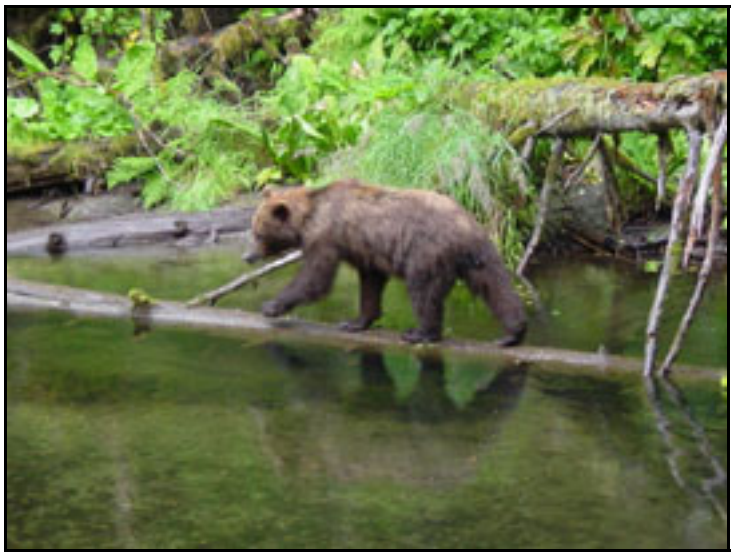
Human and brown bear use of Eva Creek: A site assessment



By Cheryl Van Dyke

Alaska Department of Fish and Game
Division of Wildlife Conservation

September 2003

Project Cooperators

USDA Forest Service, Tongass National Forest
Sitka Ranger District

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Anchorage, Alaska

Southeast Alaska Wilderness Exploration Analysis and Discovery
(SEAWEAD) Juneau, Alaska

SEAWEAD

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SUMMARY

I examined activity and use patterns of brown bears (*Ursus arctos*) and humans in the lower Lake Eva drainage in Southeast Alaska during spring and summer 2002. The purpose was to investigate how the Lake Eva Trail should be managed to provide satisfactory wildlife viewing and other natural experiences for humans, while minimally disrupting brown bear use. Observations of human and bear use, activity types, and interactions, a visitor satisfaction survey and informal interviews were performed.

Eva Creek watershed is located on northeastern Baranof Island in Southeast Alaska. A 1.6 km trail adjacent to Eva Creek is used by guided hikers from small and mid-size cruise ships during the summer. Subsistence and sport anglers use the area most of the year, and visitors to a fly-in public use cabin on the lake also access the trail. Although commercial guiding is permitted by the USDA Forest Service, the number of non-guided visitors using Lake Eva Trail was generally not known. Numbers of guided visitors to the area are increasing, similar to a growing trend of ecotourism travel in Southeast Alaska.

Summary Results

Human Use

- An estimated 1,964 people visited the Lake Eva trail in 2002.
- Most guided human activity was along the trail. Fishing, boating, and air transport combined with varying noise levels introduced inconsistent and unpredictable human presence.
- Most people were not visiting to view bears specifically. On 97 returned visitor survey registration cards, 83% of visitors reported hiking, and less than half reported fishing (34%) or wildlife viewing (34%) as an planned activity for the visit.

Bear Use

- Bear observations occurred as very small percentage of total observation effort. During 468 hrs of observation, bears were observed for only 19 hrs (4%).
- I observed primarily subadult bears: 7 individual subadults, 3 sow & cub pairs, and 2 bears of unidentified age.
- Bears primarily scavenged for fish carcasses instead of catching live fish as expected.

Effect of Human Use on Bear Use

- Bear and human use tended not to occur simultaneously, even in sites judged to be attractive to bears.
- Bears were observed more often when visitors were absent. During summer observations, bears were observed for a total of 695 minutes, and 93% of those observations occurred in the absence of visitors.
- During the summer, bears were observed more frequently in the morning, and were present most often between 7 and 8 a.m. Bear observations declined at 10 a.m. Conversely, visitors reported being present at Lake Eva trail most frequently from 11 a.m. to noon. Little visitor activity was reported prior to 9 a.m.

Management Recommendations

- Lake Eva / Eva Creek estuary meets the Unit 4 Brown Bear Management Team's definition of a 'Tier I Human–Bear High Use Zone', and the guidelines and stipulations the team recommended for such zones should be part of agency management in the area.
- Eva Creek is not a good place for bear viewing if the goal is to have a high frequency of bear sightings because 1) the habitat mosaic does not appear to support high densities of bears; 2) inconsistent human behavior in the study area does not lend itself to habituation; and 3) visibility in the area is poor and does not lend itself to distance viewing of non-habituated animals.
- Limited visitor use, to either a few days per week, or to midday hours will give bears more foraging opportunities at Eva Creek.
- Design modifications to the existing trail could reduce conflicts between visitors and improve bear accessibility to potentially important habitats, but are unlikely to change use patterns of sport fishers.
- Anglers should be encouraged to use best management practices for sport and subsistence use in the presence of bears.
- Adaptive management should be implemented to address changes in bear and human use patterns over time as documented in a long-term monitoring program.
- All commercial tour operators should be scheduled to use the study area, both at different times of the season and at different times of day. Permit-holders should receive education about best management practices in the study area.
- Enforcement of commercial permit use should be increased.
- Cooperation from user-groups should be sought in future management planning.
- Interagency cooperation should remain a high priority.
- Lake Eva trail may be a good place for an "enclave" with intensive large group visitation at an anadromous stream compared to alternative sites nearby. If the study area is designated as an enclave, commercial use for northeastern Baranof Island should be concentrated there, and adjacent proposed enclaves should not be designated for commercial outfitter / guide use. Further research is necessary for an adequate comparison.
- The Lake Eva trail would be an ideal site for a long-term recreational study regarding changes in human use patterns and conflicts between visitors in high-use areas.

Management Options

1. No Change
2. Designate the Area as a '15% Area' for 15% of Possible Guided / Commercial Use Days
3. Designate the Area as an 'enclave' for 100% of Possible Guided / Commercial Use Days
4. Create an Exclusive Bear Viewing Area
5. Create a 'Human / Brown Bear Special Use Zone'
6. Permit Non-guided Use Only - Divert Guided Use Away from Eva Creek

Key Words: Alaska, brown bear, Eva Creek, GIS, Hanus Bay, interactions, Lake Eva, movement patterns, observation, recreation, salmon, Tongass National Forest, tourism, trail, *Ursus arctos.*

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PREFACE

Increased interest in the Lake Eva Trail has prompted tourism and recreation planning for the Eva Creek watershed. In 2000, the Unit 4 Brown Bear Management Team identified Lake Eva as a "Human–Bear High Use Zone." The report suggested that Lake Eva receives enough human use to generate actual or potential problems with bears, including increased bear–human interactions and habituation of the bears (Alaska Board of Game 2000). In its preferred alternative of the 2002 Shoreline Outfitter / Guide Draft EIS, the USDA Forest Service listed the Lake Eva Trail as one of 33 proposed enclaves across the Tongass National Forest where groups of 21–75 people could occur regularly (U.S. Department of Agriculture 2002a). The Alaska Board of Game's call for attention and the Forest Service's focus on increased tourism facilitated a collaborative study at Eva Creek.

All readers should note that the study performed at Eva Creek was a singular site assessment, and conclusions drawn from research may not be applicable to sites elsewhere.

INTRODUCTION

The purpose of this study was to investigate how the Eva Creek area on Baranof Island should be managed to provide satisfactory wildlife viewing and other natural experiences for humans, while minimally disrupting brown bear (*Ursus arctos*) use. The intent was to provide a solid baseline dataset to inform resource managers deciding on an upcoming trail reconstruction plan and the future of recreation and tourism use in the area. To this end, I observed activities and use patterns of brown bears and humans in the study area during spring and summer 2002.

Objectives

Based on input from cooperating partners, the following research objectives provided the foundation for designing methods:

- Determine public use, both guided and nonguided.
- Determine bear use.
- Determine what study area features are associated with bears.
- Determine how current human use of the study area affects features associated with bears.
- Describe how existing infrastructure (trails and viewing locations) affects people/bear interactions.
- Evaluate visitor satisfaction.
- Produce management recommendations for the Alaska Department of Fish and Game (ADF&G) and the USDA Forest Service (USFS).

Background

Ecotourism Trends

Wildlife and nature viewing are two of the most widely used forms of commercial recreation in Southeast Alaska, and undeveloped natural areas rank highest for preferred settings to bring clients (Alaska Office of Tourism 2001). The International Ecotourism Society defines ecotourism as "responsible travel to natural areas that conserves the environment and sustains the well-being of local people" (International Ecotourism Society 2002a). Ecotourism has been heralded for its conservation potential, because it provides economic incentives for keeping natural areas intact. However, it is possible that increased ecotourism may negatively impact the natural attractions it was designed to protect, by displacing wildlife and degrading habitat (Smith 2001). Additionally, increases in recreational use on wild lands broaden impacts to wildlife because increased recreation is often dispersed across a vast area to limit crowding (Cole and Knight 1991). In Alaska, very little documentation exists on the terrestrial impacts of this industry.

Bear – Human Interactions

The impacts of the increasing volume of backcountry excursions in Southeast Alaska on the habitat use and behavior of brown bears are unknown. Although some statistically significant findings exist, the biological effects of wildlife viewing on bear fitness and population growth are conflicting (Smith 2001). Gilbert (1989) reviewed bear response to humans, and

concluded: “Bear-people interactions are significant because their increase has been recognized as posing a greater threat to bears than habitat modification.”

Bear – human interactions have been extensively studied at managed bear viewing areas where many of the bears are habituated. Habituation is “a reduction in the frequency of a response when no consequence is perceived by the animal” (Gilbert 1989, Jope 1985). The “relatively permanent waning of response readiness as a result of repeated stimulation” indicates that consistent, inconsequential exposure to humans is the catalyst for habituation (Braaten and Gilbert 1987). Different degrees of tolerance to people are possible. Aumiller and Matt (1994) described 3 levels of habituation: wary, neutrally habituated, and food conditioned. Additionally, 2 sublevels of neutrally habituated were detailed: partially neutrally habituated, when wariness by bears increased with unfamiliar human activity; and highly neutrally habituated, when bears tolerated humans at close distances (Aumiller and Matt 1994).

