification was:

0 = Campsite barely distinguishable: none or minimal disturbance of vegetation and/or organic litter. May be a possible/likely camping location, an old campsite that has not seen recent use, or a location of recent one-time use with no signs of permanent damage. May find evidence of a rock tent ring.

1 = Obvious vegetation difference between campsite and "control" areas indicate impacts of repeated use. Impacts may be subtle such as smaller, more durable species growing within site while taller more sensitive species growing outside of site. Campsite shape may indicate the cause of this difference in vegetation to be from human use instead of natural causes. May find evidence of a rock tent ring.

2 = Ground vegetation worn away from around center of activity. If vegetation is sparse or non-existent in campsite and control area, soil is compressed at center of activity.
3 = Ground vegetation lost (compared to control) on greater than half of the campsite, but humus and litter (if applicable) still present in all but a few areas.
4 = Bare mineral soil obvious (if control is vegetated). Tree roots exposed on the surface.
5 = Soil erosion obvious. Trees reduced in vigor or dead.

[3] A final social impact rating was determined for each measured site by calculating an additive score of these impacts, including the site's observer (vegetation) rating, size, long-lived impacts, and short-lived impacts. Ecological impacts such as plant species and sensitive animal species were not included in final impact ratings. Refer to the 2004 Camper Impact Report (Lewis and Drumheller) for details.

Overall, social impacts found in the in the 2002/03 survey were low, with rock rings, footprints and trash reported as the leading indicator of human use at campsites (Lewis and Drumheller 2004). The highest levels of impacts were found to be generally near tidewater glaciers and camper drop-off locations, between camper drop-off locations and glaciers, and/or in areas of steep terrain that concentrate camping. Organic soil was found to conceal impacts seasonally with lush vegetation, while loose mineral substrates were more prone to visible disturbance and tent rocks are more prevalent. Lewis and Drumheller (2004) recommended continuing to evaluate human impacts while initiating new studies examining the effects of human disturbance on sensitive species, using seasonal closures in areas of concern, and increasing education to backcountry users on ways to minimize disturbance.

Summary of 2012 Campsite Assessment

The revised campsite assessment protocol was field tested during the 2012 summer field season. Variables and attributes measured are summarized in Table 3. Tables 4 and 5 present a summary of survey area conditions. Campsite conditions are summarized in Tables 6, 7, and 8.

Table 3. 2012 site attributes, assessment methods and measurement scale

Site Attribute	Method Used	Measurement Scale
Survey Area		
Fire sign	Counts	Number of supratidal fire signs
Litter and trash	Ocular estimation	Five level trash quantity scale (1 = None; 2 = Handful or less; 3 = Handful to gallon; 4 = Gallon to 5 gal; 5 = >5 gallons)
Human waste	Counts	Number of individual upland/supratidal human waste sites
Structures	Counts	Number of human-made structures encountered
Campsite		
Landing substrate type	Observation	Cobble, sand, soil, boulder, cobble/sand
Campsite substrate type	Observation	Boulder, cobble, sand, cobble/sand, soil,

		compacted gravel
Campsite size	Ocular estimation	Four level campsite size scale (1 = small – 1 tent pad; 2 = med – 2-3 tents; 3 = large – 4-5 tents; 4 = x-large - >5 tents)
Tent rocks	Counts	Number of rocks placed within the site
Campfire in site	Counts	Number of campfire signs within site
[a] Vegetation cover on-site and in control areas	Ocular estimation	Six level cover scale (0-5%, 6-25%, 26-50%, 51-75%, 76-95%, 96-100%)
Vegetation types on-site and in control areas	Observation	Sparse herbaceous; dense herbaceous; open scrub; dense scrub; graminoid; Dryas mat; moss; lichen; other
Damage to live trees/shrubs	Counts	Number of separate events of human-caused damage to trees or shrubs within 2 meter radius of site
Litter and trash	Ocular estimation	Five level trash quantity scale (1 = None; 2 = Handful or less; 3 = Handful to gallon; 4 = Gallon to 5 gal; 5 = >5 gallons)

[a] Ocular estimates of on-site and off-site vegetation cover are used to calculate a metric of relative vegetation cover loss. Control areas are relatively "undisturbed" areas adjacent to campsites. The control site should be similar to the campsite in slope, tree canopy cover (amount of sunlight penetrating to the forest floor), and other environmental conditions. The intent is to locate an area which would closely resemble the campsite area had the campsite never been used. Please refer to the revised campsite monitoring protocol included at the end of this document for more information.

Table 4. Summary of 2012 GLBA Survey Area analysis. Values are means +/- SD for continuous measures and medians +/- range for ordinal measures (N = 265).

Site Attribute	GLBA 2012 Study Area	N[a]
Continuous Measures		
Fire signs (#)	.52 ± .91	56
Human waste (#)	.07 ± .26	56
Structures (#)	.79 ± 2.06	56
Ordinal Measures		
Litter/trash	1 ± 2	56

[a] 56 survey areas were included in the 2012 Survey Area assessment. However, campsites were recorded in survey areas not represented in the Survey Area assessment (see Table 6 – dashes indicate no data for a particular field). Survey areas not included in this assessment are 1, 11, 12, 13, 16, 43, 58, 63, 176, and 202. The unique identifier for one survey area assessed in 2012 is missing from the data.

Table 5. Summary of 2012 Survey Area analysis by survey area. Values reported are counts[a]. Values reported represent data from both the Survey Area analysis and Campsite assessment[b].

Survey Area	Fire Signs	Trash[a]	Human Waste	Structures	No. Campsites	No. Suspected Campsites

1	-	-	-	-	10	20
3	0	1	0	0	2	2
4	1	2	0	1	5	13
5	2	3	1	4	23	22
9	3	3	1	5	47	13
10	1	1	0	0	32	6
11	-	-	-	-	4	7
12	-	-	-	-	4	5
13	-	-	-	-	1	1
15	0	2	0	0	0	0
16	-	-	-	-	4	2
21	1	1	0	0	6	3
22	1	1	0	1	2	1
23	3	2	0	0	3	5
24	0	1	0	0	1	0
25	0	1	0	0	2	1
26	0	3	0	0	3	1
27	0	2	0	0	1	2
31	0	1	0	0	1	0
32	4	2	0	0	2	3
33	0	1	0	0	0	0
34	2	1	1	0	5	7
35	0	1	0	0	1	0
36	0	1	0	0	5	1
38	1	2	0	0	7	2
39	0	2	0	3	15	4
41	1	2	0	0	0	1
43	-	-	-	-	1	-
50	0	3	0	0	0	0
52	0	1	0	0	0	0
53	0	1	0	0	2	3
54	0	1	0	0	0	0
55	0	1	0	0	1	0
57	0	1	0	1	0	2
58	-	-	-	-	2	0
59	0	1	0	0	1	0
63	-	-	-	-	2	0
68	0	1	0	0	1	-
72	0	2	0	0	0	0
74	1	1	0	0	0	2
75	0	1	0	0	0	0

76	1	3	0	0	1	9
77	0	1	0	0	0	0
78	0	2	1	0	1	-
119	0	2	0	0	6	8
120	2	1	0	0	4	3
121	0	1	0	0	0	1
160	0	2	0	2	2	4
161	0	1	0	11	11	0
162	0	2	0	3	3	3
165	0	1	0	4	4	1
166	0	1	0	8	8	4
173	0	2	0	1	2	3
176	-	-	-	-	1	1
181	0	1	0	0	1	-
182	0	1	0	0	1	-
183	0	2	0	0	2	-
184	0	1	0	0	0	-
185	2	1	0	0	1	-
186	1	1	0	0	5	-
200	1	2	0	0	12	-
201	0	2	0	0	1	-
202	-	-	-	-	3	-

[a] 1 = None; 2 = Handful or less; 3 = Handful to gallon; 4 = Gallon to 5 gal; 5 = >5 gallons

[b] Dashes indicate no data for a given field. Some survey areas may have campsites or suspected sites recorded (e.g. Survey Area 1) but no formal Survey Area assessment was conducted, resulting in missing values for survey area-level impacts (i.e. fire signs, trash, human waste, structures).

Overall, camping *areas* in the backcountry of Glacier Bay National Park appear lightly impacted. Campfire signs are uncommon, with most areas having no sign of fire present and a maximum of 4 fire signs observed (Survey Area 32). Very little trash was present at camping areas, and evidence of improperly disposed of human waste was only present at four survey areas (areas 5, 9, 34, and 78). Survey Area 9 has the most campsites, with the maximum of 47.

A total of 265 backcountry campsites were assessed in the summer of 2012. Tent rocks are commonplace at campsites, with a mean of 10.5 tent rocks per campsite observed during field assessments and 232 sites having more than 3 tent rocks present. Campfires were rarely observed within campsites (n = 13, Table 8), and very little damage to trees and shrubs was noted. Campsites exhibit a moderate amount of vegetation cover loss relative to undisturbed areas (mean = 27.9). Relative vegetation cover loss of greater than 50% was observed at approximately forty percent of campsites assessed (Table 8). Sites tend to be small in size, accommodating one tent on average. Ten sites were considered to be larger than a “medium” on the campsite size scale. Litter occurred at approximately ten percent of sites. Conditions are also presented by survey area (Table 7, Table 8).

Table 4. Summary of campsite conditions in GLBA in 2012. Values are means +/- SD for continuous measures and medians +/- range for ordinal measures (N = 265).

Site Attribute	GLBA 2012 Study Area	N
Continuous Measures		
Tent rocks (#)	10.51 ± 10.02	265
Campfire in site (#)	0.05 ± 0.22	265
Tree/shrub damage (#)	0.09 ± 0.57	265
[a]Vegetation cover loss (%)	27.90 ± 64.23	265
Ordinal Measures		
Campsite size	1 ± 3	258
Litter/trash	1 ± 1	265

[a] Relative vegetation cover loss is calculated using the following formula:

$$\text{Cover loss} = 1 - \frac{\%\ \text{cover in campsites}}{\%\ \text{cover in control plots}} \times 100$$

To complete the calculation, the median value of the six-category ocular estimate scale for vegetation cover (see Table 3) is used for the % cover in campsite and % cover in control plot fields.

Table 5. Summary of campsite conditions by survey area in 2012. Values are means +/- SD for continuous measures and medians +/- range for ordinal measures (N = 265).

Survey Area	N	Tent Rocks	Fire	Tree Damage	Veg. Loss	Site Size	Trash
1	10	10.4 ± 4.65	0 ± 0	0 ± 0	15.82 ± 18.46	(n = 8) 1 ± 1	1 ± 1
3	2	5.50 ± 0.71	0 ± 0	0 ± 0	55.29 ± 0	1 ± 0	1 ± 0
4	5	5.20 ± 1.79	0 ± 0	0 ± 0	28.62 ± 40.14	1 ± 0	1 ± 0
5	23	9.13 ± 4.16	.04 ± .21	0 ± 0	50.63 ± 38.25	1 ± 1	1 ± 1
9	47	12.83 ± 11.36	.04 ± .20	.06 ± .25	23.33 ± 46.74	1 ± 3	1 ± 1
10	32	17.72 ± 19.05	.03 ± .18	0 ± 0	-4.84 ± 140.74	(n = 30) 1.5 ± 3	1 ± 0
11	4	15.50 ± 9.26	0 ± 0	0 ± 0	54.11 ± 40.40	1.5 ± 1	1 ± 0
12	4	8.75 ± 2.75	0 ± 0	0 ± 0	45.69 ± 35.42	1.5 ± 1	1 ± 0
13	1	9	0	0	-15.29	2	1
16	4	10.75 ± 11.93	0 ± 0	.25 ± .50	9.79 ± 12.42	1.5 ± 1	1 ± 1
21	6	7.33 ± 2.66	.17 ± .41	0 ± 0	50.05 ± 31.30	1 ± 1	1 ± 1
22	2	6.50 ± 3.54	0 ± 0	0 ± 0	41.94 ± 59.31	1.5 ± 1	1 ± 0
23	3	11.17 ± 6.43	0 ± 0	0 ± 0	0 ± 0	2 ± 1	1 ± 0
24	1	4	0	0	93.42	2	1
25	2	6.50 ± 3.54	0 ± 0	0 ± 0	0 ± 0	1 ± 0	1 ± 0

26	3	9.67 ± 1.53	.33 ± .58	.33 ± .58	40.30 ± 36.46	1 ± 1	1 ± 0
27	1	10	0	0	0	1	1
31	1	6	0	0	0	2	1
32	2	5.50 ± 4.95	.50 ± .71	0 ± 0	41.94 ± 59.31	1 ± 0	1 ± 0
34	5	5.80 ± 1.10	.20 ± .45	0 ± 0	16.35 ± 36.57	1 ± 0	1 ± 0
35	1	13	1	0	0	1	1
36	5	6.60 ± 5.37	0 ± 0	0 ± 0	0 ± 0	1 ± 1	1 ± 0
38	7	14.0 ±12.56	.14 ± .37	0 ± 0	28.55 ± 86.80	1 ± 2	1 ± 1
39	15	9.0 ± 3.70	0 ± 0	.47 ± .83	54.06 ± 54.37	1 ± 1	1 ± 1
43	1	17	0	0	-15.29	2	1
53	2	3.50 ± 4.95	0 ± 0	0 ± 0	6.63 ± 9.38	1.5 ± 1	1 ± 0
55	1	4	0	0	0	1	1
58	2	2.0 ± 0	0 ± 0	4.0 ± 5.66	0 ± 0	1 ± 0	1 ± 0
59	1	13	0	0	0	3	1
63	2	15.50 ± .71	0 ± 0	0 ± 0	40.59 ± 20.80	1.5 ± 1	1 ± 0
68	1	7	0	0	0	2	2
76	1	10	0	0	0	2	1
78	1	0	0	0	0	1	1
119	6	2.67 ± 1.51	0 ± 0	0 ± 0	0 ± 0	(n = 5) 1 ± 1	1 ± 1
120	4	1.75 ± 2.06	.50 ± .58	0 ± 0	33.65 ± 39.42	1 ± 0	1 ± 0
160	2	6.50 ± .71	0 ± 0	0 ± 0	40.88 ± 57.82	1.5 ± 1	2 ± 0
161	11	10.0 ± 5.66	0 ± 0	0 ± 0	68.62 ± 33.93	(n = 10) 1 ± 2	1 ± 0
162	3	6.33 ± 1.53	0 ± 0	0 ± 0	27.96 ± 48.42	1 ± 1	1 ± 0
165	4	6.50 ± 3.70	0 ± 0	0 ± 0	54.62 ± 37.82	1 ± 1	1 ± 0
166	8	12.0 ± 5.53	0 ± 0	.25 ± .71	26.16 ± 47.57	1.5 ± 1	1 ± 0
173	2	6.50 ± 3.54	0 ± 0	0 ± 0	48.02 ± 67.90	1 ± 0	1 ± 0
176	1	0	0	0	13.27	1	2
181	1	8	0	1	0	1	1
182	1	5	0	0	93.42	1	1
183	2	8.0 ± 2.83	0 ± 0	0 ± 0	46.71 ± 66.06	1 ± 0	1.5 ± 1
185	1	4	0	0	0	1	1
186	5	6.20 ± 11.76	0 ± 0	0 ± 0	50.32 ± 45.94	1 ± 3	1 ± 0
200	12	11.50 ± 6.19	.08 ± .29	0 ± 0	30.13 ± 37.98	1.5 ± 1	1 ± 1
201	1	28	0	0	0	2	2
202	3	9.67 ± 8.62	0 ± 0	0 ± 0	69.14 ± 25.51	1 ± 1	1 ± 1

Table 6. Summary of campsite conditions by survey area in 2012. Values are frequencies of observed impact parameters (N = 265).