Researchers have found that even bears that tolerate humans are affected by visitor activities. Warner (1987) found that presence of humans within 100 m had a significant effect on the behavior of brown bears at Pack Creek. Also at Pack Creek, the Fagens (1992) observed that brown bears tended to travel more, fish less and eat plant parts less in the presence of humans. They also observed that most brown bears preferred not to interact with humans and changed travel paths to avoid them (Fagen and Fagen 1992). Chi and Gilbert (1999) investigated the impacts of wildlife viewing on black bear foraging behavior at Anan Creek during more than 600 observation hrs in the summers of 1994 and 1995. Of 24 bears observed, 17 spent nearly all of their time fishing at a secluded upper falls area. Only 2 bears fished exclusively at the lower falls, where people were present at an observation platform. The habituated bears’ length of fishing bouts declined as the human group sized exceeded 15. With increase human presence, bears made more short visits, expending energy in transit (Chi and Gilbert 1999).

Bears that are not tolerant of human activity may be subject to more dramatic impacts from visitor presence. Persistent, long-term human presence in an area can jeopardize a bear’s well-being or even survival if it abandons important feeding or resting habitats (Alaska Department of Fish and Game 1998b). Anglers physically displace bears from creeks by fishing from stream riffles where bears forage during summer months (Smith 2002). In a multi-site study in British Columbia, MacHutchon et al. (1998) found that bears altered temporal and spatial activity patterns in response to human activity.

Displacement during summer months can have negative effects on bear well-being and impact the productivity and fitness of the entire population over time. Long-term studies have shed light on this relationship. In a study of the impacts of mountain climbing activity on grizzly bear foraging, White et al. (1999) found that bears displaced from foraging areas by human activity consumed fewer calories than non-disturbed bears. Consumption of fewer calories can reduce reproductive success, because lower body mass and fat content are costly during important hibernation and lactation periods (Hilderbrand et al. 2000). As a result, Hilderbrand et al. (2000) noted that population productivity may decline.

Many brown bear habitats are experiencing increasing use by humans for recreation and tourism (Wilker and Barnes 1998, MacHutchon 1998, MacHutchon and Wellwood 2000). Area-specific research is necessary to determine what impact such use is having on bears at the individual and population levels, especially in backcountry and coastal areas with currently low, but increasing human use (Olson et al. 1990). Eva Creek was chosen for a focused site assessment because of its increasing and minimally managed tourism activity.

Site History

Like many areas in Southeast Alaska with suitable anchorages and anadromous streams, traditional use by Tlingit people is thought to have occurred throughout the Eva Creek watershed. This stream was of particular subsistence importance due – at least in part – to its substantial sockeye salmon run (Swanson and Davis 1983).

> "Hanus Bay was one of the most important resource areas in Peril Strait. Prior to Russian contact, the main Teqwedi village in Peril Strait was located at or near the present site of Todd Cannery. It is thought that these people established a camp called 'Katsk' at the outlet of Lake Eva. The stream from Lake Eva was a good source of sockeye where traps were placed to harvest the salmon… According to informants, the land near the Lake Eva outflow was patented during the 1870s and was the scene of a potlatch approximately 50 years ago."
>
> (Swanson and Davis 1983)

Subsistence use has been replaced by other activities in recent decades. Since 1986, fewer than 12 subsistence permits per year were issued for sockeye harvest at Eva Creek (N. Ratner, pers. comm. 2003). In 1924 the Civilian Conservation Corp built the Lake Eva Trail for use by the Bureau of Fisheries. The trail has been commonly used for guided and personal use fishing as well as brown bear and deer hunting (Sitka Trail Works, Inc. 2001). Several studies have been performed in the Lake Eva watershed since the 1960s. ADF&G operated a fish weir at the falls on Eva Creek from 1962–1964, and again in 1995. In 1970, Dr. Theodore Walker lived in a small cabin on Eva Creek from April to October. And in most years since 1965, ADF&G employees count salmon by walking along the stream (Alaska Department of Fish and Game 2002).

Current Use

More than 1,000 people currently visit Eva Creek each year. Although commercially guided use is permitted by the USDA Forest Service, and the numbers can be tracked, the number of non-guided visitors using Lake Eva Trail is generally not known (A. LaPalme pers. comm. 2001). Growth in guided visitation has occurred in the past decade. According to USFS permit records, the number of guided visitors using the Lake Eva Trail increased from 761 to 963 between 1997 and 2001, coinciding with a growing trend of ecotourism travel in Southeast Alaska (U.S. Department of Agriculture 2002b).

STUDY AREA

Eva Creek watershed is located on northeastern Baranof Island in Southeast Alaska (Fig. 1).

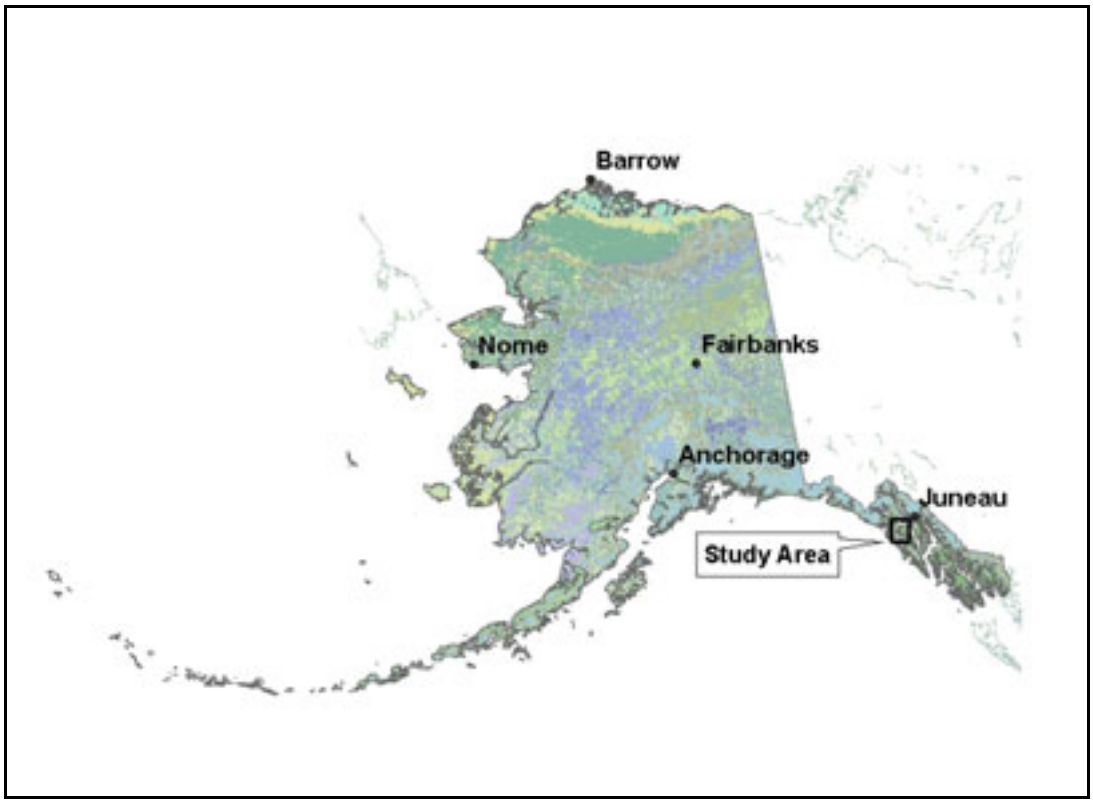

Figure 1. Location map of study area

The watershed includes approximately 6.4 km of drainage flowing into Lake Eva, which is 2.4 km long (Fig. 2). An outlet stream identified in this report at Eva Creek flows one mile to Peril Strait southwest of Catherine Island (Fig. 2).

A 1.6 km trail begins at the beach just east of the outlet and follows Eva Creek from its intertidal lagoon, past falls to the lake. The falls are composed of a shallow riffle where bears may fish. See Appendix 5 for more information about study area features.

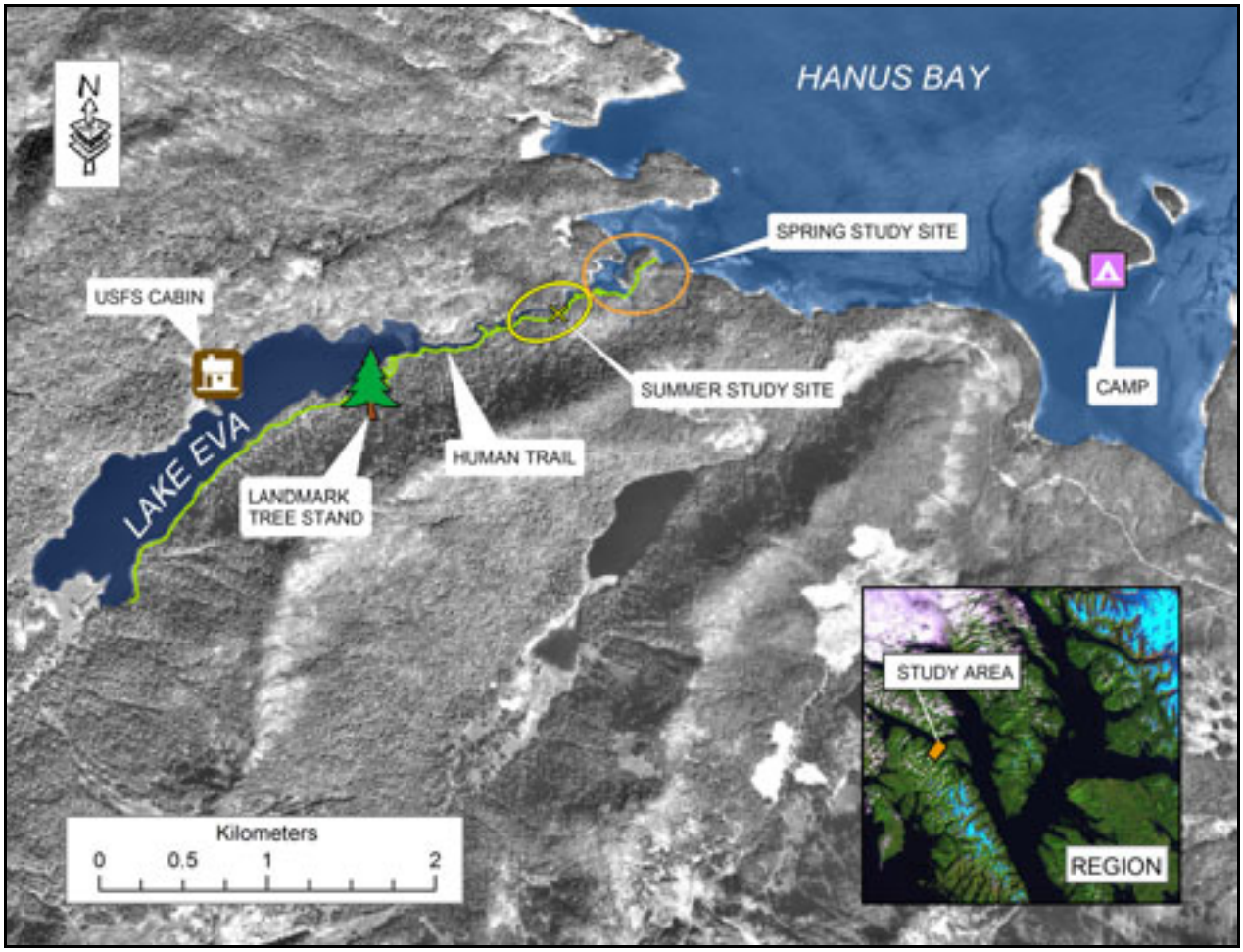

Figure 2. Study area features

The study area encompassed all land visible from 2 study sites. The spring study site used from 6-25 June included numerous vantage points on the ground where the creek mouth and / or the lagoon were visible (Fig. 3).

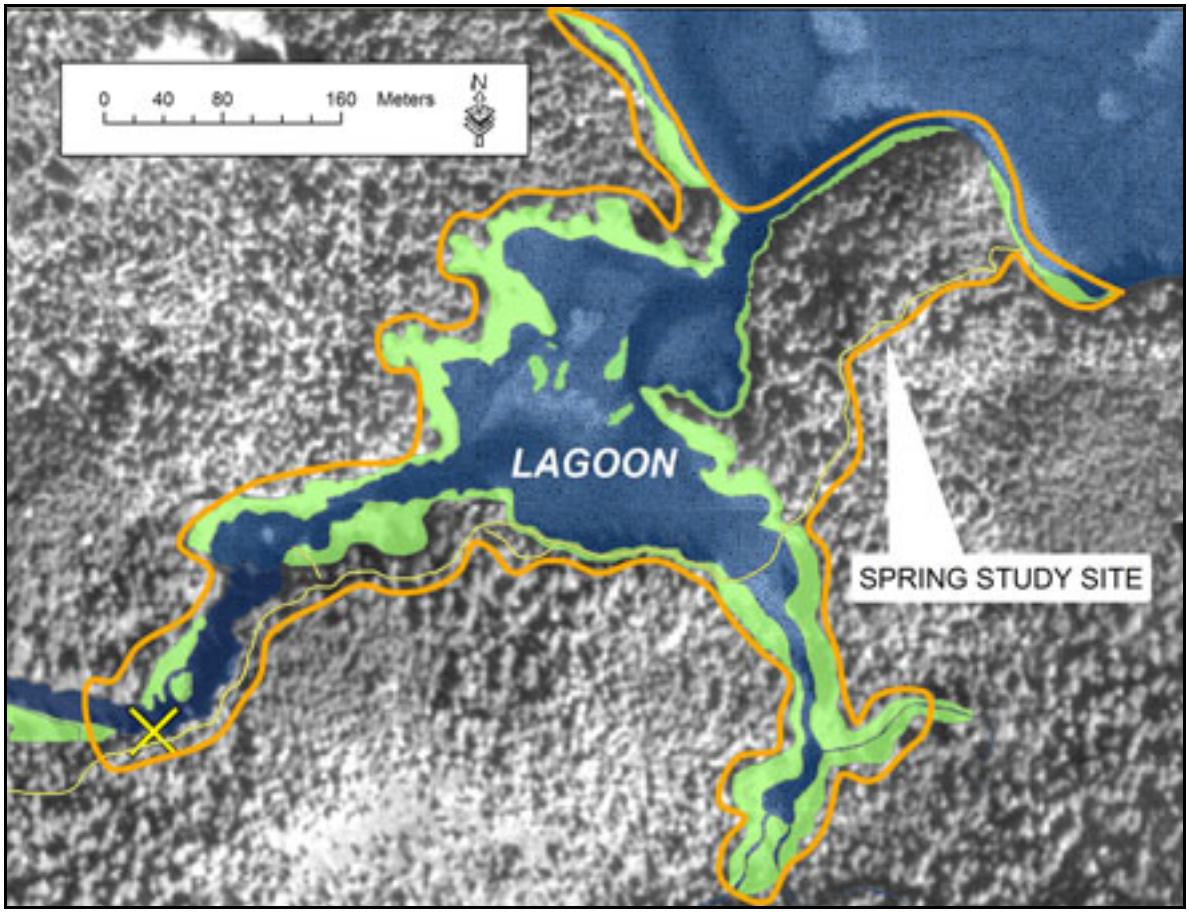

Figure 3. Spring study site

The summer study site used from 26 June – 9 September was a platform located approximately 500 meters inland, above a shallow stream riffle where bears and people fished (Fig. 4).

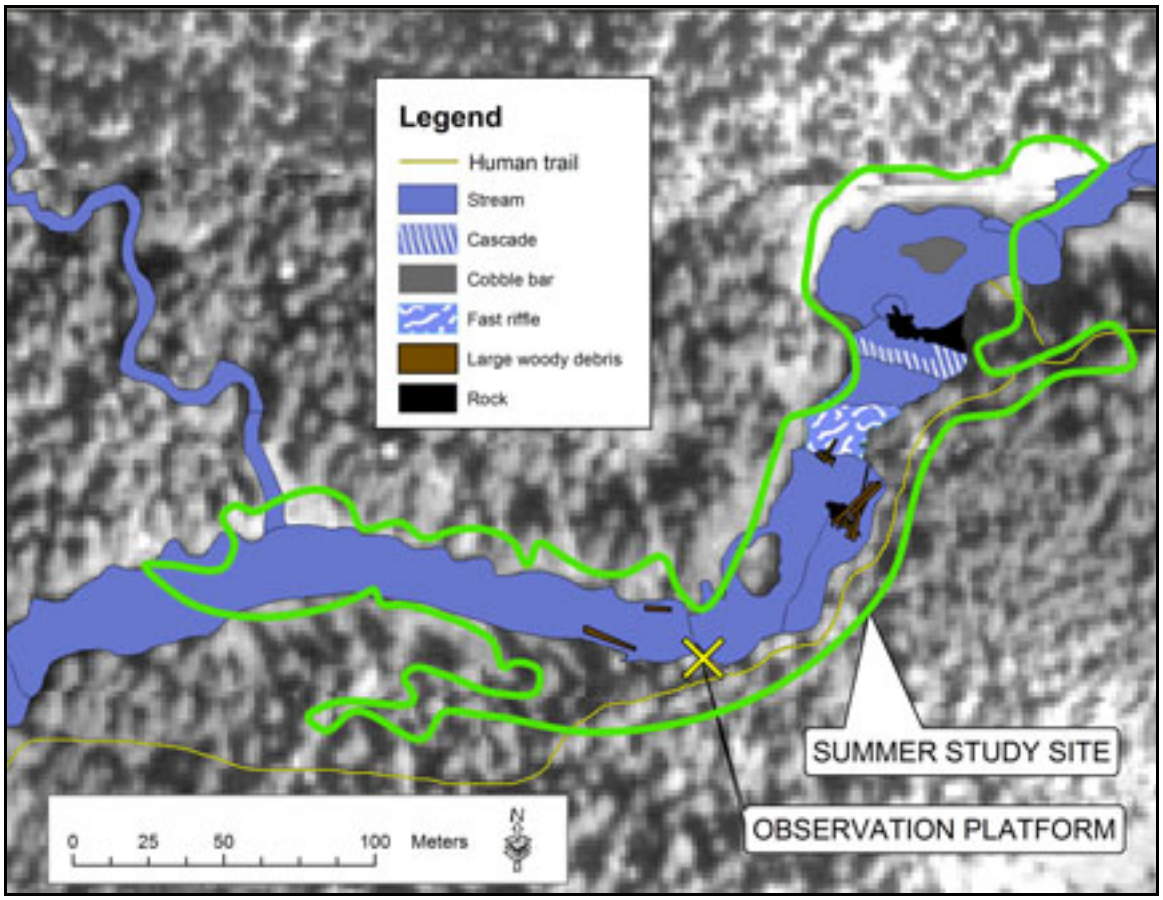

Figure 4. Summer study site

Four major habitat types are recognized in the study area: forest, salt marsh, freshwater marsh, and bog / fen complex. Forests are typically dominated by western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*). Mountain hemlock (*Tsuga mertensiana*) and Alaska yellow cedar (*Chamaecyparis nootkatensis*) are also present on upland slopes and at higher elevations. Poor drainage through the fine sands and silts in the protected salt marsh favors sedge-dominated plant communities. The freshwater marsh, or wet meadow, is dominated by herbaceous plant species such as Silverweed (*Potentilla anserina*), Western buttercup (*Ranunculus occidentalis*) and yarrow (*Achillea millefolium*). Bogs and fens, commonly called muskegs, are areas of poor drainage dominated by plants such as shore pine (*Pinus contorta*), Labrador tea (*Ledum groenlandicum*), bog rosemary (*Andromeda polifolia*), and bog laurel (*Kalmia polifolia*). The maritime climate is cool, with moist weather predominating (O'Clair et al. 1997). Angoon, the nearest town, is located on the west side of Admiralty Island and has an annual precipitation of 99cm (Smith et al. 2001).