Survey	No.	>3 Tent	Fire Sites	>1	>50% Veg.	Site Size	Trash

Area	Sites	Rocks [a]	Present [b]	Damaged Trees [c]	Loss [d]	>Medium [e]	Present [f]
1	10	10	0	0	0	0	2
3	2	2	0	0	2	0	0
4	5	4	0	0	2	0	0
5	23	21	1	0	13	0	6
9	47	44	2	0	14	4	5
10	32	26	1	0	10	2	0
11	4	4	0	0	2	0	0
12	4	4	0	0	2	0	0
13	1	1	0	0	0	0	0
16	4	3	0	0	0	0	1
21	6	6	1	0	3	0	1
22	2	2	0	0	1	0	0
23	3	3	0	0	0	0	0
24	1	1	0	0	1	0	0
25	2	2	0	0	0	0	0
26	3	3	1	0	1	0	0
27	1	1	0	0	0	0	0
31	1	1	0	0	0	0	0
32	2	1	1	0	1	0	0
34	5	5	1	0	1	0	0
35	1	1	1	0	0	0	0
36	5	4	0	0	0	0	0
38	7	7	1	0	4	1	2
39	15	15	0	3	13	0	2
43	1	1	0	0	0	0	0
53	2	1	0	0	0	0	0
55	1	1	0	0	0	0	0
58	2	0	0	1	0	0	0
59	1	1	0	0	0	1	0
63	2	2	0	0	1	0	0
68	1	1	0	0	0	0	1
76	1	1	0	0	0	0	0
78	1	0	0	0	0	0	0
119	6	2	0	0	0	0	1
120	4	1	2	0	2	0	0
160	2	2	0	0	1	0	2
161	11	11	0	0	9	1	0
162	3	3	0	0	1	0	0
165	4	3	0	0	3	0	0
166	8	8	0	1	3	0	0
173	2	2	0	0	1	0	0

176	1	0	0	0	0	0	1
181	1	1	0	0	0	0	0
182	1	1	0	0	1	0	0
183	2	2	0	0	1	0	1
185	1	1	0	0	0	0	0
186	5	2	0	0	3	1	0
200	12	11	1	0	5	0	1
201	1	1	0	0	0	0	1
202	3	2	0	0	2	0	1
Total	**265**	**232**	**13**	**5**	**103**	**10**	**28**

[a] Number of campsites with more than 3 tent rocks observed
[b] Number of campsites with 1 or more fire sites present
[c] Number of campsites with more than 1 tree or shrub exhibiting human-caused damage
[d] Number of campsites with relative vegetation loss greater than 50%
[e] Number of campsites larger than 2 (medium – 2-3 tent pads) on the site size scale
[f] Number of campsites with trash present (category 2 or greater on trash quantity scale)

Comparisons to Historic Data

In reviewing the campsite assessment data from the last decade, several observations lead us to caution against attempting to compare campsite conditions over time. First and foremost is the definition of a *campsite*. For the 2002/03 assessment, the term "campsite" is defined as a location where people are known or suspected to have camped, with sites showing evidence of human use considered as "established" sites, and sites showing no evidence of human use considered "not established." In some cases, campsites were divided into main sites and "satellites," or smaller camp areas associated with a main site. In 2011, a "site not measured" feature was added, defined as a site with only one short-lived impact (in contrast, a measured site had two or more short-lived impacts or at least one long-lived impact). *Site not measured* areas were often those that looked like they could be camped at, but it was difficult to discern whether impacts were caused by human use or natural phenomena (i.e. wildlife, storms, tidal, natural patchy vegetation, other disturbance, etc.). The 2012 revised assessment protocol defines a campsite as a location containing clear evidence of recent (within last 2-3 years) camping activity. Evidence of camping includes: vegetation loss or flattened vegetation clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.), compressed gravel clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.), recently placed tent rocks, camp trash, recent tree or shrub damage, campfire in site. Each individual location of camping activity is considered a campsite: there are no satellite sites. The 2012 protocol also includes a *suspected campsite* feature, defined as a backcountry area where overnight camping activities are suspected but no clear evidence of such activities is present. At these sites only a location point is measured.

Second, differences in the inventory and measurement of campsites exist among protocols and between survey years. In 2002, field crews measured human impacts in at least one campsite per survey area. In 2003, crews attempted to measure impacts on all established campsites within each survey area. If no evidence of camping was found within a survey area, a campsite was chosen that seemed the most likely to be used by campers within the survey area. In addition,

main sites were differentiated from satellite sites, and satellite sites were not measured. The "most likely camping spot" procedure was dropped from the 2011 protocol. The revised 2012 protocol specifies that all individual campsites within a survey area be measured.

Third, variables were inconsistently measured. This was most apparent in the campsite size variable included in the 2002/03 survey. Length and width dimensions for each site were measured. In some cases, the dimensions given were for individually impacted sites (e.g. 4 x 5 meters), whereas in other cases dimensions for a very large area able to accommodate camping activity and containing several individually impacted areas were given (e.g. 30 x 40 meters).

In an effort to compare impact parameters between years, we eliminated campsites from the 2003/03 data that had no discernable impacts (to align with 2012 definition of a campsite as having evidence of camping) and only evaluated parameters that were consistently measured between years within the same survey areas (n=34), including the number of sites within each survey area containing: tent rock rings, evidence of fire, and trash (Table 9). While the number of sites within each survey area varies substantially for reasons discussed previously, it is interesting to note that tent rocks were equally prevalent (found at 91-92% of sites) between surveys. Many survey areas containing impacts were consistent between years (ex. # 1, 5, 9, 10, etc) while others contained impacts in one year but not the other (ex. # 11, 23, 120, etc). These patterns may be informative and helpful in choosing survey areas for long-term monitoring.

Table 9. Number and percentages of impacts found at campsites by survey area during 2002/03 and 2012 surveys.

	2002/03							2012						
Survey Area	No. Sites	No. Sites Tent Rocks	% Sites Rocks	No. Sites Fire	% Sites Fire	No. Sites Trash	% Sites Trash	No. Sites	No. Sites Tent Rocks	% Sites Rocks	No. Sites Fire	% Sites Fire	No. Sites Trash	% Sites Trash
1	8	8	100	2	25	0	0	10	10	100	0	0	2	20
3	1	1	100	0	0	0	0	2	2	100	0	0	0	0
4	6	6	100	0	0	3	50	5	4	80	0	0	0	0
5	4	4	100	2	50	2	50	23	21	91	1	4	6	26
9	3	3	100	1	33	2	67	47	44	94	2	4	5	11
10	3	3	100	0	0	1	33	32	26	81	1	3	0	0
11	6	6	100	1	17	2	33	4	4	100	0	0	0	0
16	1	0	0	0	0	0	0	4	3	75	0	0	1	25
21	3	3	100	0	0	0	0	6	6	100	1	17	1	17
22	4	4	100	0	0	0	0	2	2	100	0	0	0	0
23	4	4	100	2	50	2	50	3	3	100	0	0	0	0
24	1	1	100	0	0	0	0	1	1	100	0	0	0	0
25	6	5	83	0	0	0	0	2	2	100	0	0	0	0
26	1	1	100	0	0	1	100	3	3	100	1	33	0	0
27	2	2	100	1	50	1	50	1	1	100	0	0	0	0
31	2	1	50	0	0	1	50	1	1	100	0	0	0	0

32	2	2	100	0	0	1	50	2	1	50	1	50	0	0
34	2	2	100	0	0	0	0	5	5	100	1	20	0	0
35	1	1	100	0	0	0	0	1	1	100	1	100	0	0
36	2	2	100	0	0	0	0	5	4	80	0	0	0	0
38	2	2	100	0	0	1	50	7	7	100	1	14	2	29
39	2	2	100	0	0	1	50	15	15	100	0	0	2	13
43	1	1	100	0	0	0	0	1	1	100	0	0	0	0
53	1	1	100	0	0	0	0	2	1	50	0	0	0	0
55	1	0	0	0	0	0	0	1	1	100	0	0	0	0
59	1	1	100	0	0	0	0	1	1	100	0	0	0	0
68	2	2	100	1	50	0	0	1	1	100	0	0	1	100
76	1	0	0	0	0	1	100	1	1	100	0	0	0	0
120	1	0	0	0	0	0	0	4	1	25	2	50	0	0
161	3	2	67	0	0	1	33	11	11	100	0	0	0	0
162	6	6	100	0	0	1	17	3	3	100	0	0	0	0
165	1	1	100	0	0	0	0	4	3	75	0	0	0	0
166	2	2	100	0	0	0	0	8	8	100	0	0	0	0
173	1	1	100	0	0	0	0	2	2	100	0	0	0	0
TOTAL	**152**							**220**	**200**	**91**	**12**	**5**	**20**	**9**

Testing the 2012 Assessment Protocol

In order to evaluate the reliability of the revised protocol, three field teams of two or three individuals independently applied the protocol in five survey areas: areas 3, 4, 5, 9, and 10 in August 2012. These sites include Ptarmigan (survey area 9), Reid Inlet (survey area 5) and the beaches south of Reid Inlet (survey areas 4 and 3). This area was selected because of the complexity of terrain, high levels of use and varying size of the survey areas. Surveyors consisted of three seasoned assessors who had been working on campsite assessments for the previous months. The remaining surveyors had much less experience with the new protocol. Inexperienced members were placed with seasoned members and training consisted of a half-hour refresher prior to the start (which was interrupted by a boat maintenance issue), and on the job training for the remaining three days. In retrospect, this training was likely insufficient and contributed to some of the variability found during the test.

Test Results

Substantial differences can be observed in the number of campsites identified in survey areas 4, 5, 9, and 10 (Table 10). One complication was the creation of new campsites by visitors, as occurred in survey area 4 during the variability test sampling period. But this one-time occurrence does not explain all the differences in campsite identification. The data suggests that most variability occurs in survey areas consisting of cobble/sand and compacted gravel as a mineral substrate and dense scrub or moss as vegetation types. Some modifications were made to the campsite definitions and an additional field was created to require surveyors to provide their

rationale for selecting an area as a campsite. Further recommendations to reduce variability amongst observers are made in the conclusion of this document.

Table 7. Summary of 2012 team surveys by area.

Survey Area	Feature	Team KNK	Team KC	Team TB
3	Campsites (#)	3	2	3
	Suspected campsites (#)	0	2	0
4	Campsites (#)	7	5	2
	Suspected campsites (#)	5	13	22
5	Campsites (#)	30	23	13
	Suspected campsites (#)	9	22	30
9	Campsites (#)	37	47	22
	Suspected campsites (#)	22	13	40
10	Campsites (#)	20	32	15
	Suspected campsites (#)	3	6	7

Overall, few differences were observed between the impact assessments conducted by the three teams. Exceptions were the assessment of off-site vegetation cover in Survey Area 5 (F = 4.151, p-value = .020) and Survey Area 10 (F – 3.335, p-value = .042), the number of tent rocks counted in Survey Area 9 (F = 3.535, p-value = .033), and the amount of trash observed in Survey Area 10 (F = 26.480, p-value = .000). Differences in the estimation of site size were observed between groups for Survey Areas 4 (F = 7.984, p-value = .007), 5 (F = 3.342, p-value = .042), and 10 (F = 26.480, p-value = .000). However the overall differences in estimated campsite size were substantively small.

Table 10. Variability test for continuous measures: summary of campsite conditions by survey areas as surveyed by different field teams in 2012.

Survey Area	Attribute	Team KNK		Team KC		Team TB		F-value	*p*-value
		Mean	SD	Mean	SD	Mean	SD		
3	Tent rocks (#)	5.33[a]	1.155	5.50[a]	.707	5.00[a]	1.732	.091	.915
	Fire signs (#)	.00[a]	.000	.00[a]	.000	.33[a]	.577	.781	.507
	Tree/shrub damage (#)	.00[a]	.000	.00[a]	.000	.00[a]	.000	-	-
	Veg. cover on site	46.167[a]	35.462	38.00[a]	.000	58.833[a]	41.408	.234	.800
	Veg. cover off site	77.667[a]	12.702	85.0[a]	.000	98.0[a]	.000	4.898	.066

4	Tent rocks (#)	13.57[a]	28.512	5.20[a]	1.789	3.00[a]	4.243	.325	.729
	Fire signs (#)	.00[a]	.000	.00[a]	.000	.00[a]	.000	-	-
	Tree/shrub damage (#)	.00[a]	.000	.00[a]	.000	.00[a]	.000	-	-
	Veg. cover on site	45.00[a]	34.719	29.40[a]	38.760	50.250[a]	67.529	.292	.752
	Veg. cover off site	57.214[a]	28.812	36.50[a]	35.733	80.50[a]	24.749	1.541	.257
5	Tent rocks (#)	7.20[a]	4.318	9.13[a]	4.159	7.92[a]	3.201	1.468	.238
	Fire signs (#)	.10[a]	.305	.04[a]	.209	.08[a]	.277	.286	.752
	Tree/shrub damage (#)	.00[a]	.000	.00[a]	.000	.00[a]	.000	-	-
	Veg. cover on site	36.883[a]	35.435	27.565[a]	31.191	23.00[a]	22.629	1.054	.354
	Veg. cover off site	42.767[a]	33.011	49.587[a,b]	26.312	70.904[b]	25.904	***4.151***	***.020***
9	Tent rocks (#)	8.24[a]	5.387	12.83[b]	11.360	8.91[a,b]	3.650	***3.535***	***.033***
	Fire signs (#)	.00[a]	.000	.04[a]	.204	.00[a]	.000	1.274	.284
	Tree/shrub damage (#)	.00[a]	.000	.06[a]	.247	.00[a]	.000	1.954	.147
	Veg. cover on site	11.203[a]	25.644	12.947[a]	26.437	7.432[a]	20.417	.363	.696
	Veg. cover off site	19.162[a]	28.610	22.766[a]	31.283	27.023[a]	31.838	.465	.630
10	Tent rocks (#)	11.30[a]	5.723	17.72[a]	19.047	9.47[a]	6.468	2.303	.108
	Fire signs (#)	.00[a]	.000	.03[a]	.177	.00[a]	.000	.539	.586
	Tree/shrub damage (#)	.00[a]	.000	.00[a]	.000	.00[a]	.000	-	-
	Veg. cover on site	2.50[a]	.000	6.047[a]	7.770	6.833[a]	6.343	2.742	.072
	Veg. cover off site	13.550[a,b]	4.763	13.266[a]	16.957	25.400[b]	22.068	***3.335***	***.042***

Any two teams that share a superscript are not significantly different ($p \leq 0.05$) according to Bonferroni's least significant difference test.

Table 11. Variability test for ordinal measures: summary of campsite conditions by survey area as surveyed by different field teams in 2012.

Survey Area	Attribute	Team KNK	Team KC	Team TB	F-value	p-value
3	Site size	1.33[a]	1.00[a]	2.50[a]	.986	.449
	Trash	1.00[a]	1.00[a]	1.33[a]	.781	.507
4	Site size	1.43[a]	1.00[a]	2.50[b]	***7.984***	***.007***
	Trash	1.00[a]	1.00[a]	1.00[a]	-	-
5	Site size	1.37[a,b]	1.17[a]	1.69[b]	***3.342***	***.042***
	Trash	1.07[a]	1.26[a]	1.23[a]	2.040	.139
9	Site size	1.30[a]	1.48[a]	1.14[a]	2.233	.112
	Trash	1.03[a]	1.11[a]	1.00[a]	2.076	.131
10	Site size	1.30[a,b]	1.60[a]	1.00[b]	***5.974***	***.004***
	Trash	1.60[a]	1.00[b]	1.07[b]	***26.480***	***.000***

Any two teams that share a superscript are not significantly different ($p \leq 0.05$) according to Bonferroni's least significant difference test. Measurement scales are: five level trash quantity scale (1 = None; 2 = Handful or less; 3 = Handful to gallon; 4 = Gallon to 5 gal; 5 = >5 gallons); and four level campsite size scale (1 = small – 1 tent pad; 2 = med – 2-3 tents; 3 = large – 4-5 tents; 4 = x-large - >5 tents). Both measurements based on ocular estimates (refer to Table 4).

Some differences were observed in the proportion of campsites detected in various mineral substrates, particularly sites on cobble/sand and compacted gravel substrates (Table 12) (Pearson Chi-Square = 31.131, p-value = .000). Differences in the proportion of campsites detected in various vegetation types were observed for campsites located in areas where dominant vegetation was listed as dense scrub or moss (Table 13) (Pearson Chi-Square = 56.057, p-value = .000). The data suggests that more care

Table 12. Variability test for campsite substrate: summary of campsites detected in different mineral substrates as surveyed by different field teams in 2012 (Pearson Chi-Square 31.131, *p*-value = .000; Cramer's V = .248, *p*-value = .000).

Campsite Substrate	Team KNK (n = 97)		Team KC (n = 109)		Team TB (n = 55)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cobble	58[a]	59.8	71[a]	65.1	33[a]	60.0
Cobble/Sand	29[a]	29.9	15[b]	13.8	18[a,b]	32.7
Compacted Gravel	0[a]	0	15[b]	13.8	0[a]	0
Sand	3[a]	3.1	3[a]	2.8	3[a]	5.5
Soil	7[a]	7.2	5[a]	4.6	1[a]	1.8

Kruskal-Wallis non-parametric ANOVA. Each superscript letter denotes a subset of Survey Teams whose column proportions do not differ significantly from each other at the .05 level.

Table 13. Variability test for campsite substrate: summary of campsites detected in different vegetation types as surveyed by different field teams in 2012 (Pearson Chi-Square 56.057, *p*-value = .000; Cramer's V = .328, *p*-value = .000).

Vegetation Type	Team KNK (n = 97)		Team KC (n = 109)		Team TB (n = 55)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Dense Herbaceous	6[a]	6.2	5[a]	4.6	1[a]	1.8
Dense Scrub	0[a]	0	0[a]	0	3[b]	5.5
Dryas Mat	30[a]	30.9	20[a]	18.3	18[b]	32.7
Graminoid	4[a]	4.1	2[a]	1.8	2[a]	3.6
Lichen	1[a]	1.0	1[a]	.9	1[a]	1.8
Moss	1[a]	1.0	22[b]	20.2	3[a]	5.5
Open Scrub	5[a]	5.2	13[a]	11.9	9[a]	16.4
Sparse Herbaceous	30[a]	30.9	40[a]	36.7	14[a]	25.5
Other	0[a]	0	0[a]	0	0[a]	0
Not Specified	20[a]	20.6	6[b]	5.5	4[a,b]	7.3

Kruskal-Wallis non-parametric ANOVA. Each superscript letter denotes a subset of Survey Teams whose column proportions do not differ significantly from each other at the .05 level.

Conclusions

In light of the analysis of the existing data and the PI's past experience with campsite assessment work on the Alaskan coast, several conclusions can be made:

First, it currently remains difficult to identify any substantive trends in campsite conditions in Glacier Bay's coastal areas, due to clear differences in protocols used and the highly descriptive nature of early assessment work. Hence, the existing historical data at GLBA may provide an important qualitative basis for future quantitative monitoring established by this protocol, but it few quantitative comparisons can be made at present.

Second, while substantial variation was observed in discovering and classifying sites as "established sites" or "suspect sites", less variation was observed in the site condition ratings and other parameters. This suggests that the protocol can benefit from refinements of the campsite definition and protocol that have been made and that the field crews must receive adequate training to locate sites and to classify them in a consistent manner. Some of this can be accomplished by narrowing the number of staff involved in conducting the baseline inventory, increasing the amount of staff training, and ensuring ongoing improvement to existing

procedures and definitions in the standing protocol. For example, the *Staff Training* procedures outlined in the recreation impact assessment protocol have been expanded to include additional time in the field to allow staff to gain experience locating and identifying recreation impacts in a variety of geographic settings within GLBA and to calibrate their assessments to ensure reduced variability. The various condition assessment attributes (Table 3) appear to be less susceptible to inter-rater variability and the results suggest little if any refinement is needed. Some discrepancy will always be present in recreation impact assessments where most data are reliant on observer observations—minimizing this variation is a continual challenge. Past research has commented on this issue (e.g., Cole et al., 2008; Twardock et al., 2010) and consistency in application of a protocol and consistency of observers can help considerably at minimizing variability.

Glacier Bay National Park currently has approximately 3500 annual wilderness visitor use nights occurring in Glacier Bay proper and selection of campsites is on an "at-large" basis. Glacier Bay National Park has a rare opportunity to document general baseline conditions while visitor use numbers are low and management influences are negligible. These baseline conditions will help GLBA articulate the resource and social conditions it wishes to maintain within the park and to manage visitor use to stay within those parameters. Without a baseline inventory and ongoing monitoring of recreation impacts, these tasks are not possible.

NPS managers can use the data collected for the following purposes:

- To assist in the determination of sustainable visitor capacities and desired future conditions for coastal areas of GLBA.
- As a measure for wilderness character monitoring.
- To evaluate the success of management actions to minimize visitor created resource impacts.
- To create boundaries for various use zones.
- To assist in developing minimum impact suggestions for GLBA visitors.

Implementation Recommendations

With adequate training for field crews and oversight, the protocol developed and tested in this project will be an effective tool to document location, number, and general condition of recreation impacts and campsites in a baseline inventory of the coastal areas of Glacier Bay. This baseline will be an effective tool to inform management decisions and planning processes. The importance and efficacy of monitoring programs has been demonstrated in many natural areas over nearly five decades of research (e.g., Frissell and Duncan 1965; Cole 1983: Marion and Leung 1997; Twardock et al., 2010). Understanding trends in conditions of campsites and visitor use locations is a fundamental component in the application of long-term planning strategies such as the Visitor Experience and Resource Protection framework (National Park Service, 1997) and Wilderness Character Monitoring. Determining trends in resource conditions often highlights the need for management actions, and can indicate when more specific research is needed (Boyers, 2000).

Since not all inter-rater variability will ever be eliminated, it is recommended that a baseline recreational impact survey be implemented in a "campaign style" manner, with all survey areas and other campable areas surveyed by the same survey team in a succinct time period. Surveys should take place between June 15 and August 30 of each year (significant vegetation change before and after these dates may alter condition class assessments). This survey would establish a

baseline for GLBA campsite location, number and general conditions. This would likely take 1-2 seasons to complete in Glacier Bay proper. The baseline inventory also establishes a foundation for further inquiry; once a baseline is established a subset of analysis areas or individual campsites could be selected for more specific measures based on current or potential management issues. Using the baseline data, a monitoring protocol can be developed that allows for timely and effective monitoring of changes in the number, location, and condition of campsites. Since site conditions change rapidly with changes in use levels, especially in a place without static conditions and few hardened sites (like the shorelines of Glacier Bay), a monitoring interval of 5 years would adequately show change over time. The baseline inventory would help determine whether a different monitoring strategy (for example, to only measure certain index survey areas) would suffice in order to create an operationally feasible monitoring protocol.

An additional protocol to document restoration/custodial effort is under development by park staff. This protocol will document rock ring, fire ring, and trash removal, and other restoration efforts made by GLBA staff. The data collected in this manner will be useful for end of year reporting, and for documenting restoration /custodial effort in individual survey areas between monitoring intervals.

A final campsite inventory and monitoring program for Glacier Bay should include the following components: 1) establish baseline inventory (1-2 field seasons), 2) document site restoration efforts (ongoing), 3) monitor change (frequency, intensity and sampling design TBD following baseline inventory). This, coupled with other visitor use data and future social science work can provide early warning of potential resource change and inform best practices for allocating use and preserving Glacier Bay's opportunities for solitude, and primitive and unconfined recreation as well as other qualities of its superlative wilderness character.

Literature Cited

Belnap, J. 1998. Choosing indicators of natural resource condition: A case study in Arches National Park, Utah, USA. Environmental Management. 22(4): 635-642.

Boyers, L, M. Fincher, and J. van Wagtendonk. 2000. Twenty-Eight Years of Wilderness Campsite Monitoring in Yosemite National Park. USDA Forest Service Proceedings RMRS-P15-Vol-5:105-109.

Cole, D.N. 1983. Monitoring the condition of wilderness campsites. USDA Forest Service Research Paper INT-302. Intermountain Forest and Range Experiment Station, Ogden, UT.

Cole, D.N. 1989. Wilderness campsite monitoring methods: A sourcebook. USDA Forest Service General Technical Report INT-259. Intermountain Research Station, Ogden, UT.

Cole, D.N., and T.E. Hall. 1992. Trends in campsite condition: Eagle Cap Wilderness, Bob Marshall Wilderness, and Grand Canyon National Park. USDA Forest Service Research Paper INT-453. Intermountain Research Station, Ogden, UT.

Cole, D.N. 1995. Disturbance of natural vegetation by camping: Experimental applications of low level stress. Environmental Management 19:405-416.

Cole, D.N. 2004. Impacts of hiking and camping on soils and vegetation. In: Buckley R (ed) Environmental impacts of ecotourism. CABI Publishing, Wallingford, UK, pp 41–60.

Cole, D.N., and C.A. Monz. 2004. Impacts of camping on vegetation: Response of acute and chronic disturbance on vegetation. Environmental Management 32:693-705.

Cole, D.N. and C.A. Monz. 2004. Spatial patterns of recreation impact on experimental campsites. Journal of Environmental Management 70:73-84.

Cole, D.N., P. Foti and M. Brown. 2008. Twenty years of change on campsites in the backcountry of Grand Canyon National Park. Environmental Management 41:959-970.

Cordell, H.K. 2004. Outdoor recreation for 21st century America. Venture Publishing, State College, PA.

Cordell, H.K. 2008. The latest on trends in nature-based outdoor recreation and tourism. *Forest History Today* Spring:4-10.

Cordell, H.K., C.J. Betz, and G.T. Green. 2008. Nature-based outdoor recreation trends and wilderness. *International Journal of Wilderness* 14(2):7-13.

Firssell, S.S., and D.P. Duncan. 1965. Campsite preference and deterioration in the Quetico-Superior Canoe Country. Journal of Forestry 63(4): 256-260.

Frissell, S.S. 1978. Judging recreational impacts on wilderness campsites. Journal of Forestry 76:481-483.

Leung, Y-F, and J.L. Marion. 2000. Recreation impacts and management in wilderness: A state-of-knowledge review. *In* D. N Cole and others (compilers), Wilderness Science in a Time of Change Conference– Volume 5: Wilderness Ecosystems, Threats and Management. USDA Forest Service Proceedings RMRS-P-15-Vol-5, Rocky Mountain Research Station, Ogden UT. Pp. 23-48.

Lewis, T.M., and N. Drumheller. 2004. Wilderness Camp Impacts: Assessment of Human Effects On The Shoreline of Glacier Bay. NPS GLBA internal document.

Marion, J.L. 1995. Capabilities and management utility of recreation impact monitoring programs. Environmental Management 19:763–771.

Monz, C.A., and P. D'Luhosch. 2005. National Park Service Southwest Alaska National Parks visitor impact monitoring: Phase 1 report. 59 pp.

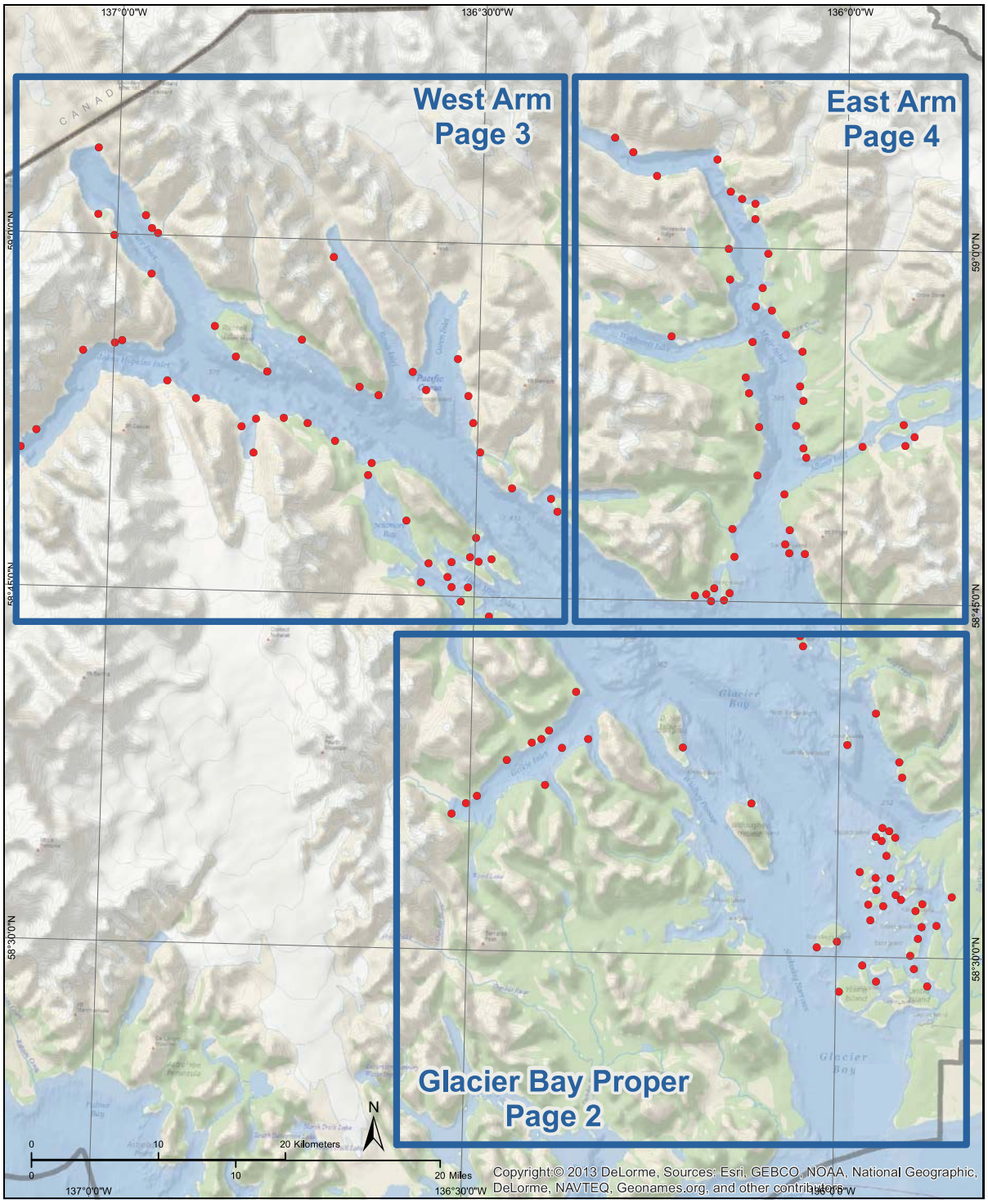
Monz, C.A., D.N. Cole, J. Marion, and Y-F. Leung. 2010. Sustaining Visitor Use in Protected Areas: Future Opportunities in Recreation Ecology Research Based on the USA Experience. *Environmental Management* 45: 551-562.