From 1932–1936, Frank Dufresne of the Alaska Game Commission and Jay Williams of the U.S. Forest Service surveyed and counted bear numbers on Admiralty, Chichagof and Baranof islands. They estimated minimum bear numbers for each stream in the study area by enumerating uniquely sized or configured bear track sets (Williams 1952). Of the 79 salmon streams surveyed on Baranof Island, Dufresne and Williams determined that only 4 other streams had more bears than Eva Creek. In 1934, Dufresne and Williams estimated there were 13 bears utilizing the greater Eva Creek watershed (L. Beier, pers. comm. 2003).

Dolly Varden trout (*Salvelinus malma*) are found in Eva Creek from May to September, and steelhead (*Oncorhynchus mykiss*) and cutthroat trout (*Oncorhynchus clarkii*) are present from May to June. Sockeye salmon (*Oncorhynchus nerka*) migrate to Lake Eva from late June to early July. From early July to late August, chum salmon (*Oncorhynchus keta*) are found in the creek. Pink salmon (*Oncorhynchus gorbuscha*) are present from late July to early September, and coho salmon (*Oncorhynchus kisutch*) migrate to the tributary during mid-to-late September.

METHODS

Data Collection Procedures

My continuous scanning methods were adapted from Altmann's (1974) focal and simple scanning methods, commonly used in observational studies. Continuous scanning for bears and visitors was conducted in one 5 hr block per day. Continuous scanning was performed daily, and sampling period varied according to seasonal study sites. Opportunistic time sample blocks were used in spring, and systematic time sample blocks were used in summer. During spring (6–25 June), I spent 5 hrs moving through the study area each day, and began sampling wherever and whenever a bear was observed. In summer, I remained stationary in the tree stand during scheduled 5-hr time sample blocks.

In summer (26 June–9 September), systematic time sample blocks occurred from 0600–1100, 1100–1600 and 1600–2100. Each block was repeated every 3 days. It was necessary to observe bear activity in Eva Creek both before and during human presence. Humans were anticipated to occupy the study area between 8 a.m. and 5 p.m. Bears were predicted to use Eva Creek primarily at dawn, dusk, and after dark. Many similar studies used stratified random sampling to select observation time blocks. However, systematic time sample periods on alternate days were chosen for this study to assure that variables of tide and daylight were systematically addressed. During August and September, some late night sessions ended early because the forest became dark before 9 p.m.

Because the purpose of this study was to monitor both human and bear activities, focused observations were performed during both spring and summer observation periods whenever either species entered researchers' field of view. This is contrary to Altmann's approach, which did not document human activity constantly. Researchers continuously scanned for bears and humans within the study area during the 5-hr time block. When a bear or human

entered the observation area, the observer watched the bear or human. For each observation, the following data were collected:

- Time (on 2400 clock)
- Wind direction (upstream or downstream)
- Wind speed (in knots)
- Tide level (high, ebbing, low, flooding)
- Unique ID (such as first bear of the day, second human group of the day)
- Type (guided or non-guided people, or sex and age of bear)
- Group size
- Activity (fishing or hiking for people, and feeding, locomotion or resting for bears)
- Condition (noise level for people, and stress level for bears)
- Notes (additional information about observations, such as physical characteristics for bears, or visitor group origin)
- Location of individuals or subgroups (using electronic mapping)

Any time the bear or person changed activity or condition, the time and new activity and/or condition was recorded. Each animal observed was plotted on the site map and subsequently entered into a GIS. The animal's activity was recorded until it left the study area. Observation codes are provided in Appendix 2.

A site map outlining geographic features and major trails was drawn from various maps and surveys before the summer observation platform was installed. Exact distances of key geographic features from the observation platform were recorded for reference with a laser range finder. Individuals were plotted on the study area map during scans.

Attempts were made to identify individual bears throughout the season, based on scars, distinctive molting patterns, and unique morphological features. Still photos and video footage assisted with identification of individual bears, both in the field and at the end of the season when researchers were more familiar with identification techniques.

Variability in salmon abundance during the season could potentially confound results because bear use might correlate with salmon numbers independent of other factors, such as number of humans in the study area. Therefore, trends in abundance for each salmon species were quantified during the course of the season. Salmon counts were performed hourly during tree platform observations. The number of each species of fish to pass the focus area was counted simultaneously by 2 observers, and a mean number was recorded for each hour.

All visitors were invited to sign up to participate in a voluntary online survey. Ninety-seven people filled out and returned cards to trailhead registration boxes, representing a small proportion (< 5%) of the total estimated number of visitors during summer 2002. From those cards, 69 valid email addresses were used to contact participants. Information about the visitor survey is located in Appendix 1.

Research Approach

This study was unique as it observed continuous activity from June to September. Many projects that study bears focus on the peak of the most abundant local salmon run (Olsen et al. 1990, Braaten and Gilbert 1987, Egbert 1978, Wilker and Barnes 1998), but this study's camp was set up in late May, observations began in the first week of June, and research continued until 9 September. By making observations in the spring, researchers saw how different parts of the system were used while bears were grazing. Tourism and recreation activities take place from late May to late August. This research aimed to examine the impacts of that use for the entire season, not just when spawning salmon were present in the study area.

Data Analysis

Statistical Analysis

SPSS for Windows (version 11.0.1) statistical software was used to perform statistical analyses, and some graphs were generated with Microsoft Excel 2000 (version 9.0). Data were analyzed primarily with descriptive statistics to address the following research objectives:

1. Determine human use.
   A. Use Levels: Sum of total number of visitors to the area in spring and summer. Compared with the number of actual visitors reported by a reputable tour operator, the proportion of observed visitors was calculated and the total number of visitors for the spring and summer visitor season was estimated.
   B. Activities: Total number of visitors performing certain activities (fishing, hiking), categorized by guided and non-guided use, for both individuals and groups counted in spring and summer.
   C. Seasonal Trends: Frequency distribution of activities (fishing, hiking), categorized by guided and non-guided use, for both individuals and groups counted in spring and summer.
   D. Diurnal Patterns: Survey data were grouped by hour of visitation. For example, if a respondent reported a group of 6 people who arrived in the area at noon and stayed 3 hrs, 6 people were recorded for the 1200, 1300, and 1400 blocks.
   E. Duration of Stay: Mean of total hrs reported stay on visitor survey.

2. Determine bear use.
   A. Total number of Bears per Day: Frequency distribution of total number of bears per day in summer. A sow with one cub was counted as 2 bears
   B. Individual Bears Using the Site: Sum of observed individual bears using the site during all observations in spring and summer. Sum of observed individual bears using the site in summer. Sum of observed individual bears using the site during the pink salmon run, from 29 July– 9 September.
   C. Sex and Age of Brown Bears Using the Site: Aggregation of observed individual bears into sex and age classes (Appendix 2) in summer.

D. Diurnal Distribution: Frequency distribution of total number of bears per 1-hr time block (0600– 2200) in summer. If a bear was observed from 8:45 a.m. to 9:20 a.m., it was tallied in both the 800 and the 900 time block.
E. Seasonal Distribution: Frequency distribution of total length of time bears were observed daily in summer.
F. Duration of Bear Activities: Frequency distribution and sum of total minutes that bears were observed engaging in primary and secondary activities during the pink salmon run. Primary and secondary bear activities were combined for this analysis. For example, a grazing bear might have also been traveling.

3. Determine how current human use affects brown bear use.
   A. General: Pearson correlation between observed total number of bears and total people per day in summer. Levene's independent sample t-test of total number of minutes bears were observed in the presence versus absence of visitors, in summer. Frequency distribution of reported visitor group size and length of stay for each hour block from 3 June – 8 September. Frequency distribution of observed bear activity for each hour block in summer.
   B. Number of Observed Brown Bear–Human Interactions: Sum of bear–human interactions in summer. Interactions were defined as an event in which bears and visitors were observed simultaneously from the tree stand, or bears moved within 25m of the tree stand. Analysis of behavioral response to human activities was not possible. Sum of interactions in relation to human activities, group size, and noise levels, in summer.
   C. Undesirable Events Between Brown Bears and Humans: Sum of observed negative bear–human interactions. Undesirable events were defined as "a more serious action where a bear charges people, people take extreme evasive action in response to a bear, people use a deterrent on a bear, property is damaged, or a bear makes physical contact with a person." (MacHutchon and Wellwood 2002).

Additional analyses were included in Appendix 3 to describe variables used to interpret data collected in the observational study. The research objective to determine what features of the site were associated with bears was partially met with the following analyses:

4. Brown Bear Use of the Study Site in Relation to Salmon Runs.
   A. Timing of Salmon Species Runs: Frequency distribution of total number of minutes bears observed per month in summer.
   B. Timing of Salmon Species Runs: Frequency distribution of salmon species observed per day in summer.
   C. Strength of Salmon Runs: Frequency distribution of mean and sum of total salmon of each species counted per day at high tide in summer.
   D. Timing of Bear Observations in Relation to Salmon Runs: Pearson correlation of total number of bears observed per day with mean number of salmon species per day in summer. Pearson correlation of total minutes bears observed per day with mean number of salmon species per day in summer.
   E. Pink Salmon in the Context of Historic Pink Salmon Runs at Eva Creek: 1-sample t-test to compare the number of pink salmon counted by ADF&G in 2002 (22,500) with

historic ADF&G pink salmon counts for Eva Creek (Alaska Department of Fish and Game 2002).

GIS Analysis

A Geographic Information Systems (GIS) map was generated to illustrate spatial distribution of brown bears and visitors in the study area. Graduated symbols were used to illustrate the length of time each group was observed at a particular location. Data entry forms for the handheld PC were created using ESRI® ArcView™3.3, and used in ESRI® ArcPad™6.0. GIS data were analyzed with ESRI® ArcMap™8.2.