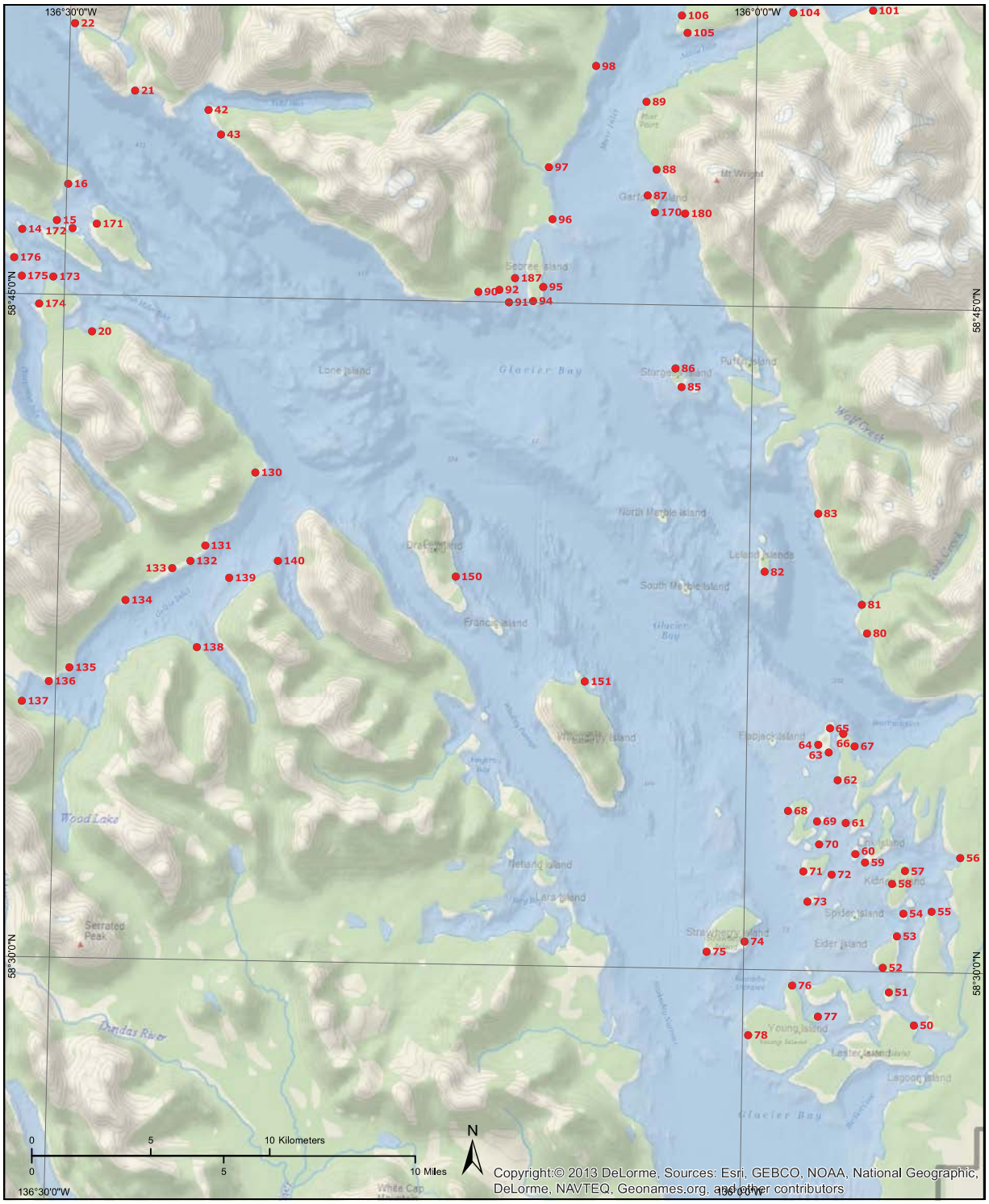
Monz, C.A., and P. Twardock. 2010. A classification of campsites in Prince William Sound, Alaska, USA. *Journal of Environmental Management.* 91(7) 1566-1572.

Unertl, K. 2011. Variability Test for Glacier Bay's Wilderness Campsite Assessment Protocol, NPS GLBA internal document.

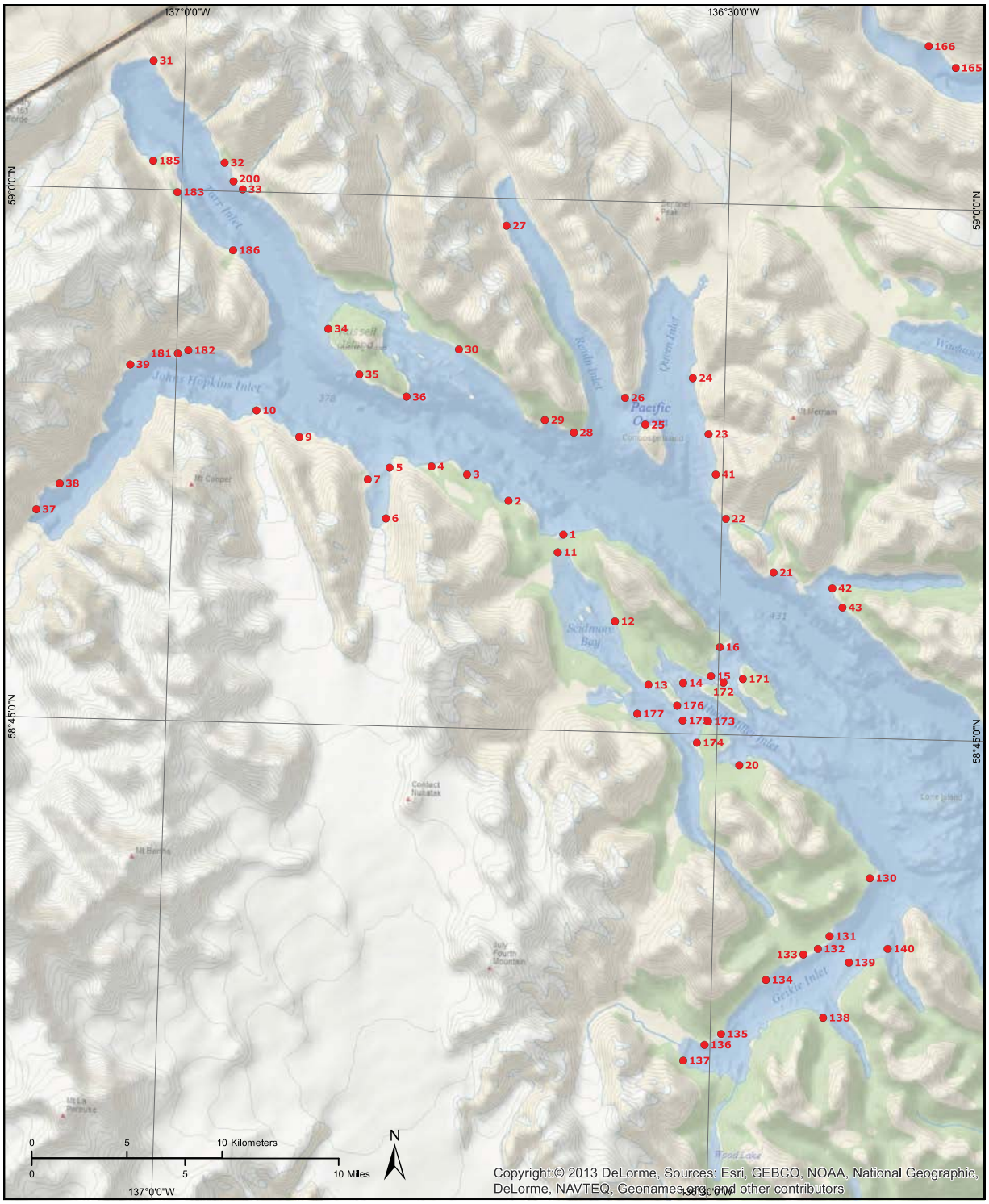
Twardock, P., C.A. Monz, M. Smith, and S. Colt. 2010. Long-term changes in resource conditions on backcountry campsites in Prince William Sound, Alaska, USA. *Northwest Science.* 84 (3) 223-232.

Appendix I. Map of GLBA Survey Areas

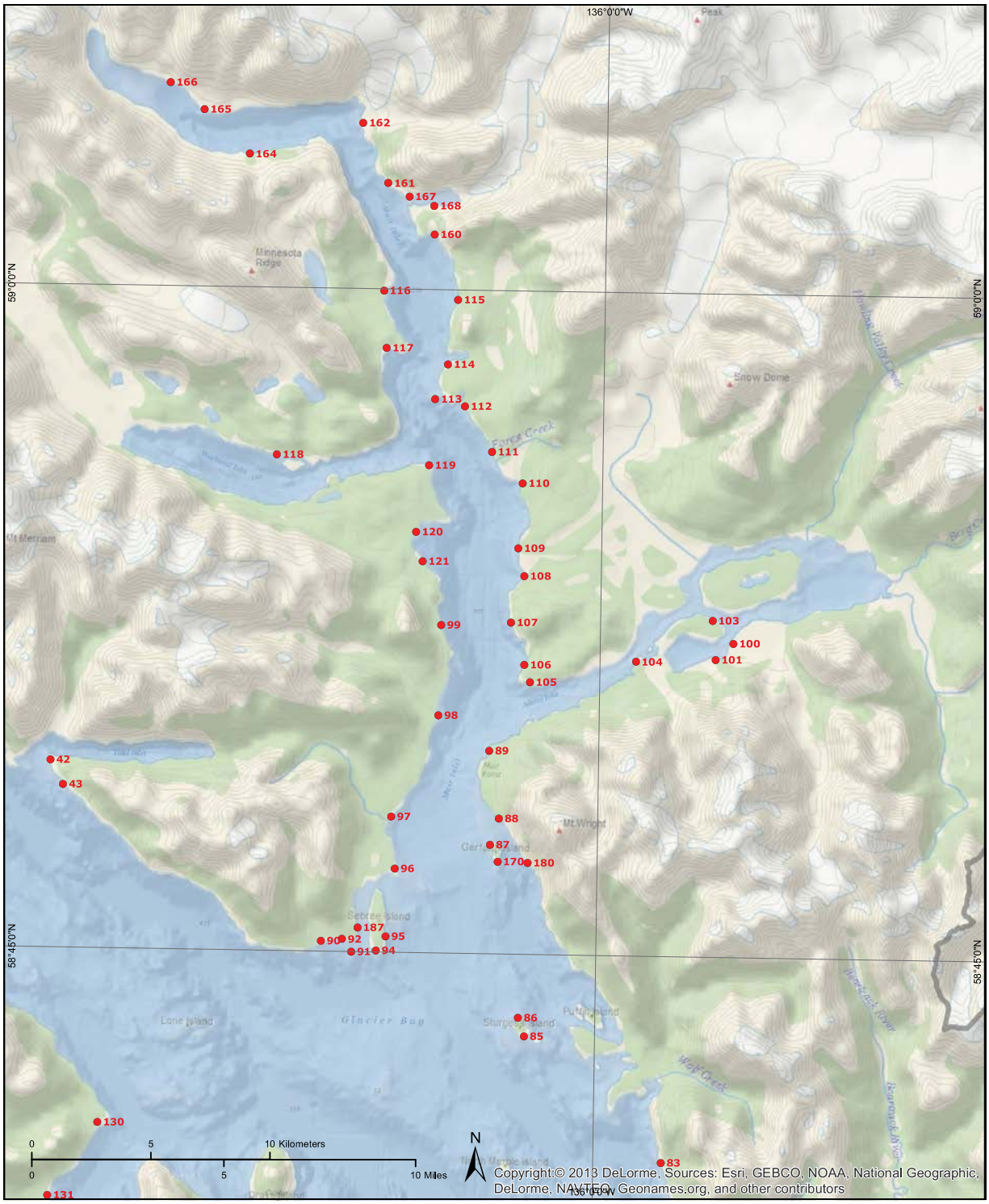



136°30'0"W
136°0'0"W
58°45'0"N
58°30'0"N
22
21
42
43
16
15
14
172
171
176
175
173
174
20
106
105
104
101
98
89
97
88
87
170
180
96
187
95
90
92
91
94
86
85
130
131
132
133
140
139
150
134
138
135
136
137
151
83
82
81
80
65
64
66
67
63
62
68
69
61
70
60
59
56
71
72
57
58
73
54
55
53
74
75
52
76
51
77
50
78
Lone Island
Glacier Bay
Sturgess Island
Reid Inlet
Wolf Creek
North Marble Island
Leland Islands
South Marble Island
Francis Island
Flapjack Island
Wood Lake
Netland Island
Lara Island
Spider Island
Eider Island
Young Island
Lester Island
Lagoon Island
Serrated Peak
Dundas River
White Cap Mountain
Mt Wright
Garforth Island
Seddon Island
Strawberry Island
Kidney Island
0
5
10 Kilometers
0
5
10 Miles
N
Copyright:© 2013 DeLorme, Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, NAVTEQ, Geonames.org, and other contributors

2


137°0'0"W
136°30'0"W
59°0'0"N
58°45'0"N
166
165
31
185
32
200
33
183
186
27
34
30
181
182
39
35
36
24
26
10
29
25
23
9
28
5
4
3
41
38
7
2
37
6
22
1
11
21
42
43
12
16
15
171
13
14
172
176
177
175
173
174
20
130
131
132
133
140
139
134
138
135
136
137
0
5
10 Kilometers
0
5
10 Miles
N
Copyright:© 2013 DeLorme, Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, NAVTEQ, Geonames.org, and other contributors

3


136°0'0"W
59°0'0"N
58°45'0"N
166
165
162
164
161
167
168
160
116
115
117
114
113
112
118
111
119
110
120
109
121
108
99
107
103
100
106
104
101
105
98
89
42
43
97
88
87
96
170
180
187
95
90
92
91
94
86
85
130
131
83
Minnesota Ridge
Snow Dome
Mt Merriam
Mt Wright
Setree Island
Lone Island
Glacier Bay
Garforth Island
Forks Creek
Wolf Creek
0
5
10 Kilometers
0
5
10 Miles
N
Copyright © 2013 DeLorme, Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, NAVTEQ, Geonames.org, and other contributors

4

Survey Area ID	Location Description
1	Scidmore Cut Beach
Area is attractive to kayakers who are waiting to get through the high-tide cut into Scidmore Bay, and the western end of the survey area has historically been used as a camper drop-off location. 2003 Sensitive Species observed include: nesting semi-palmated plovers, nesting spotted sandpipers, oystercatchers, wolverine, river otter sign and abundant bear foods and sign.	
2	First Cove Northwest of Scidmore Cut
Area is attractive to campers en route from the camper drop-off to the glaciers of the West Arm. 2003 Sensitive Species observed include: nesting spotted sandpipers, nesting oystercatchers, wolf sign and brown bear with cubs.	
3	Small Beach East of Long Beach East of Ibach Point
Area is attractive to campers en route from the camper drop-off to the glaciers of the West Arm. 2003 Sensitive Species observed include: nesting oystercatchers, nesting ptarmigan, river otter sign, possibly denning marmot, and abundant bear sign.	
4	Long Beach East of Ibach Point
Area is attractive to campers en route from the camper drop-off to the glaciers of the West Arm. 20032003 Sensitive Species observed include: nesting oystercatchers, nesting mew gulls, nesting ptarmigan, nesting sparrows, denning marmots, river otter sign, small salmonids, and abundant bear foods and sign.	
5	Reid Inlet, Ibach Point
This area is very attractive to campers as it offers views of Reid Glacier, and receives day-use from people off of boats anchored in Reid Inlet. 2003 Sensitive Species observed include: nesting oystercatchers, nesting ptarmigan, nesting sparrows, arctic terns, mew gulls, pelagic cormorants, spotted sandpipers, scoters offshore, river otter sign, wolf sign, and abundant bear foods and sign.	
6	Head of Reid Inlet, East Side
This area has potential to be attractive to campers as it is directly adjacent to Reid Glacier, and receives day-use from people off of boats anchored in Reid Inlet. 2003 Sensitive Species observed include: nesting mew gulls, parasitic jaegers, oystercatcher nest, and bear sign.	
7	Reid Inlet, Western Side of Mouth
This area is very attractive to campers as it offers views of Reid Glacier and contains the historic Ibach Cabin remains. For these reasons the area also receives day-use from people off of boats anchored in Reid Inlet. 2003 Sensitive Species observed include: nesting ptarmigan, nesting least sandpipers, nesting semi-palmated plovers, nesting spotted sandpipers, nesting oystercatchers, nesting sparrows, nesting bald eagles, possibly nesting arctic terns, spawning pink salmon, river otters, and abundant bear sign.	
9	Ptarmigan Creek
This area is attractive to campers because it is the last large campable area with fresh water before turning into Johns Hopkins Inlet. 20032003 Sensitive Species observed include: nesting oystercatchers, nesting mew gulls, suspected nesting semi-palmated plovers and spotted sandpipers, nesting bank swallows, river otters, and brown bear.	
10	Mary's Beach, East of Lamplugh Glacier
A trail along the beach berm heads up the valley to the west, eventually reaching an overview of Lamplugh Glacier. This area is attractive because of this access to a view of Lamplugh Glacier and also because it is the last easily campable beach before turning into Johns Hopkins Inlet. 2003 Sensitive Species observed include: nesting oystercatchers, denning marmots, nesting barn swallows, nesting sparrows and warblers, nesting bald eagles, nesting spotted sandpipers, boreal toads, river otter sign, and bear sign.	
11	Scidmore Bay, Northern End

This area is attractive to kayakers waiting to get through the high-tide cut from Scidmore Bay to the West Arm. 2003 Sensitive Species observed include: nesting arctic terns, nesting semi-palmated plovers, nesting mew gulls, nesting spotted sandpipers, nesting ptarmigan, wolf, black bear and brown bear. Common mergansers, harlequin ducks, and white-winged scoters in, or near, Scidmore Glacier outwash on southern end of survey area.	
12	Scidmore Bay, East Side
This area holds no particular attraction to campers other than it is a long open beach in the middle of Scidmore Bay. 2003Evidence of 2003 Sensitive Species observed include: wolf and bear sign.	
13	Entrance to Scidmore Bay, Eastern Shore
2003 This area holds no particular attraction to campers other than it is a scenic point overlooking the mouth of Scidmore Bay. Evidence of sensitive species observed was bear sign.	
14	Small Island in Hugh Miller West of Blue Mouse Cove
This area holds no particular attraction to campers but offers scenic island camping in Hugh Miller Inlet. 20032003 Sensitive Species observed include: oystercatchers, river otter sign, and bear sign.	
15	West Blue Mouse Cove - North of Cut to Hugh Miller
This area holds no particular attraction to campers except as a place to camp while waiting to get through the tidal cut from Blue Mouse Cove into Hugh Miller Inlet. 2003 Evidence of sensitive species observed was bear sign.	
16	Blue Mouse Cove
This area holds no particular attraction except for years when it is used as a camper drop-off location. 2003 Sensitive Species observed include: spawning pink salmon, oystercatchers, spotted sandpipers, and bear sign.	
20	Sundew Cove
This area is attractive to campers during years that it is used as a camper drop-off. 2003 Sensitive Species observed include: oystercatchers with chicks, common mergansers with chicks, spawning pink salmon, wolf sign and bear sign.	
21	Southeast of Gloomy Knob
This area is attractive to campers who want to climb Gloomy Knob or hike to Vivid Lake. 2003 Sensitive Species observed include: spawning pink and sockeye salmon, boreal toads, wolf sign, river otter sign, mountain goat sign, and bear sign.	
22	Northwest of Gloomy Knob
One attraction of this area may be a hiking route to Vivid Lake. 2003 Sensitive Species observed include: nesting oystercatchers, spawning pink and sockeye salmon, semi-palmated plover, spotted sandpiper, river otter sign, and bear sign.	
23	Queen Inlet, 2nd Drainage South of Carroll Glacier
This area is especially attractive to campers when the camper drop-off is located about 1 mile to the south and this is the nearest campable meadow. 2003 Sensitive Species observed include: mew gulls and arctic terns with young, nesting oystercatchers, spawning pink salmon, spotted sandpipers, wolves and a brown bear.	
24	Queen Inlet, 1st Drainage South of Carroll Glacier
This area offers no particular attraction except that it is relatively close to the Queen Inlet camper drop-off. 2003 Sensitive Species observed include: oystercatchers, wolf sign, a brown bear, and a large number of scoters just offshore.	
25	Composite Island, North End
This area is attractive to campers who are en route from the Queen Inlet drop-off to Rendu Inlet or north to the glaciers. 2003 Sensitive Species observed include: possible nesting oystercatchers, merlin with young, warblers and sparrows with young, river otter sign, and bear sign.	
26	Mouth of Rendu Inlet, Eastern Shore
This area is somewhat out of the way and probably only gets use from kayakers exploring Queen and Rendu Inlets. 2003 Sensitive Species observed include:: nesting oystercatchers, river otter sign, and a	

brown bear.	
27	Rendu Inlet, Romer Glacier Outwash
This area is one of the few suitable camping areas near the head of Rendu Inlet. 2003 Sensitive Species observed include: nesting oystercatchers, wolf sign, river otter sign, brown bears and bear cub sign.	
28	First Beach West of Mouth of Rendu Inlet
This area is near the Rendu camper drop-off location. 2003 Sensitive Species observed include: oystercatchers, river otter sign and bear sign.	
29	Rendu Camper Drop-off
This area is used most heavily in years when the camper drop-off location is here. 2003 Sensitive Species observed include: nesting spotted sandpipers, oystercatchers, river otter sign and bear sign.	
30	Mainland North of SE Tip of Russell Island
This area offers no particular attraction to campers. 2003 Sensitive Species observed include: nesting spotted sandpipers, possible eagle nest inland from beach, river otter sign, bear sign.	
31	Northeast Tarr Inlet
Survey area contains a trail up a knoll with the remains of a rock cairn on it. This area's greatest attraction is spectacular views of Marjorie and Grand Pacific Glaciers. 2003 Sensitive Species observed include: nesting spotted sandpipers and bear sign.	
32	Mid-Tarr Inlet, Beach NW of Large Outwash on East Side
This area would likely only be used by kayakers heading up Tarr Inlet. 2003 Sensitive Species observed include: oystercatchers, spotted sandpipers, least sandpipers, wolf sign and a brown bear.	
33	Mid-Tarr Inlet, Large outwash on East Side
This area would likely only be used by kayakers heading up Tarr Inlet. 2003 Sensitive Species observed include: ptarmigan with young, oystercatchers with young, possibly nesting spotted sandpipers, common redpolls with young, mew gulls, arctic terns, river otter sign, wolf sign, and bear sign.	
34	Northwest Russell Island
This area hold no particular attraction to campers except for scenic views of the West Arm. 2003 Sensitive Species observed include: nesting spotted sandpipers, oystercatchers, warblers and sparrows with young, ptarmigan with young, river otter sign, and bear sign.	
35	Southwest Russell Island
This area hold no particular attraction to campers except for scenic views of the West Arm. Evidence of 2003 Sensitive Species observed include: abundant river otter sign and bear sign.	
36	Southeast Russell Island
This area hold no particular attraction to campers except for scenic views of the West Arm. 2003 Sensitive Species observed include: warblers with young, scoters off shore, river otter sign, and bear sign.	
37	Johns Hopkins Head, West Shore
This area is the closest possible campsite to Johns Hopkins Glacier and offers a spectacular view. It is, however, difficult to get to at times of heavy ice and questionable in safety due to calving induced waves. 2003 Sensitive Species observed include: harbor seals hauled out on icebergs, kittiwakes, glaucous-winged and mew gulls.	
38	Johns Hopkins, Chocolate Falls (Seal Camp)
The area has worn trails up a rocky knoll and erosion from human use is evident. This area is very close to Johns Hopkins Glacier and offers a spectacular view. It is also difficult to get to at times of heavy ice. The area has been used as a harbor seal research camp for several weeks per summer from 1991-2002. 2003 Sensitive Species observed include: harbor seals hauled out on icebergs, nesting oystercatchers, and bear sign.	
39	Topeka Outwash

This area has been closed to camping since the early 1990s due to bear problems. The exception to this rule is Alaska Discovery, the Park guided kayaking concessionaire, has been allowed to camp there since year 2000. If this area were to open to the general public for camping, the attraction would be a large open campable area at the mouth of Johns Hopkins inlet with spectacular views and access into the inlet. 2003 Sensitive Species observed include: mew gulls with young, oystercatchers and arctic terns with suspected young, spotted sandpiper nests, ptarmigan with young, and bear sign.	
41	Queen Inlet, Camper Drop-off
Two rock cairns are present on beach, probably from drop-off. Area is likely only attractive to campers when it is a drop-off location because there is little campable terrain and there is a high danger of rocks falling onto this area. 2003 Sensitive Species observed include: nesting oystercatchers, spotted sandpipers with young, and bear sign.	
42	Point at the Mouth of Tidal Inlet, South Shore
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: nesting eagles, oystercatchers with young, river otter sign and bear sign.	
43	Tiny Peninsula 1 Mile South of Tidal Inlet
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: nesting oystercatchers, spotted sandpipers, wolf sign, river otter sign and bear sign.	
50	Northeast Lester Island
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter and bear sign.	
51	Island North of Lester
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: blue grouse with young, coyote sign, river otter sign and bear sign.	
52	South Tip of Island South of Kidney Island
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: blue grouse with young, nesting crows, oystercatchers, river otter sign and bear sign.	
53	North End of Island South of Kidney Island.
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter sign, coyote sign, and bear sign.	
54	South Kidney Stone Island
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign.	
55	South Hutchins Bay, Mainland peninsula East of Kidney island
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: nesting ravens and river otter sign.	
56	Hutchins Bay
This area is one of the few places in the Beardslee Islands that has a consistent supply of fresh water. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign.	
57	Northeast Kidney Island
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter sign, coyote sign and bear sign.	
58	Northwest Kidney Island
There is a dilapidated small shack in woods. Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: spotted sandpiper, river otter sign and bear sign.	
59	Southern tip of Link Island
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: nesting oystercatchers, nesting warblers, river otter sign, coyote sign, and a black bear. Survey area is near seal haulout.	
60	Small Island West of South Tip of Link Island

Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: nesting oystercatchers, semi-palmated plovers suspected nesting, river otter sign and a black bear with bear sign including den.	
61	Tiny Island with SPIDER Geo-marker
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter and bear sign.	
62	Peninsula Due North of SPIDER Geo-marker
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: boreal toad, river otter sign and a black bear.	
63	South End of Northern-most Island in the Beardslees.
Area holds no particular attraction to campers unless they were passing by except for a possible waiting area for access through the high-tide cut into Beartrack Cove. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign, including sign of cubs.	
64	Southwest Corner of Northern-most Beardslee Island
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: oystercatchers, river otter sign and bear sign.	
65	Northern-most Tip of the Beardslees
Survey area is at the northernmost tip of the Beardslee Islands in Beartrack Cove and is a natural stopping point for kayakers waiting to access the Beardslees through a high-tide cut. 2003 Sensitive Species observed include: nesting oystercatchers, semipalmated plovers, spotted sandpipers, nesting sparrows, lady slipper orchid, river otter sign and bear sign including an old den and sign of cubs.	
66	North Tip of Mainland, Beardslees
Area holds no particular attraction to campers unless they were passing by except for a possible waiting area for access through the high-tide cut into the Beardslee Islands. 2003 Sensitive Species observed include: raft of over 500 common mergansers off shore, sign of small weasel including den, sign of bear including den.	
67	East Side of Peninsula West of Beartrack Cove
Area holds no particular attraction to campers unless they were passing by except for a possible waiting area for access through the high-tide cut into the Beardslee Islands. Evidence of sensitive species observed river otter sign, and sign of bear including den.	
68	Island Due East of Boulder Island, West Side.
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: a large flock (120) of oystercatchers, coyotes, and bear sign including possible den.	
69	Island Due West of Tiny Island with SPIDER Geo-Marker.
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter sign including possible den, and bear sign.	
70	Island Southwest of Spider Geo-marker, South Tip
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: oystercatcher nest, nesting hairy woodpecker, spotted sandpiper, nesting sparrows, river otter sign, black bear and a dug up den, possible coyote or river otter.	
71	Island North of White crow Island with SOCK Geo-marker.
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: river otter sign with possible den and a black bear .	
72	Linear Island Northeast of White crow
No established sites found in area and no other definitive evidence of human use. Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: river otter sign and black bears.	
73	West White Crow Island

Area holds no particular attraction to campers except for being on a southwest facing point at the southern end of the Beardslee Islands. This site receives use from harbor seal researchers 1-3 weeks per year. 2003 Sensitive Species observed include: nesting oystercatchers, coyote, river otter sign, bear sign. Nearby reefs are used by arctic terns, gulls, oystercatchers harlequin ducks and harbor seals that may be impacted by kayakers in this area.	
74	Southeast Strawberry Island
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: river otter sign and bear sign.	
75	Southwest Strawberry Island
holds no particular attraction to campers unless they were passing by except for being the westernmost point of Strawberry Island and a natural stopping point for kayakers traveling through the northern part of Sitakaday Narrows. 2003 Sensitive Species observed include: oystercatchers, black turnstones, river otter sign and bear sign.	
76	Northern Tip Young Island
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: nesting sparrows, river otter sign and bear sign.	
77	East Side of Island in Secret Bay
Area holds no particular attraction to campers unless they were passing by. The only sensitive species observed in 2003 was a black bear.	
78	Cove West Side Young Island
Area holds no particular attraction to campers except for kayakers traveling through Sitakaday Narrows. 2003 Sensitive Species observed include: oystercatchers, river otter sign and bear sign.	
80	First Cove South of York Creek
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: wolf sign, river otter sign, and bear sign.	
81	York Creek
This area is a natural stopover for kayakers traveling up the east side of the bay as it offers level campable terrain and fresh water. 2003 Sensitive Species observed include: river otter sign and bear sign.	
82	South Leland Island
This area is very attractive to kayakers traveling up or down the east side of the bay because the "island hopping" route is the most direct and the rest of Leland Island is closed to camping. 2003 Sensitive Species observed include: nesting oystercatchers, nesting gulls of unknown species, and river otter sign. A nearby harbor seal haulout is extremely susceptible to disturbance from kayakers entering or leaving this area.	
83	1st Drainage S. of Spokane Cove
The main attraction of this area is probably that it is the last campable area at the southern end of a long beach camping closure and has freshwater available. 2003 Sensitive Species observed include:river otter sign, coyote sign, and bear sign.	
85	South Sturgess Island
This area is very attractive to kayakers traveling up or down the east side of the bay because the "island hopping" route is the most direct and the adjacent mainland is closed to camping. 2003 Sensitive Species observed include: river otter sign.	
86	North Sturgess Island
This area is very attractive to kayakers traveling up or down the east side of the bay because the "island hopping" route is the most direct and the adjacent mainland is closed to camping. 2003 Sensitive Species observed include: oystercatchers, nesting crows, and river otter sign.	
87	North Garforth Island
This area is particularly attractive to campers when the camper drop-off is located nearby at Mt. Wright. 2003 Sensitive Species observed include:river otter and bear sign.	
88	Mount Wright