Data from 6–25 June were combined with other data primarily for describing the total numbers of individual bears and people observed throughout the season. Otherwise, data from the summer were the main observational study dataset used in analysis, because the dataset represented systematic observations made from the tree platform and excluded all opportunistic spring observations. In cases where it was necessary to isolate observations during the presence of pink salmon, a subset of the data from 7 August – 9 September was used for analysis.

Validity and Reliability of Measures

A team of 2 people performed all observation sessions. Simultaneous observations were made, and uncertainties were discussed to reduce observer error. Digital video footage recorded bear and human activities, and was used to clarify uncertainties.

RESULTS

Visitor Use of the Area

A. Use Levels

I observed 656 visitors during the study. When compared with actual number of clients reported by a reputable tour company, the count of 656 visitors represented approximately one-third (33.4%) of the estimated 1964 visitors to actually visit Lake Eva Trail during 96 days in summer 2002. The observed mean number of visitors per day was 8.3 (n=67), and the observed median was 2. The estimated mean number of visitors per day for the entire summer was 20.5 (n=96).

There were 26 days when no visitors were observed, accounting for 33.3% of the observation days (Table 1). On most days, less than 5 visitors were seen, if any at all. A little more than 20% of the time, 5–10 visitors were observed in a day. Eleven percent of the time, 11–20 visitors were observed. Total numbers of people between 21 and 40 visitors were rare, but numbers exceeding 41 visitors in a day were observed 5 times (6.4%). Because only 33.4% of estimated activity was observed, the reader should note that the numbers reported in Table 1 represent observed, not total visitation.

Table 1. Total number of individual visitors per day at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

	Frequency	Percent	Cumulative Percent
no visitors	26	33.3	33.3
<5 visitors	18	23.1	56.4
5-10 visitors	17	21.8	78.2
11-20 visitors	9	11.5	89.7
21-30 visitors	2	2.6	92.3
31-40 visitors	1	1.3	93.6
>41 visitors	5	6.4	100.0
Total	78	100.0	

B. Activities

1. Individual Visitors

I observed 178 non-guided and 478 guided visitors during spring and summer (Fig. 5). Of those, 383 were guided hikers, 60 were non-guided hikers, 101 were guided anglers and 112 were non-guided anglers. (See Appendix 4 for visitor profiles).

Of the total number of individual visitors, guided hikers were observed more frequently than any other visitor type (58.4%). Individual non-guided hikers were observed least frequently (9.1%). Non-guided anglers comprised 17.1% and guided anglers comprised 15.4% of visitors.

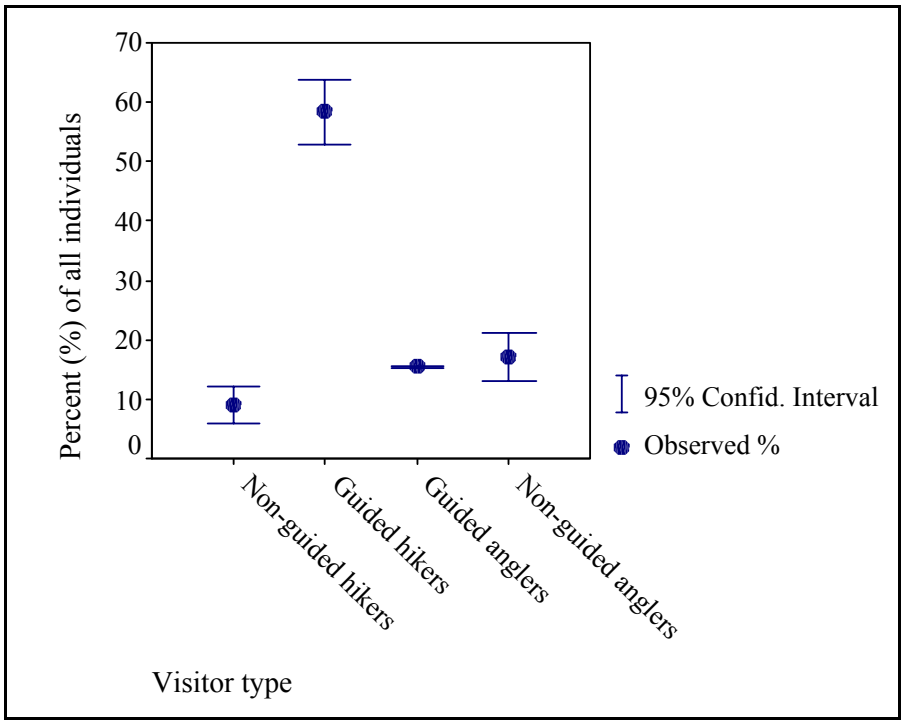

Figure 5. Percent of individual visitor type at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

2. Groups of Visitors

Consideration of visitors by the groups (one or more individuals) into which they were aggregated revealed different visitation patterns (Fig. 6). One hundred and one groups were observed during the summer. More non-guided angler groups were observed than any other visitor group type (n = 33).

When analyzed by group rather than individual, the proportions of non-guided hikers, guided hikers, guided anglers and non-guided anglers did not differ.

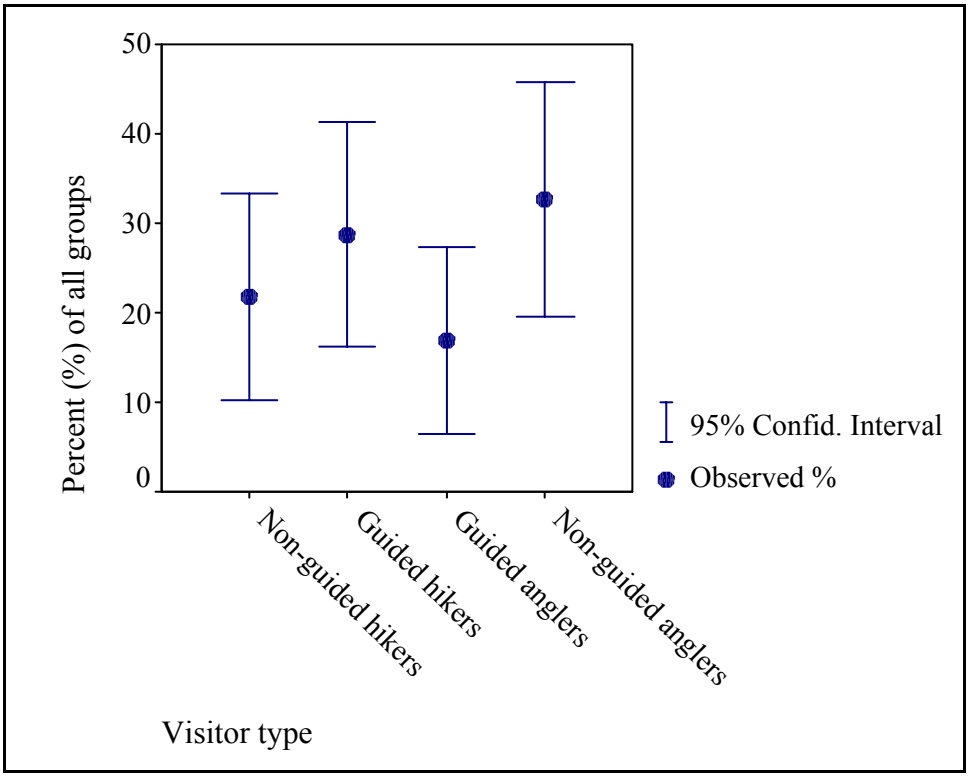

Figure 6. Percent of visitor type by group at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

Among groups, non-guided anglers (median group size = 3) and guided hikers (median group size = 33) were observed most frequently (Table 2). Fewer and generally smaller groups of non-guided hikers (median group size = 2) and guided anglers (median group size = 5) were observed.

Table 2. Number of groups and median group size of visitors at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

Visitor Type	N	Median Group Size	Standard Deviation	Range
Guided hikers	29	13	7.386	39
Non-guided hikers	22	2	1.420	5
Guided anglers	17	5	2.703	10
Non-guided anglers	33	3	2.015	8

Guided and non-guided anglers tended to visit most in the spring (Fig. 7), and were observed fishing for Dolly Varden and cutthroat trout. Non-guided hikers visited the area sporadically throughout the season independent of any other group. Groups of guided hikers usually visited the trail in clusters over several days in July and August.

Mean guided hiker group size at Lake Eva was 13. On 7 occasions 2–3 groups of 10–15 people hiking up the trail were observed within 10 minutes of one another. In these cases, a more accurate characterization may have been to identify one large group of 20–45 people.