This area is particularly attractive to campers when the camper drop-off is located nearby at Mt. Wright. 2003 Sensitive Species observed include: bear sign.	
89	Muir Point
This area has been used as a camper drop-of location and is also close to the Mt. Wright camper drop-off. It is also attractive in its location at the southern mouth of Adams Inlet. Sensitive species include oystercatchers with young, river otters and a black bear.	
90	Creek West of Tlingit Point
This area is especially attractive when the camper drop-off location is at nearby Sebree Island and because of its freshwater creek. 2003 Sensitive Species observed include: eagle nest, spawning salmon, wolf sign, otter sign and bear sign.	
91	Small Island south of Tlingit Point
This area is probably attractive when the camper drop-off location is at nearby Sebree Island. 2003 Sensitive Species observed include: over 260 oystercatchers, arctic terns, a large raft of scoters, several cormorants and mew and glaucous-winged gulls.	
92	Tlingit Point
This area is probably attractive when the camper drop-off location is at nearby Sebree Island, but beach terrace appears to be eroding and past evidence of use may have been erased. 2003 Sensitive Species observed include: oystercatchers, nesting crows, river otter sign and bear sign.	
94	SW Sebree Island
This area is often the location of a camper drop-off and is most likely used more heavily during those times. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign.	
95	SE Sebree Island
This area is probably attractive when the camper drop-off location is nearby on the southwest side of Sebree Island. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign.	
96	Caroline Point
This area is attractive to campers traveling up and down Muir Inlet, particularly when the camper drop-off is at Sebree Island. 2003 Sensitive Species observed include: arctic terns, oystercatchers, scoters off shore, river otter sign and bear sign.	
97	Shore North of Ice Valley Outflow
This area may be attractive to campers traveling up and down Muir Inlet but holds no other significant attractions. 2003 Sensitive Species observed include: spotted sandpipers suspected nesting, harlequin ducks with young, and bear sign.	
98	Morse Glacier Outwash
This area may be attractive to campers traveling up and down Muir Inlet but holds no other significant attractions other than freshwater. 2003 Sensitive Species observed include: oystercatcher with young, arctic terns, semipalmated plovers and spotted sandpipers acting defensively, sparrows and warblers with young, wolf sign, coyote sign, and bear sign.	
99	Creek across Muir Arm form Klotz Hills
This area may be attractive to campers traveling up and down Muir Inlet but holds no other significant attractions other than freshwater. 2003 Sensitive Species observed include:wolf sign, river otter sign and bear sign.	
100	Adams Glacier Outwash
This area may be attractive to campers who wish to hike the outwash. 2003 Sensitive Species observed include:semipalmated plovers, oystercatchers, arctic terns, wolf sign, and bear sign.	
101	Southwest of Adams Glacier Outwash
No specific attractions in this survey area. 2003 Sensitive Species observed include: spotted sandpipers, oystercatchers, and bear sign.	
103	South of Casement Glacier Outwash across Adams Inlet
No specific attractions in this survey area. 2003 Sensitive Species observed include:wolf sign and bear sign.	

104	Mid-Adams Inlet, South side
No specific attractions in this survey area except as a mid-point in Adams Inlet. 2003 Sensitive Species observed include: nesting juncos, wolf sign, and bear sign.	
105	Point George
The main attraction of this area is its location at the northern mouth of Adams Inlet. 2003 Sensitive Species observed include: oystercatchers and bear sign.	
106	Maquina Cove
Measured site contained trailing and cut branches. No specific attractions in this survey area. 2003 Sensitive Species observed include: bear sign.	
107	South Klotz Hills
No specific attractions in this survey area. No sensitive species observed in survey area.	
108	First Cove North of Klotz Hills
.No specific attractions associated with this survey area. 2003 Sensitive Species observed include: suspected nesting spotted sandpipers and semipalmated plovers, oystercatcher, river otter sign, brown bear.	
109	Large Former River Fan, South of Forest Creek.
No specific attractions associated with this survey area. 2003 Sensitive Species observed include: oystercatchers, parasitic jaegers, and bear sign.	
110	Center of Small Cove at South End of Forest Creek Fan
No specific attractions associated with this survey area. Evidence of 2003 Sensitive Species observed include: river otter sign, wolf sign and bear sign.	
111	North End of Forest Creek Fan
No specific attractions associated with this survey area. Evidence of 2003 Sensitive Species observed include: wolf sign and bear sign.	
112	Goose Cove
The attraction of this area is a small tidal lagoon and freshwater stream. 2003 Sensitive Species observed include: defensive oystercatchers, wolf sign and bear sign. Stream is believed to contain spawning salmon.	
113	Sealer's Island
2003 Sensitive Species observed include: nesting arctic terns, nesting mew gulls, nesting oystercatchers, nesting glaucous-winged gulls, nesting crows, river otter sign, and a brown bear.	
114	Rounded Peninsula between Nunatak and Goose Coves.
No specific attraction in this area except that it offers extensive camping possibilities. 2003 Sensitive Species observed include: defensive oystercatchers, nesting warblers, and bear sign.	
115	Nunatak (1st cove North of Nunatak)
No specific attractions in this survey area. 2003 Sensitive Species observed include: bear sign.	
116	Wolf Point
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: defensive semipalmated plovers, mew gulls, oystercatchers, and bear sign.	
117	Stump Cove
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: defensive oystercatchers and bear sign.	
118	North Side Wachusetts Inlet
No specific attractions in this survey area. 2003 Sensitive Species observed include: nesting sparrows and bear sign.	
119	Rowlee Point
This area's main attraction is its location at the southern mouth of Wachusetts Inlet. 2003 Sensitive Species observed include: defensive spotted sandpipers, oystercatchers, coyote sign and bear sign.	

120	Hunter Cove North
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: defensive semipalmated plovers and spotted sandpipers, oystercatchers, coyote sign, and a brown bear.	
121	Hunter Cove South
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include:river otter sign, wolf sign, and bear sign.	
130	Mouth of Geikie, North Shore
2003 Sensitive Species observed include: oystercatchers, spawning pink and chum salmon, river otter sign, a wolverine, and black bears and a brown bear.	
131	North shore Geikie with ARCH Geomarker
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: oystercatchers, spawning pink salmon, coyote sign, river otter sign, and a blue color phase black bear (glacier bear).	
132	First Site East of Charpentier Valley
No specific attractions in this survey area except for freshwater stream. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign.	
133	Valley From Charpentier Inlet
No specific attractions in this survey area except for freshwater stream. Sensitive species include common mergansers with young, oystercatchers and bear sign.	
134	Mid North Shore, Geikie Inlet
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: a black bear.	
135	Stream Off of South Mt. Bulky, Geikie Inlet
Rock cairn in survey area likely from camper drop-off. This area was used as a drop-off location for at least one year. Otherwise, no specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: brown bears.	
136	North Shore Geikie, about 1 mile from the head.
No specific attractions in this survey area except for access to Geikie Glacier Outwash. 2003 Sensitive Species observed include: bear sign.	
137	Head of Geikie Inlet, South Shore
No specific attractions in this survey area except for access to Geikie Glacier Outwash and freshwater stream. 2003 Sensitive Species observed include: bear sign.	
138	Mouth of Tyndall Inlet, West shore
No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: black turnstones, wolf sign and bear sign.	
139	West island of the two islands in Geikie Inlet
No specific attractions in this survey area except for being an island with scenic views. 2003 Sensitive Species observed include: black turnstones, oystercatchers and bear sign.	
140	Island at Mouth of Shag Cove, Geikie Inlet
No specific attractions in this survey area except for being an island with scenic views. Sensitive species observed nesting bald eagles, river otter sign and bear sign.	
150	East Drake Island
No specific attractions in this survey area except for being on an island with scenic views. Evidence of sensitive species observed river otter sign and bear sign.	
151	Johnson Cove, Willoughby Island

. Historic structure remnants were found in survey area. This area is attractive because it is located within a protected cove on the outside of Willoughby Island, and thus a natural stopover for kayakers passing by. 2003 Sensitive Species observed include: several species of orchids, river otter sign and bear sign.	
160	Large cove south of McBride Inlet
. No specific attractions in this survey area except for freshwater stream. 2003 Sensitive Species observed include: oystercatchers, wolf sign and bear sign.	
161	Long beach north of McBride Inlet
Four established sites, Impact Rating: 2 sites - Low, 1 site - Medium, 1 site - not rated. 2 sites with rock rings, 1 with intertidal fire pit, 1 with trash, 1 with human waste, and 3 with footprints. Trash, supratidal human waste, and footprints found in survey area. This area is attractive to campers because of its proximity to McBride Glacier and access to freshwater. Many Alaska Discovery guided kayaking trips begin or end in this location. 2003 Sensitive Species observed include: river otter, defensive oystercatcher, semipalmated plovers, coyote and bear sign.	
162	Riggs Glacier
This area is attractive to campers because of the spectacular views of Riggs Glacier. 2003 Sensitive Species observed include: nesting semipalmated sandpipers, spotted sandpipers, oystercatchers, finches with young, coyote, wolf and bear sign. Nesting arctic terns and mew gulls in vicinity that could be impacted by campers in this area.	
164	South Shore, Mid Upper Muir Inlet
This area is attractive to campers traveling in upper Muir Inlet because it is one of the few campable areas, and may be an access point for hiking up White Thunder Ridge. 2003 Sensitive Species observed include: nesting oystercatchers, suspected nesting spotted sandpipers, nesting swallows, wolf sign and bear sign.	
165	North Shore, Mid Upper Muir Inlet
This area is attractive to campers traveling in upper Muir Inlet because it is one of the few campable areas and has freshwater. 2003 Sensitive Species observed include: nesting arctic terns, mew gulls with young, oystercatchers with young, nesting semipalmated plovers, nesting glaucous-winged gulls, nesting herring gulls, and a spotted sandpiper. Boreal toad tadpoles were later reported at this site.	
166	North Shore, West End of Muir Inlet
This area is attractive to campers traveling in upper Muir Inlet because it is one of the few campable areas and has freshwater. 2003 Sensitive Species observed include: nesting mew gulls with young, nesting oystercatchers, nesting glaucous-winged gulls, defensive spotted sandpipers, semipalmated plovers, and American pipits.	
167	North spit McBride Inlet
This area is very attractive to campers because of the spectacular views of McBride Glacier. 2003 Sensitive Species observed include: nesting oystercatchers, nesting gulls of unknown species, defensive semipalmated plovers, coyote sign, bear sign, and wolf sign including evidence of pups. Harbor seals pupping and molting in fjord would potentially be disturbed by campers in this area. Arctic terns have been observed nesting in area in past, but no evidence of nesting was observed in 2002 or 2003.	
168	South spit McBride Inlet
This area is very attractive to campers because of the spectacular views of McBride Glacier. 2003 Sensitive Species observed include: oystercatchers with nests, semipalmated plovers, spotted sandpipers, wolf sign, bear sign, and possible river otter sign. Harbor seals pupping and molting in fjord would potentially be disturbed by campers in this area.	
170	Garforth Island, South End
. This area is probably most attractive to campers when the camper drop-off is nearby at Mt. Wright. 2003 Sensitive Species observed include: oystercatchers, river otter sign and bear sign.	
171	Blue Mouse Cove, Southeast
Area holds no particular attraction to campers unless they were passing by. Evidence of 2003 Sensitive Species observed include: river otter sign and bear sign.	

172	Small Island in South Blue Mouse Cove
Area holds no particular attraction to campers unless they were passing by. Evidence of sensitive species observed was bear sign.	
173	North tip of Mainland Peninsula in Mid-Hugh Miller Inlet
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: oystercatchers, a black bear and river otter sign.	
174	Northeast Mouth of Charpentier Inlet
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: young spotted sandpipers, river otter sign, and bear sign.	
175	Small Island at Mouth of Charpentier Inlet
Area holds no particular attraction to campers except for being an island with scenic views. 2003 Sensitive Species observed include: mew gulls with young, oystercatchers with young, arctic terns, dowitchers, black turnstones, crow nest, and bear sign.	
176	South Tip of Island off Southeast Tip of Gilbert Peninsula
No established sites or evidence of human use. Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: river otter sign, mink sign, and bear sign including evidence of cubs.	
177	South of Entrance to Weird Bay, mouth of Scidmore Bay
Area holds no particular attraction to campers unless they were passing by. 2003 Sensitive Species observed include: oystercatchers, glaucous-winged gulls and molting harlequin ducks.	
180	Mt. Wright Drop-off
This area is sometimes the location of a camper drop-off and probably receives most of its use during these times. The potential for falling rocks makes this area hazardous for camping. 2003 Sensitive Species observed include: river otter sign and bear sign.	
181	Topeka Outwash East
Created in 2011	
182	Topeka Outwash West
Created in 2011	
183	Tarr Inlet West Side
Created in 2011	
185	Tarr Inlet West Side
Created in 2011	
186	Tarr Inlet West Side
Created in 2011	
187	Sebree
Created in 2011	

Appendix II. Historical Campsite Assessment Summary

Survey Year	Location Information/Data Source(s)	Attribute Information	Completeness of Data	Comparison to 2012 Possible
1970s	• Survey sheets • Paper maps	General descriptive information; focus on structures (e.g. cabins, tent platforms, etc.)	• Selected areas • Lacking Survey Area ID • Narrative report – would require coding	No
1982/83	• Survey sheets • Paper maps	• General descriptive information • Counted tent sites, fire rings •Descriptive information about vegetation condition (e.g. "trampled," "flattened," "dead," "recovering")	• Selected areas • Lacking Survey Area ID • Narrative report – would require coding	Minimal
1986/87	• Survey sheets • Paper maps	• Frequency of use • Substrate • Dominant vegetation • Area of vegetation impact (square feet) • Area of substrate impact (square feet) • Fire rings (count) • Human alteration • Human waste • Trash • Trails (yes/no) • Condition (pass/fail) • General comments	• Selected areas • Data sheets mostly complete • Some areas have associated Survey Area ID • Open-ended comments would require coding • Not all reports distinguish between 'satellite sites' and individually impacted sites	Minimal
2002/03	• GIS locations	• Unique campsite ID	Links to Access database	Minimal
2002/03	• Digitized data sheets (electronic spreadsheets)	• Site Name • Location description • Landing substrate • Site substrate	• Attribute information mostly complete • Descriptive observations require coding	Minimal

		• Veg type in site • Veg type off site • Site length • Site width • General observations • Trailing • Supratidal fire pit • Rock ring • Intertidal firepit • Trash • Human waste • Firewood • Structures • Footprints • Size • Long-lasting impact • Short-lived impact • Impact number • Impact rating Observer rating	• Many variables coded as presence (TRUE) or absence (FALSE) • Inconsistency in measurement/ application of protocol (e.g. site dimensions; using vague terms like "several" instead of giving a number)	
2011	• GIS locations	• Location description • Type of site • Landing substrate • Campsite substrate • No. satellite sites • Condition class • Veg cover on site • Veg cover off site • Trash • Human waste • Campfire • Rock rings • Size category • Campable area • Size estimate • Size dimension • Dominant vegetation type	• Attribute information missing for most locations • Missing Survey Area ID for each site – can be overlaid with Survey Area layer in GIS • Lacking complete spatial information for 2011 survey areas (i.e. no polygon layer)	No
2011	• Digitized data sheets (electronic spreadsheets)	• Site Name • Location description • Landing substrate • Site substrate • Veg type in site	• Attribute information mostly complete • Descriptive observations require coding • Many variables	Minimal

		• Veg type off site • Site length • Site width • General observations • Trailing • Supratidal fire pit • Rock ring • Intertidal firepit • Trash • Human waste • Firewood • Structures • Footprints • Size • Long-lasting impact • Short-lived impact • Impact number • Impact rating Observer rating	coded as presence (TRUE) or absence (FALSE) • Inconsistency in measurement/ application of protocol (e.g. site dimensions; using vague terms like "several" instead of giving a number) Several sites not measured	
2012	• GIS locations	• Landing substrate • Campsite substrate • Dominant vegetation type • Tent rocks • Campfire • Tree/shrub damage • Veg cover on site • Veg cover off site • Site size • Trash	• Mostly complete – lacking size information for 7 measured campsites	N/A