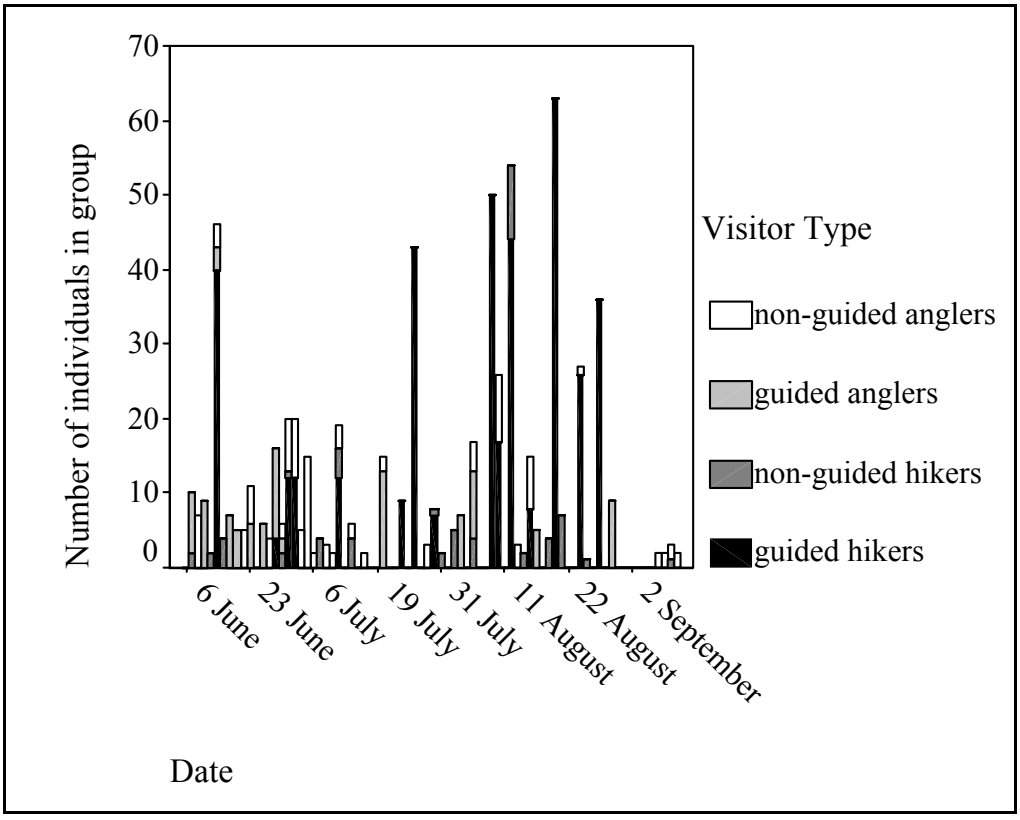

Figure 7. Group size per day at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

C. Seasonal Trends

Seasonal trends were related to the visitation of small and mid-size cruise ships. The peak of observed visitor activity occurred in August, due to a rapid increase in observed guided hikers (Fig. 8).

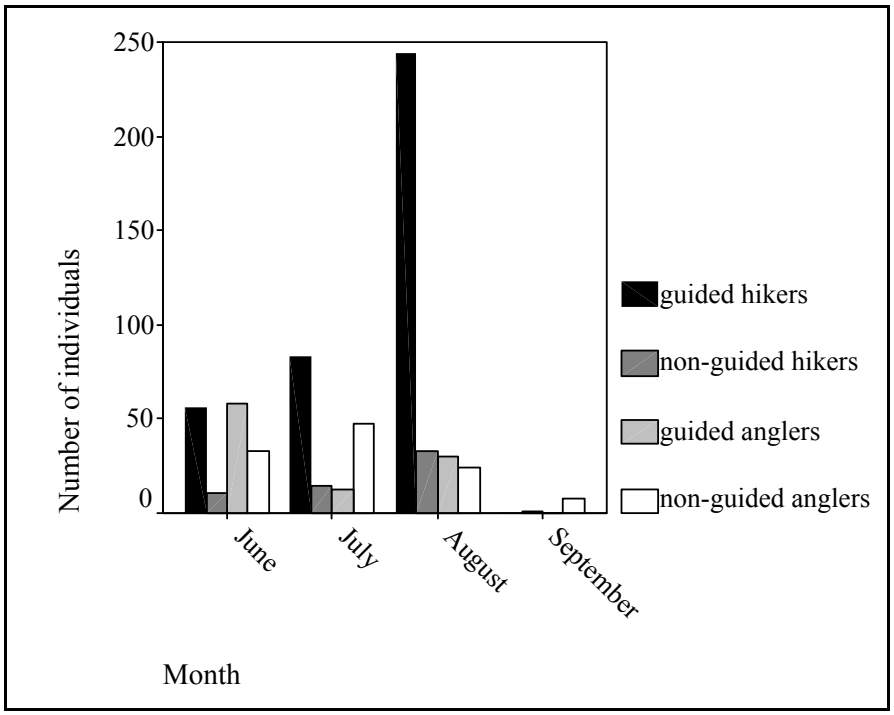

Figure 8. Types of visitors at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

One to two days of visitor absence tended to be followed by 2–3 days of visitor presence (Fig. 9). This trend was especially evident in July and August when guided hiking to the area was more frequent. In June, however, anglers and non-guided hikers were observed almost every day – anglers were observed on 10 consecutive days and non-guided hikers were observed on 13 consecutive days.

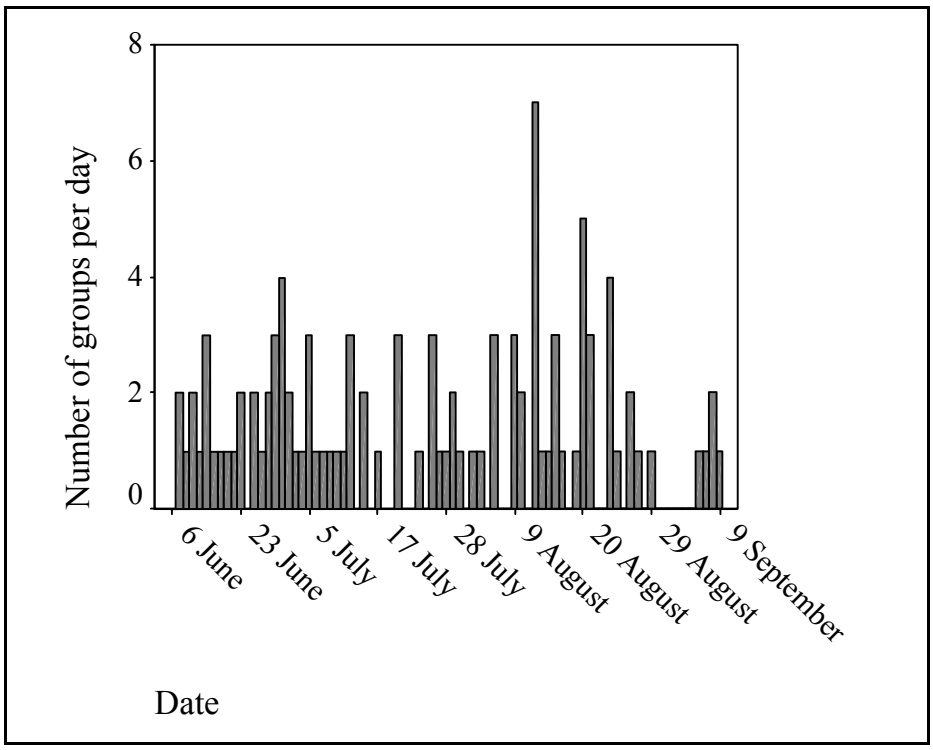

Figure 9. Number of visitor groups per day at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

D. Diurnal Patterns

Most reported use was clustered from 9:00 a.m. to 5:00 p.m., and modal use peaked from 11:00 a.m. to 12:00 noon (Fig. 10).

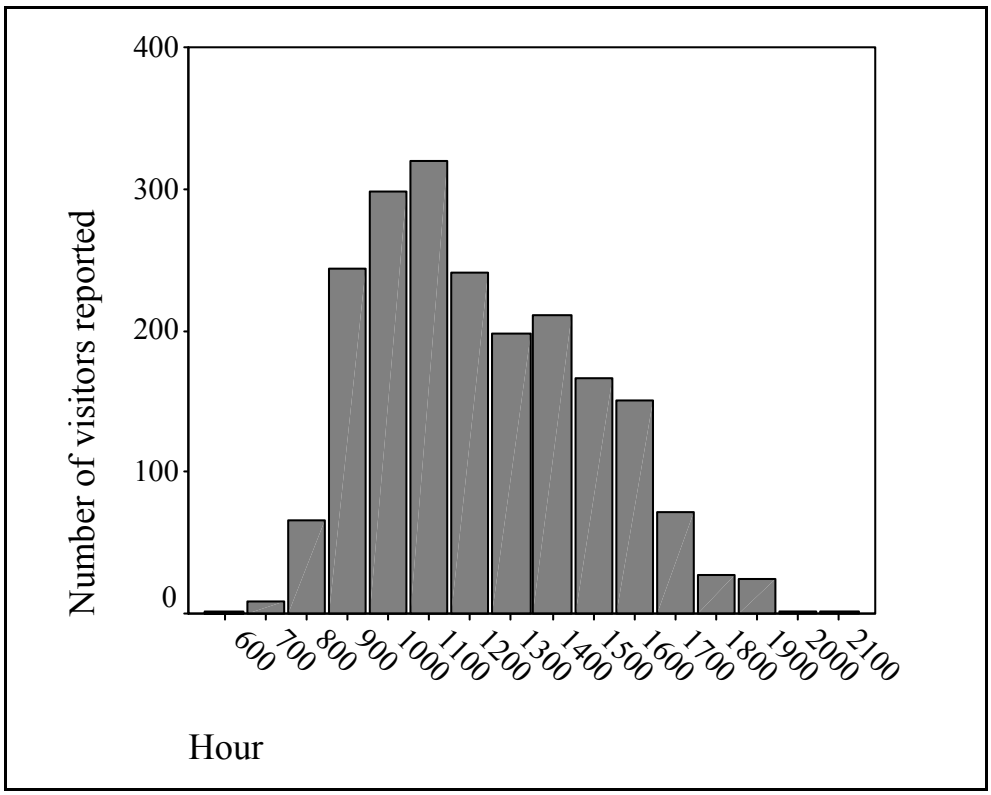

Figure 10. Diurnal visitor patterns at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

E. Duration of Stay

Some visitors spent a few nights aboard an anchored vessel in the bay, but most arrived by boat and stayed for an average of 3.5 hrs. On the survey registration card, 81 of 97 visitors reported making a day visit to the area, with a mean stay of 3.5 hrs. Eight respondents stayed at the USFS cabin, and stayed a mean 5.6 days. Four participants stayed on land or boats nearby for a mean stay of 2.25 days.

F. Spatial Distribution of Human Visitors

There were 3 ways that people spatially occupied the Eva Creek watershed during summer months. Hikers, anglers and vessel operators each used different parts of the area, and in different ways (Fig. 11).

Hikers displayed the most predictable use patterns, because they remained almost entirely on the trail and moved at a steady pace. Hikers generally walked upstream along the trail with occasional bouts of mingling, then turned around and walked downstream before departing. Hikers rarely, if ever, walked beyond the big trees near the lake.

Anglers tended to have more erratic patterns, because their activities took place in the stream, along the banks, and on the trail. Anglers varied their pace between stationary, meandering walking, purposeful walking, and animated movement throughout their stays. Anglers were the only people who entered the falls area where bears foraged.

Vessel operators using skiffs, canoes and kayaks all exhibited different patterns as they moved through Eva Creek and Lake Eva. Cabin visitors used a boat to access the trail near the lake's outlet stream, occasionally the boat had a small outboard engine attached. Once the boat was anchored, cabin visitors assumed the patterns of anglers or hikers. Skiff operators tended to perform drop-off or sightseeing services for passengers, and occasionally landed in the lagoon just below the falls at high tide to unload or load visitors. Likewise, kayakers entered the lagoon at high tide and paddled near to the falls for sightseeing purposes, but unlike skiff operators, they never landed their boats. Vessels used for drop-off or pick up tended to move in and out of the lagoon, while sightseeing vessels meandered around the lagoon for longer lengths of time.

Visitors tended to stay on the south side of the creek where the trail was. Most visitors did not walk in the creek. Anglers were the only visitors to walk in the creek and onshore on the north side of the creek.

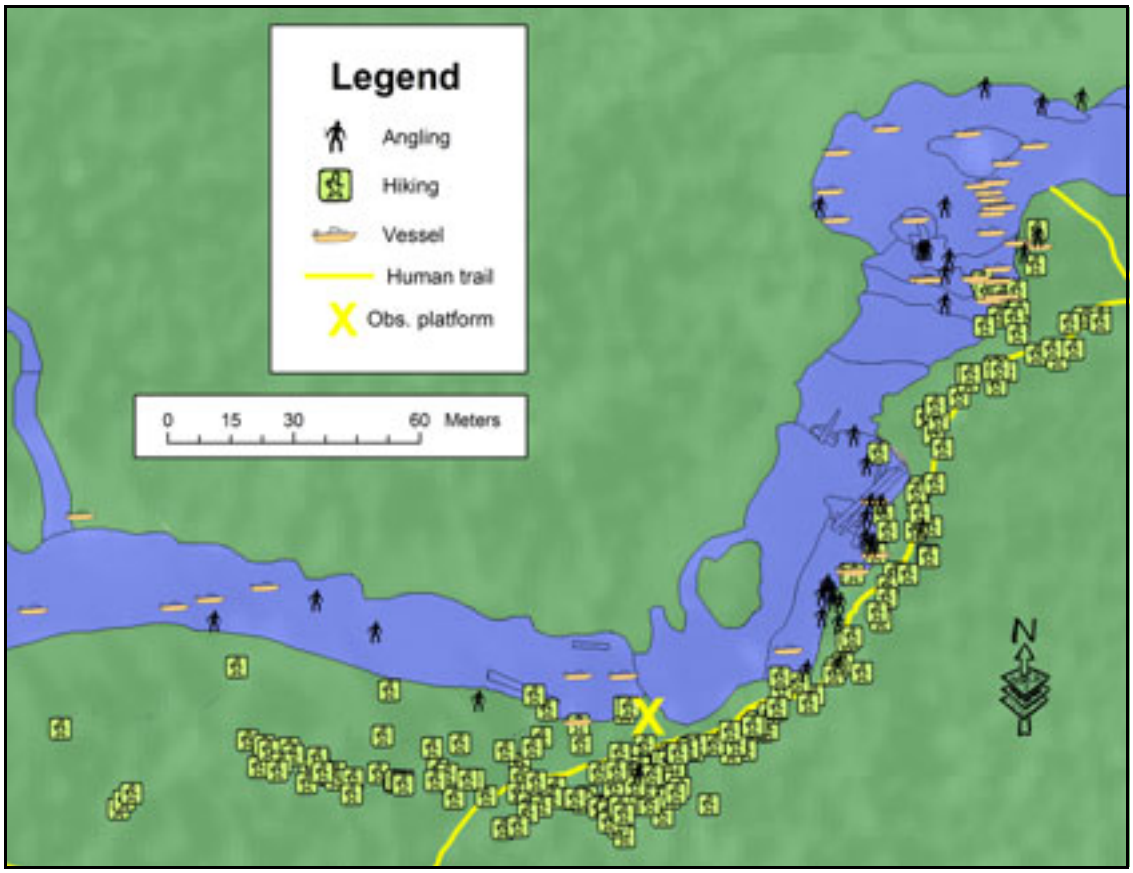

Figure 11. Spatial distribution of visitors by group type at Eva Creek
Baranof Island, Alaska, 7 August - 9 September 2002.

Brown Bear Use of the Area

A. Number of Brown Bears per Day (June–September)

Bear observations were limited. During 468 hrs of observation from the tree stand, bears were observed for about 19 hrs, or 4% of the time. Thirty-nine separate bear sightings were made from the tree platform from 26 June to 9 September, 25 of those occurring during the pink salmon run, from 29 July to 9 September (Fig. 12). Ten additional bear observations were recorded during opportunistic spring observations in June.

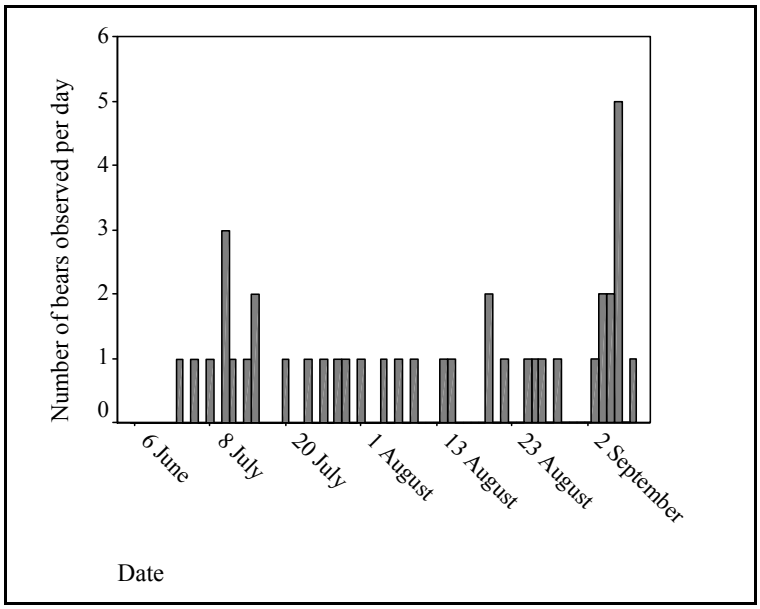

Figure 12. Number of individual brown bears observed per day at Eva Creek
Baranof Island, Alaska, summer 2002.

B. Individual Bears Using the Study Area

I observed 15 different bears during the summer. Five different bears were observed in the spring, including 2 sows with one cub each, and a subadult female. Ten individual bears were observed from the tree stand in the summer (Table 3). Four were sub-adults of unidentified sex, and 2 were subadult females. One female of unidentified age and one bear with unidentified age or sex was seen. One sow with a cub was also observed.

Table 3. Age class of individual brown bears observed at Eva Creek
Baranof Island, Alaska, spring and summer 2002.

	Adult	Subadult	Cub	Unidentified	TOTAL
Sex	-	-	-	-	-
Male	-	-	-	-	-
Female	3	3		1	7
Unidentified	-	4	3	1	8
TOTAL	3	7	3	2	15

Some bears were observed in the study area for several weeks. Two subadult females were observed most frequently, although their use never overlapped (Fig. 13). One subadult female was observed for approximately 6 weeks, and the other was observed for 3 weeks. A third subadult was observed occasionally for 2 weeks. All other bears were not observed more than a few times.

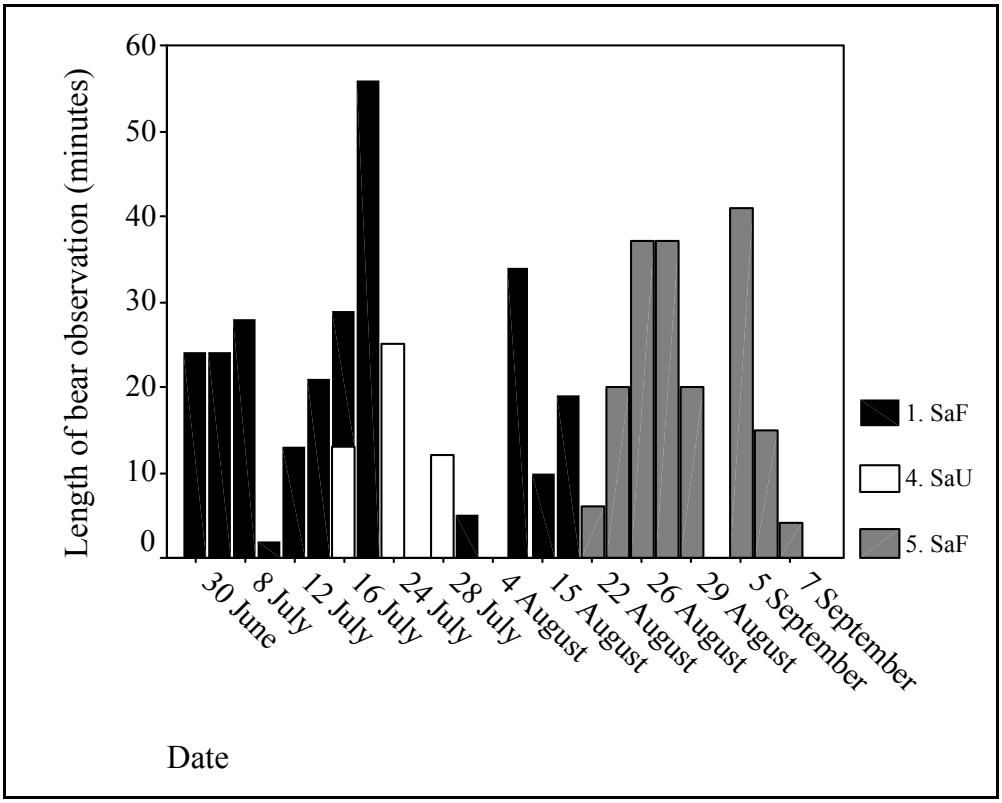

Figure 13. Duration of use by most frequently observed brown bears at Eva Creek SaF = subadult female; SaU = subadult unknown sex. **Baranof Island, Alaska, summer 2002.**

C. Sex and Age of Brown Bears Using Site

Subadult bears were observed for 722 minutes, and adult bears were observed for 326 minutes (Table 4). During the summer, subadults were observed almost exclusively. The only adult bears observed were sows with cubs.