Appendix III: Number of full assessments completed per survey area each year

Data sources: Export_WCIsites3.xlsx and tblSiteObs.xlsx, provided by National Park Service

Survey Area	2002	2003	2011	2012
Not Given			47	
1		8		10
2		3		
3		1		2
4		6	1	5
5		4	1	23
6		1		
7		5	3	
9		3		47
10		3	1	32
11		6		4
12	1			4
13	1			1
14	1			
15	1			
16	1			4
20				
21		3	1	6
22		4		2
23		4		3
24		1		1
25		6		2
26		1	1	3
27		2		1
28		1		
29		2		
30		1		
31		2		1
32		2		2
33				
34		2	1	5
35		1		1
36		2	1	5

37		2		
38		2	1	7
39		2	1	15
40				
41		1	1	
42		1		
43		1		1
50	1			
51	1			
52	1	1		
53	1			2
54	1			
55	1	1		1
56	1		1	
57	1	1		
58	1	1		2
59	1	1		1
60		1		
61	1			
62	1			
63	1			2
64		2		
65	5	4		
66	1			
67		1		
68		2		1
69	1			
70		1		
71	1			
72	1			
73	1	1		
74	1			
75	1			
76	1			1
77	1			
78		1		1
80	2			
81	3			
82	2			
83	1			
85	2			

86	1				
87	3				
88	1				
89	1				
90		4	1		
92	2	1			
94	4	3	1		
95	2		2		
96	5				
97	4				
98	1				
99	1				
100	1				
101	1				
103	1				
104	1				
105	1				
106	1				
107	1				
108	5				
109		2			
110		1			
111		2			
112	6				
113	1				
114	3				
115	1				
116	1				
117	1				
118	1				
119	1				6
120	1				4
121					
130	1				
131	1				
132	1				
133	1				
134	2				
135	2				
136	2				
137	2				

138	1			
139	1			
140	1			
150	1			
151	2			
160	1			2
161	2	2	4	11
162	6		2	3
164	3	2		
165	1			4
166	2			8
167	1	6	2	
168	2	8	2	
170	2			
171	1		1	
172	1			
173	1			2
174	1			
175	1			
176	1			1
177	1			
180		1		
181				1
182				1
183				2
184				
185				1
186				5
200				12
201				1
202				3
212	1			
Total number of measured sites	142[a]	133[b]	76[c]	265

[a] 15 sites not measured in 2002
[b] 1 site not measured in 2003
[c] 6 sites not measured in 2011

Appendix IV: Summary of Historical Assessments by Data Source

Survey Area	2002 GIS	2002 tblsSiteObs	2003 GIS	2003 tblSiteObs	2004 Report	2011 GIS	2011 tblSiteObs	2012
Not Given							47	
1	0		8	8		0		10
2	0		3	3		0		-
3	0		1	1		0		2
4	0		6	6		17	1	5
5	0		4	4		12	1	23
6				1				
7	0		5	5		19	3	-
9	0		3	3		8		47
10	-		-	3		-	1	32
11	0		6	6		0		4
12	1	1	0			0		4
13	1	1	0			0		1
14	1	1	0			3		-
15	1	1	0			3		-
16	1	1	0			5		4
20	0		0			7		-
21	0		3	3		12	1	6
22	0		4	4		4		2
23	0		4	4		4		3
24	0		1	1		0		1
25	0		6	6		5		2
26	0		1	1		6	1	3
27	0		2	2		0		1
28	0		1	1		0		-
29	0		2	2		5		-
30	0		1	1		0		-
31	0		2	2		4		1
32	0		2	2		7		2
33	0		0			2		-
34	0		2	2		6	1	5
35	0		1	1		0		1
36	0		2	2		0	1	5
37				2				
38	0		2	2		3	1	7
39	0		2	2		6	1	15

40	0		0			7		-
41	0		1	1		5	1	-
42				1				
43	-		-	1		-		1
50	1	1	0			0		-
51	1	1	0			0		-
52	1	1	1	1		0		-
53	1	1	0			0		2
54	1	1	0			0		-
55	1	1	1	1		3		1
56	1	1	0			4	1	-
57	1	1	1	1		0		-
58	1	1	1	1		0		2
59	1	1	1	1		3		1
60				1				
61	1	1	0			0		-
62	1	1	0			0		-
63	1	1	0			0		2
64				2				
65	2	5	3	4		0		-
66	1	1	0			0		-
67				1				
68	-		-	2		-		1
69	1	1	0			0		-
70				1				
71	1	1	0			0		-
72	1	1	0			5		-
73	1	1	1	1		0		-
74	1	1	0			0		-
75	1	1	0			0		-
76	1	1	0			0		1
77	1	1	0			0		-
78	-		-	1		-		1
80	1	2	0			0		-
81	1	3	0			0		-
82	1	2	0			0		-
83	1	1	0			0		-
85	1	2	0			0		-
86	1	1	0			0		-
87	1	3	0			0		-
88	1	1	0			0		-

89	1	1	0			0		-
90				4			1	
92	1	2	1	1		0		-
94	2	4	2	3		5	1	-
95	1	2	0			2	2	-
96	2	5	0			0		-
97	1	4	0			0		-
98	1	1	0			0		-
99	1	1	0			0		-
100	1	1	0			0		-
101	1	1	0			0		-
103	1	1	0			0		-
104	1	1	0			0		-
105	1	1	0			0		-
106	1	1	0			0		-
107	1	1	0			0		-
108	2	5	0			0		-
109				2				
110				1				
111				2				
112	2	6	0			0		-
113	1	1	0			0		-
114	2	3	0			0		-
115	1	1	0			0		-
116	1	1	0			0		-
117	1	1	0			0		-
118	1	1	0			0		-
119	2	1	0			0		6
120	2	1	0			0		4
121	1		0			0		-
130	1	1	0			0		-
131	1	1	0			0		-
132	1	1	0			0		-
133	1	1	0			0		-
134	1	2	0			0		-
135	1	2	0			0		-
136	1	2	0			0		-
137	1	2	0			0		-
138	1	1	0			0		-
139	1	1	0			0		-
140	0	1	0			0		-

150	1	1	0			0		-
151	1	2	0			0		-
160	1	1	0			0		2
161	2	2	2	2		12	4	11
162	2	6	0			6	2	3
164	1	3	2	2		0		-
165	1	1	0			6		4
166	1	2	0			0		8
167	0	1	6	6		7	2	-
168	0	2	8	8		18	2	-
170	1	2	0			0		-
171	1	1	0			3	1	-
172	1	1	0			3		-
173	1	1	0			0		2
174	1	1	0			0		-
175	1	1	0			0		-
176	1	1	0			0		1
177	1	1	0			0		-
180				1				
181	-		-			-		1
182	-		-			-		1
183	-		-			-		2
184	-		-			-		-
185	-		-			-		1
186	-		-			-		5
200	-		-			-		12
201	-		-			-		1
202	-		-			-		3
212		1						
Total number of sites	**98**	**142[a]**	**105**	**133[b]**	**257[c]**	**227**	**76[d]**	**265**

[a] 15 sites not measured in 2002
[b] 1 site not measured in 2003
[c] 268 sites identified in 2002/2003; 257 measured and rated
[d] 6 sites not measured in 2011

GIS values for 2002, 2003, and 2011 were derived by overlaying campsite point data with survey area polygons in ArcMap and counting the number of campsites within each survey area. Attribute tables from the point shapefiles were edited to include each point's corresponding survey area number.

tblSiteObs values for 2002, 2003, and 2011 were derived by (i) manually merging tblSiteObs.xls (attribute data) and Export_WCIsites3.xls (spatial location data) and then (ii) selecting sites for which the field **Measured** was TRUE.

2004 Report values were taken from the Lewis and Drumheller (2004) camper impact report. This report summarizes the campsite monitoring data collected in 2002 and 2003.

Appendix V: GLBA Data Collection and Handling Recommendations

- For each feature collected, enter *all* attribute information
- Minimize comments/field notes to relevant information not adequately captured in the attribute fields. Reading comments for all sites is very time consuming, and coding the information can be difficult (multiple observers, clarity/specificity of information provided, etc.).
- Be as specific as possible (within reason!) in comments. For example, instead of "multiple tent pads" or "several tent rocks," record a number. This will enable analysis of trends and comparisons between sites/areas.
- Do not separate out data. Having data in too many places makes it difficult to ensure all sites are being counted and hinders the ability to make comparisons over time. Maintain all data in GIS format (e.g. shapefiles, geodatabases). Files can be merged to ease data management (e.g. create one "campsite" file for each survey year by merging individual files collected in the field). Attribute information can be exported to a flat file format (.xls, .csv, etc.) for statistical analysis/summarizing.
- Do not separate attribute information from spatial information (e.g. create multiple tables/files). If you must for analysis purposes, make sure to keep the original file.
- Develop a standard protocol for naming files
- Create a metadata file for each data file
- Future data needs: updated polygon layer of Survey Areas

Appendix VI: Glacier Bay National Park Recreation Impact Assessment Protocol v.5.

Overview

Goal of the Procedural Manual

This manual describes all procedures necessary to conduct initial and repeat campsite assessments in coastal areas of Glacier Bay National Park.

Application to Park Management

Local land managers can use past, current, and future data in the following manner:

- Document current impacts and condition of campsites.
- Create Limits of Acceptable Change (LAC) standards and indicators.
- Develop minimum impact suggestions for users.
- Assist in the determination of sustainable visitor capacities for Glacier Bay National Park.
- Create boundaries for various use zones.

Staff Training

Although this manual contains all the information necessary to conduct the inventory and monitoring program, it is not meant to be a substitute for proper on-site staff training. The objective of staff training is to communicate and illustrate field procedures, develop and refine experience and judgment, and build a commitment to quality. A minimum of two days of staff training is recommended. Training can be organized as outlined below:

Day 1: Field staff read and discuss procedural manual – *Glacier Bay National Park Recreation Impact Assessment Protocol*.

Day 2: For Quality Control, assessment procedures are demonstrated on a typical campsite. Following discussion and question and answer session, field staff, independently or in small groups, will apply procedures to a common survey area and group of campsites. The entire group reviews evaluations of each campsite. Differences are examined and resolved by referring to the manual and group critique.

A minimum of two field personnel are needed to conduct the inventory.

Materials for Collecting Field Data

- *Glacier Bay National Park Recreation Impact Assessment Protocol* – one per person
- Glacier Bay topographic map
- Compass
- Flagged wire pins – 25 minimum (two separate colors if more than one group is working in same area)

- Trimble Nomad or GeoXT GPS unit, Stylus
- Data Dictionary: GLBA2012_Rapid_v7
- Survey area polygons loaded onto GPS units or aerial photo
- Digital camera (for back-up)
- Note pad and pencil

Description of Procedures

This manual describes procedures for conducting inventories and resource condition assessments necessary to document changes in condition of coastal campsites in Glacier Bay National Park.

Types of Assessments

Survey Area

For the purposes of this manual, survey areas are defined as areas where camping activities are known or suspected to take place. These areas will be walked and scouted for campsites and other signs of visitor use. Polygons of survey areas collected in 2002-2003 will be used to guide field crews. Survey areas are (often but not always) predefined by the 2002-2003 camper impact survey. Make sure you are covering the entire survey area as defined in the Trimble or the aerial photo given to you prior to your trip. Make sure you sweep the entire area from **mean high tide and then inland** to the logical end of most camper activity. If new survey areas are established, please start numbers at 200.

Campsites

Definition of a campsite:
For the purposes of this manual, campsites are defined as locations where there is clear evidence of recent (within last 2-3 years) camping activity. Each "campsite" is distinct and separated by vegetation, geographic restrictions, etc. If you are questioning whether a large site is multiple sites or a single site, please record it as multiple sites. Conversely, do not call multiple sites a single site (i.e. no satellite sites!).
Evidence includes:

- Vegetation loss or change clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.).
- Flattened vegetation clearly caused by human use (i.e. in the pattern of a tent, etc.)
- Compressed gravel clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.).
- Recently placed tent rocks
- Camp trash
- Recent tree or shrub damage
- Campfire in site

Finding sites to add to the inventory/monitoring program

A goal of the inventory/monitoring program is to keep informed of campsite conditions in Glacier Bay National Park. To achieve this goal, new visitor sites are added to the inventory as they are discovered. Survey areas must be thoroughly searched to identify locations of visitor sites to add to the program and locate previously surveyed campsites – including those no longer used. After landing on a beach with potential camping, conduct searches for new visitor sites by following all visitor-created trails, however faint, to search out likely camping areas. Analyze visitor sites' vegetation by comparing site to adjacent areas of similar topography – compare a disturbed beach berm with a similar undisturbed beach berm. For coastal visitor sites (those along or near beaches), be sure to analyze the site for natural influences, such as tidal and weather, to determine whether the vegetation inconsistencies are due to human or environmental influence. If you are in doubt as to whether the site is a campsite – please log it as a suspect site!

Suspected Campsites

For the purposes of this manual, *suspected campsites* are defined as a location where camping is likely to have occurred and use is suspected, but no clear evidence is present. If evidence of recent camping is present (see above list), the location should be recorded and measured as a campsite. If you are in doubt that the site is indeed a suspect site, do not record the site!

Visitor-Created Trails

A visitor-created trail connects known areas of visitor use, such as campsites, water sources, food storage areas, viewpoints, and intertidal access. Only include trails that are 5-meters in length or longer. Do not map wildlife trails

Sensitive Species

Collect a waypoint for sensitive species or species of concern including: nesting birds, dens, exotic plants, and hauled out and/or unusual animal species.

Interstadial Wood

Gather a point for interstadial wood that is in place (i.e. large logs or stumps that are embedded in the soil). Do not include driftwood. Indicate whether or not there are signs of human-caused damage, such as cuts, charring, or burn scars.

Rapid Assessment Backcountry Campsite Assessment Procedures

Survey Area

Survey areas are (often but not always) predefined by the 2002-2003 camper impact survey. Make sure you are covering the entire survey area as defined in the Trimble or the aerial photo given to you prior to your trip. Make sure you sweep the entire area from **mean high tide and then inland** to the logical end of most camper activity. Begin at one

end of the survey area. Walk the entire area to search for campsites and other signs of visitor use. As you walk, do the following:

- Place a pin flag in each campsite and suspected campsite that you encounter.
- Keep a tally of the number of fire signs, human waste sites, structures, and amount of trash you find.

When you have concluded your sweep of the survey area, start the GPS and do the following:

1. Open TerraSynch and create new file. Use the numeric code for the survey area to name the file.
2. Load GLBA2012_Rapid_v7 data dictionary.
3. Collect "**Survey Area**" point within the survey area polygon and record attributes

Attributes

1. **Survey Area Number:** Enter pre-assigned three-digit survey area code

2. **Surveyed By:** Enter the initials of the field crew conducting the assessment

3. **Fire Signs:** Enter the number of supratidal fire signs you encountered in the survey area. Fire signs include fire rings, charcoal piles, and large burnt logs. Do not include burnt scattered pieces of charcoal or washed-up firewood.

4. **Trash:** Use the drop down menu to choose a category for the amount of camping trash found in the survey area. Do not include trash found in campsites (this will be counted later) or flotsam that has been washed ashore.
    a. None
    b. Handful or less
    c. Handful to gallon
    d. Gallon to 5 gallons
    e. More than 5 gallons

5. **Human Waste:** Follow all trails in the vicinity of campsites to conduct a quick search of likely "toilet" areas, typically just out of site of campsites. Count the number of individual human waste sites, defined as separate locations exhibiting toilet paper and/or human feces. The intent is to identify the extent to which the improper disposal of human waste is a problem. Enter the number of individual human waste sites found within the survey area. Include upland and supratidal sites only. Note: use individual counts for each location (e.g. one multi-day/use pile is 1 site).

6. **Structures:** Enter the number of human-made structures encountered. Include beach furniture made of rock, wood, or other available materials; stacked rocks such as cairns. Do not include tent rocks, fire rings.

7. **Comments:** Enter any notable comments, if any, about the area.

8. **Field Notes:** Use the drop down menu to indicate whether any field notes were recorded separate from the information collected using the GPS unit.

9. **Date/Time:** Created automatically with feature.

Campsite

Walk the survey area again, using the pin flags you placed during the initial sweep to help locate campsites observed during the initial sweep of the survey area. At the campsite, stand in the center and collect a high-accuracy GPS point (minimum of 20 locations collected on the GPS for each site). A high-accuracy point is critical in relocating campsites during future monitoring. Do not move from the center of the campsite while the GPS is logging. If you must move or the GPS has logged at least 20 positions, select the Pause button before moving. You can continue entering attribute information while the data logger is paused. Remove the pin flag before moving on to the next site.

Attributes

1. **Survey Area Number:** Enter the three-digit number of the survey area where the campsite is located.

2. **Campsite Number:** Enter a number for the campsite, beginning at 1 for each survey area and increasing incrementally.

3. **Surveyed By:** Enter the initials of the field crew conducting the assessment

4. **Rationale:** Specify *why* you are designating the location as a campsite by choosing an option from the drop down menu:
    a. Veg loss or change – Primary reason for recording the location as a *campsite* is due to vegetation loss or change clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.).
    b. Flattened veg – Primary reason for recording the location as a *campsite* is due to flattened vegetation clearly caused by human use (i.e. in the pattern of a tent, etc.).
    c. Compressed gravel – Primary reason for recording the location as a *campsite* is due to compressed gravel clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.).
    d. Tent rocks – Primary reason for recording the location as a *campsite* is due to the presence of recently placed tent rocks.
    e. Camp trash – Primary reason for recording the location as a *campsite* is due to the presence of camping trash in the site.
    f. Tree/shrub damage – Primary reason for recording the location as a *campsite* is due to recent tree or shrub damage caused by human use (i.e.

sawed limbs or branches, axe/hatchet scars, burn scars, cut stump, broken or twisted branches, etc.).

g. Campfire – Primary reason for recording the location as a *campsite* is due to the presence of a campfire in the site.
h. Other – There is another reason for considering this location a *campsite*. Specify the reason in the **Comments** field at the end of the data dictionary.

5. **Landing Substrate:** Record the predominant substrate where visitors using this site would land their boats by choosing one of the categories below from the drop down menu:
    a. Cobble – includes gravel size stone and larger; smaller than boulders
    b. Sand – includes sandy beach soils which do not form a surface crust in trampled areas
    c. Soil – includes clays to loamy soils
    d. Boulder – includes large rocks 8-inches in diameter or larger (think melon-size or larger)
    e. Cobble/Sand – combination of cobble and sand

6. **Campsite Substrate:** Record the predominant substrate of the campsite by choosing one of the categories below from the drop down menu:
    a. Boulder – includes large rocks 8-inches in diameter or larger
    b. Cobble – includes gravel size stone and larger; smaller than boulders
    c. Sand – includes sandy beach soils which do not form a surface crust in trampled areas
    d. Cobble/Sand – combination of cobble and sand
    e. Soil – includes clays to loamy soils
    f. Compacted gravel – small size stone that has been compacted and flattened into an obvious tent pad. Common in recently deglaciated areas that have little or no vegetation.

7. **Campsite Size:** Record the size of the campsite by choosing one of the categories below from the drop down menu. Assume a 5'x7' tent with enough room for normal camp activities. If in doubt, divide into multiple campsites.
    a. Small – 1 tent pad
    b. Medium – 2-3 tents
    c. Large – 4-5 tents
    d. X-large – more than 5 tents

8. **Tent Rocks:** Count all rocks within the site that have been moved and placed by humans. A tent rock should be fist-size or larger and obviously placed within the site.

9. **Campfire IN Site:** Count the number of campfire signs within the campsite.

10. **Veg Cover ON Site:** An estimate of the percentage of live non-woody vegetative ground cover (including herbs, grasses, and mosses. Exclude tree seedlings,

saplings, and shrubs) within the campsite boundaries using the categories listed below. Exclude undisturbed "islands" of vegetation. For this and the following parameter, it is often helpful to narrow your decision to two categories and concentrate on the boundary that separates them. For example, if the vegetation cover is either 6-25% or 26-50%, you can simplify your decision by focusing on whether vegetative cover is greater than 25%. Do not extrapolate the amount of ground cover that could or should be seen. Use total leaf coverage, not stem or stock coverage, to determine percent. Refer to the color photos provided in this manual for further guidance.

a. 0-5%
b. 6-25%
c. 26-50%
d. 51-75%
e. 76-95%
f. 96-100%

11. **Veg Cover OFF Site:** An estimate of the percentage of vegetative ground cover in an adjacent but largely undisturbed "control" area. Use the categories listed below. The control site should be similar to the campsite in slope, tree canopy cover (amount of sunlight penetrating to the forest floor), and other environmental conditions. The intent is to locate an area which would closely resemble the campsite area had the campsite never been used. In instances where you cannot decide between two categories, select the category with less vegetative cover. The rationale for this is simply that, all other factors being equal, the first campers would have selected a site with the least amount of vegetation cover. Refer to the color photos provided in this manual for further guidance.
    a. 0-5%
    b. 6-25%
    c. 26-50%
    d. 51-75%
    e. 76-95%
    f. 96-100%

12. **Veg Type 1 IN Site:** Indicate the dominant vegetation type within the site by choosing from the drop down menu:
    a. Sparse Herbacerous – leafy forbs and herbs growing intermittently within the campsite boundaries
    b. Dense Herbaceous – leafy forbs and herbs growing closely together or continuously within the campsite boundaries
    c. Open Scrub – shrub or alder scrub that is open enough to allow for easy walking among plants
    d. Dense Scrub – shrub or alder scrub with plants growing densely together and providing a barrier to easy walking
    e. Graminoid – grasses and grass-like plants (sedges)
    f. Dryas Mat – low growing mats of Dryas spp.
    g. Moss

h. Lichen
i. Other

13. **Veg Type 2 IN Site:** If vegetation within the boundaries of a campsite is an equal mixture of two types (e.g. Moss and Lichens), indicate the co-dominant vegetation type here by choosing one of the categories listed below from the drop down menu. If there is one clear dominant vegetation type, leave this attribute blank.
    a. Sparse Herbacerous – leafy forbs and herbs growing intermittently within the campsite boundaries
    b. Dense Herbaceous – leafy forbs and herbs growing closely together or continuously within the campsite boundaries
    c. Open Scrub – shrub or alder scrub that is open enough to allow for easy walking among plants
    d. Dense Scrub – shrub or alder scrub with plants growing densely together and providing a barrier to easy walking
    e. Graminoid – grasses and grass-like plants (sedges)
    f. Dryas Mat – low growing mats of Dryas spp.
    g. Moss
    h. Lichen
    i. Other

14. **Veg Type 1 OFF Site:** Indicate the dominant vegetation type present in an adjacent but largely undisturbed "control" area. Use the categories listed below. The control site should be similar to the campsite in slope, tree canopy cover (amount of sunlight penetrating to the forest floor), and other environmental conditions. The intent is to locate an area which would closely resemble the campsite area had the campsite never been used. If the campsite is located in a forested area with tall trees, indicate the dominant understory vegetation type.
    a. Sparse Herbacerous – leafy forbs and herbs growing
    b. Dense Herbaceous – leafy forbs and herbs growing closely together or continuously
    c. Open Scrub – shrub or alder scrub that is open enough to allow for easy walking among plants
    d. Dense Scrub – shrub or alder scrub with plants growing densely together and providing a barrier to easy walking
    e. Graminoid – grasses and grass-like plants (sedges)
    f. Dryas Mat – low growing mats of Dryas spp.
    g. Moss
    h. Lichen
    i. Other

15. **Veg Type 2 OFF Site:** If vegetation within the control area is an equal mixture of two types (e.g. Moss and Lichens), indicate the co-dominant vegetation type here by choosing one of the categories listed below from the drop down menu. If there is one clear dominant vegetation type, leave this attribute blank.

a. Sparse Herbacerous – leafy forbs and herbs growing intermittently
b. Dense Herbaceous – leafy forbs and herbs growing closely together or continuously
c. Open Scrub – shrub or alder scrub that is open enough to allow for easy walking among plants
d. Dense Scrub – shrub or alder scrub with plants growing densely together and providing a barrier to easy walking
e. Graminoid – grasses and grass-like plants (sedges)
f. Dryas Mat – low growing mats of Dryas spp.
g. Moss
h. Lichen
i. Other

16. **Trash:** Include all recreational use litter or trash that is present within the boundaries of the campsite. Choose an amount from the drop down menu:
    a. None
    b. Handful or less
    c. Handful to gallon
    d. Gallon to 5 gallons
    e. More than 5 gallons

17. **Tree/Shrub Damage:** Count the number of separate events of tree or shrub damage within a 2 meter radius of the campsite that is clearly caused by humans. Examples of tree/shrub damage include sawed limbs or branches, axe/hatchet scars, burn scars, cut stump, broken or twisted branches. Do not include tree and shrub damage caused by wildlife (e.g. scraping or scratching from bears, moose, and other animals) or storm damage.

18. **Reference Photo:** Take a photo of the campsite using the Trimble camera and link the file to the campsite feature here (see directions below). If the GPS unit you are using does not have a camera or the camera is not working, take a photo using a separate digital camera and indicate the file name in the Comments section. When taking the photo, choose the best vantage point that gives you a clear perspective of the campsite.

19. **Photo Bearing:** Enter compass bearing from the location where you take the campsite reference photo. This will aid in future relocation of the campsite.

20. **Comments:** Record comments regarding anything noteworthy about this campsite. If you selected "Other" in the **Rationale** field, explain why you recorded this location as a *campsite*.

21. **Field Notes:** Use the drop down menu to indicate whether field notes associated with this campsite were taken separately from the information recorded in the GPS unit during the assessment.

22. **Date/Time:** Created automatically when the campsite feature is created.

Suspected Campsite

In locations where camping is suspected but no clear evidence of recent camping is present, a *Suspected Campsite* feature can be created with the GPS. Stand in the center of the suspected site and collect a high-accuracy point. Note any relevant information in the **Comments** field. The rationale for collecting location information for suspected campsites is that these sites can be relocated during future monitoring and inspected for evidence of camping activities. A "suspected campsite" may develop into a "campsite" over time.

Attributes

1. **Surveyed By:** Enter the initials of the field crew conducting the assessment.

2. **Comments:** Specify why you designated this location as a *suspected campsite*.

3. **Date/Time:** Created automatically when the suspected campsite feature is created.

Sensitive Species

Collect a waypoint for sensitive species or species of concern including: nesting birds, dens, exotic plants, and hauled out and/or unusual animal species. Please try NOT to disturb the nest, den or animals by getting too close. Take the GPS point from a distance at which the animals' behavior is not changed by your presence.

Attributes

1. **Type:** Choose one of the following from the menu of sensitive species:
    a. Bird nest
    b. Mammal den
    c. Animals
    d. Hauled out pinniped
    e. Exotic plant
    f. Other

2. **Species:** Choose one of the following from the menu:
    a. BLOY
    b. ARTE
    c. Gull
    d. Weasel
    e. Canine

f. Bear
g. Marmot
h. Boreal Toad
i. Dandelions
j. Other
k. Unknown

3. **Number:** If applicable, enter the number of nests, dens, or other sensitive species. Not necessary for dandelions, etc.

Description: A 50 character memo field to write any necessary notes on your observation.

Vis Created Trail

A visitor-created trail connects known areas of visitor use, such as campsites, water sources, food storage areas, viewpoints, and intertidal access. Only include trails that are 5-meters in length or longer. Do not map wildlife trails.

Walk and map any visitor-created trails in the survey area. The Vis Created Trail is set to collect a location every 1 second. This creates a more precise line feature. However, you don't want to stop and stand around without pausing while logging or you'll get a big jumbled mess of lines! Record any relevant information in the **Comments** field.

Interstadial Wood

Collect a point to indicate the location of any large pieces of interstadial wood within the survey area. Use the drop down menu to indicate whether there is any **Human-caused damage** present. Record any relevant information in the **Comments** field.

Taking Campsite Reference Photos Using the Trimble Nomad GPS

Before taking the photo, make sure the data logger is paused and the GPS is not collecting any position data.

1. From TerraSynch, tap on the Windows icon in the top left corner of the screen. Select **Pictures and Videos** from the drop down menu. A new window will open.

2. Tap the **Camera** icon in the top left corner of the window.

3. Aim the front of the Nomad at the campsite. The screen will function as the viewfinder of the camera.

4. Press the Enter button **[↵]** on the front of the Nomad to take the picture.

5. Underneath the picture, select **Menu**.

6. Click on **Properties**. Name the file using the 3-digit survey area code and campsite number using the following format: <survey area>_<campsite number>. For example, the reference photo for campsite 4 in survey area 007 would be named 007_4.jpg.

7. Close the camera program by clicking **OK** in the top right corner. You will be back in the campsite feature in TerraSynch that you collected previously.

8. Under the **Reference Photo** field, tap the box with the stylus. You should see a list of files in the My Pictures folder. If necessary, navigate to the correct folder by tapping the **[…]** icon next to the drop down box.

9. Select the file for this campsite (007_4.jpg). The most recent photo should appear at the top of the list. To view or verify the file, tap the **Play** button (looks like a right-pointing triangle) next to the box. The picture you have selected will be displayed. To clear the preview, click **OK**.

Vegetation Reference Photos

Cover On Site

0-5% cover

6-25% cover

26-50% cover

51-75% cover

76-95% cover

96-100% cover

Cover Off Site

0-5% cover

6-25% cover

26-50% cover

51-75% cover

76-95% cover

96-100% cover

Glossary of Terms

boulder: Rocks 8-inches in diameter (melon-size) or larger

campsite: For the purposes of this manual, campsites are defined as locations where there is clear evidence of recent (within last 2-3 years) camping activity. Evidence of camping includes: Vegetation loss or flattened vegetation clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.), compressed gravel clearly caused by human use (i.e. in the pattern of a tent, framed by tent rocks, etc.), recently placed tent rocks, camp trash, recent tree or shrub damage, campfire in site. This clear evidence **must** be present to call a location a campsite.

cobble: Fist sized rocks, larger than gravel, that do not move when you walk on them.

compacted gravel: Gravel that has been flattened to accommodate a tent. Rocks do not shift when walked on.

gravel: Small rocks of maximum size 1-2 cm. If it moves when you walk on it, it's gravel.

interstadial wood: Large pieces of wood, such as logs or stumps, that were covered by glacial ice and exposed after glacier receded.

landing: Area where visitors pull their boat up to the shore.

sand: Includes any sandy beach soils that do not form a surface crust in trampled areas.

soil: Includes any clays to loamy soils. Soil is a mixture of minerals, organic matter (dead and alive), water and air. Note: moss is a vegetation, NOT a soil.

substrate: A general term used to describe the soil-vegetation types where campsites are found.

supratidal: The area above the mean high tide line and into the uplands.

survey area: Discrete area where camping activities are known or suspected to take place. Survey areas may be a variety of shapes, including long, linear beaches or points of land. Individual survey areas are usually bound by environmental features such as very dense vegetation, cliffs, and water.

suspected campsite: Backcountry area where overnight camping activities are suspected but no clear evidence of such activities is present. See definition of campsite for examples of evidence.