Table 4. Minutes of brown bear observations by age class at Eva Creek, Baranof Island, Alaska, spring and summer 2002.

	Spring (6/6-6-25)	Summer (6/26-9/9)	All observations (6/6/-9/9)
Age Class			
Subadult	119	603	722
Sow & cub	325	1	326
Unidentified	0	91	91

D. Diurnal Distribution

During summer observations from the tree stand, bears were observed most frequently between 7:00 a.m. and 8:00 a.m., then sightings dropped off between 10:00 a.m. and 11:00 p.m. (Fig. 14).

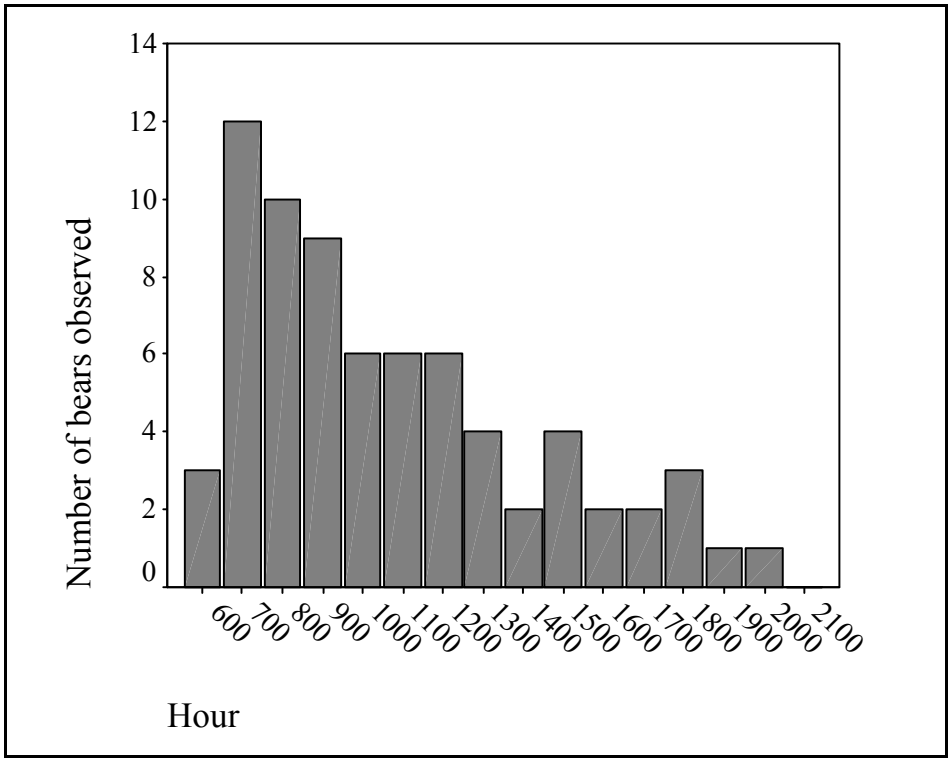

Figure 14. Observed diurnal patterns for brown bears at Eva Creek Baranof Island, Alaska, summer 2002.

E. Seasonal Distribution

Bears were observed infrequently from the tree-stand before mid-August and only 3 times on consecutive days during that period (Fig. 15). After mid-August, bears were observed more frequently, and occasionally for 3–4 consecutive days. The mean length of time that bears were observed was 10.4 minutes per day (n = 67).

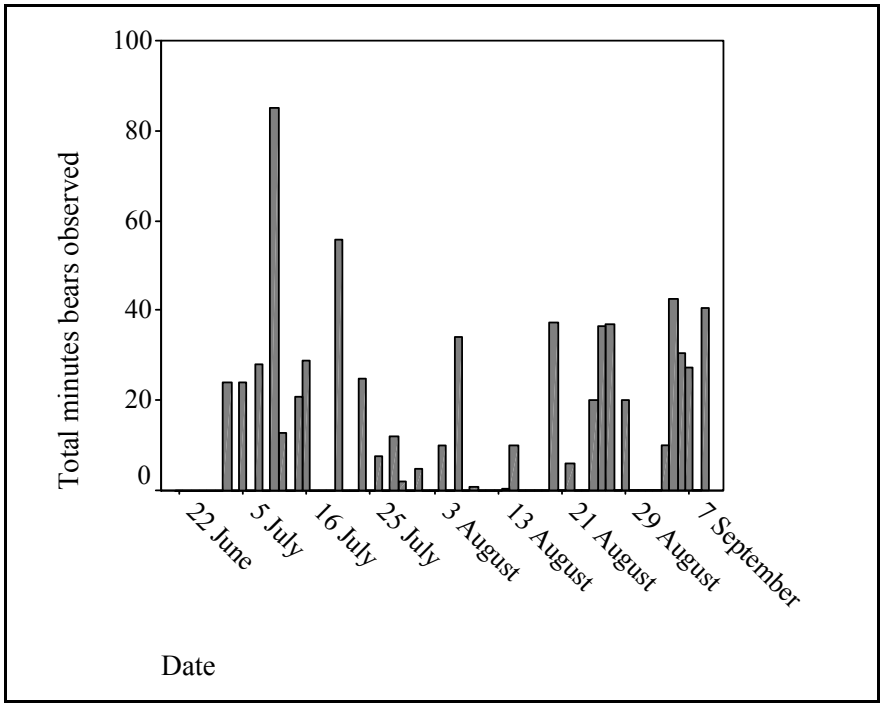

Figure 15. Length of time of brown bears observed at Eva Creek Baranof Island, Alaska, summer 2002.

F. Duration of Observed Brown Bear Activities

During 370 minutes of observations during the pink salmon run, bears spent most time traveling (Σ = 136 min., n = 162) and fishing (Σ = 110 min., n = 137). A smaller amount of time (Σ = 98 min., n = 39) was spent grazing. Other activities were observed for 39 minutes (n = 38). While fishing, bears spent the majority of time scavenging for dead fish (Σ = 18 min., n = 52), and eating carcasses (Σ = 17.5 min., n = 14). Bears were observed searching for fish a shorter length of time (Σ = 12 min., n = 43). A bear was recorded catching a live fish from the stream only one time.

Brown Bear Use in Relation to Visitor Presence

A. Temporal and Spatial Patterns

1. Number of Bears Observed in Relation to Visitor Presence

   Bears were observed on only 5 occasions when visitors were observed to be present. There was no correlation (r = 0.086; p= 0.245) between observed number of bears and number of observed visitors per day.

2. Frequency of Bear Use in Relation to Visitor Presence

Bears were observed for more minutes when visitors were absent ($t = -4.346$; $p = 0.000$). Bears were observed for a total of 695 minutes in the summer, of which 643.5 minutes (92.6%) were in the absence of visitors (Fig. 16). During the pink salmon run (29 July – 9 September) bears were observed for 370 minutes, of which 331 minutes (89.5%) were in the absence of visitors.

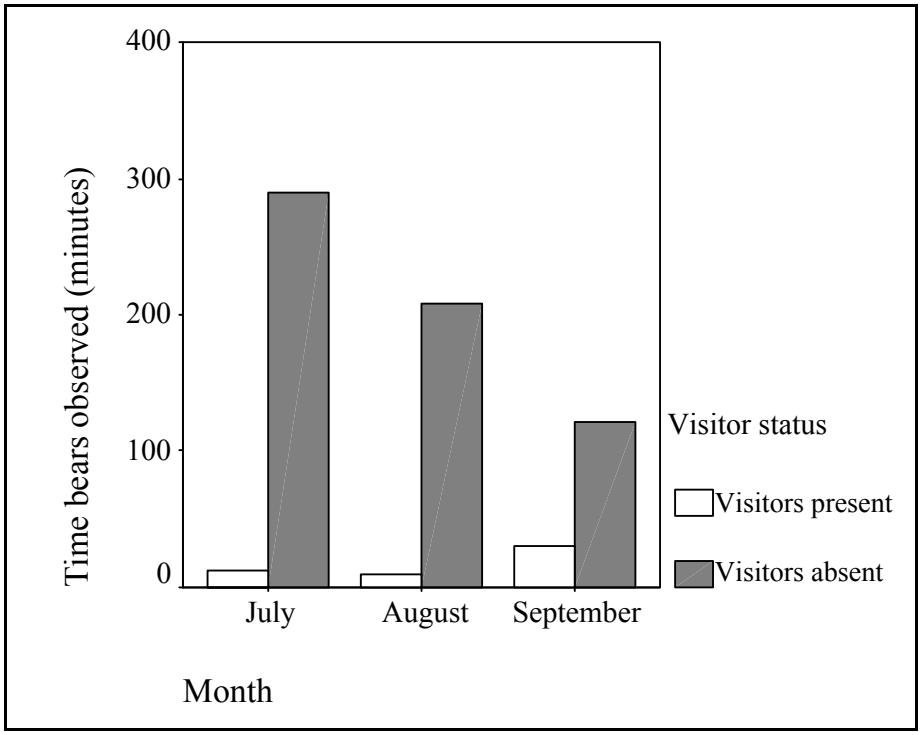

Figure 16. Length of time brown bears observed in the presence and absence of visitors at Eva Creek **Baranof Island, Alaska, summer 2002.**

3. Timing of Bear Use in Relation to Visitor Presence

During summer, bears were observed more frequently in the morning, most often between 7 and 8 a.m., and their presence dropped off drastically after 10 a.m. Conversely, visitors reported being present at Lake Eva trail very seldom prior to 9:00 a.m., peaked at 11:00 a.m. to 12:00 noon, and tailed off thereafter (Fig. 17).

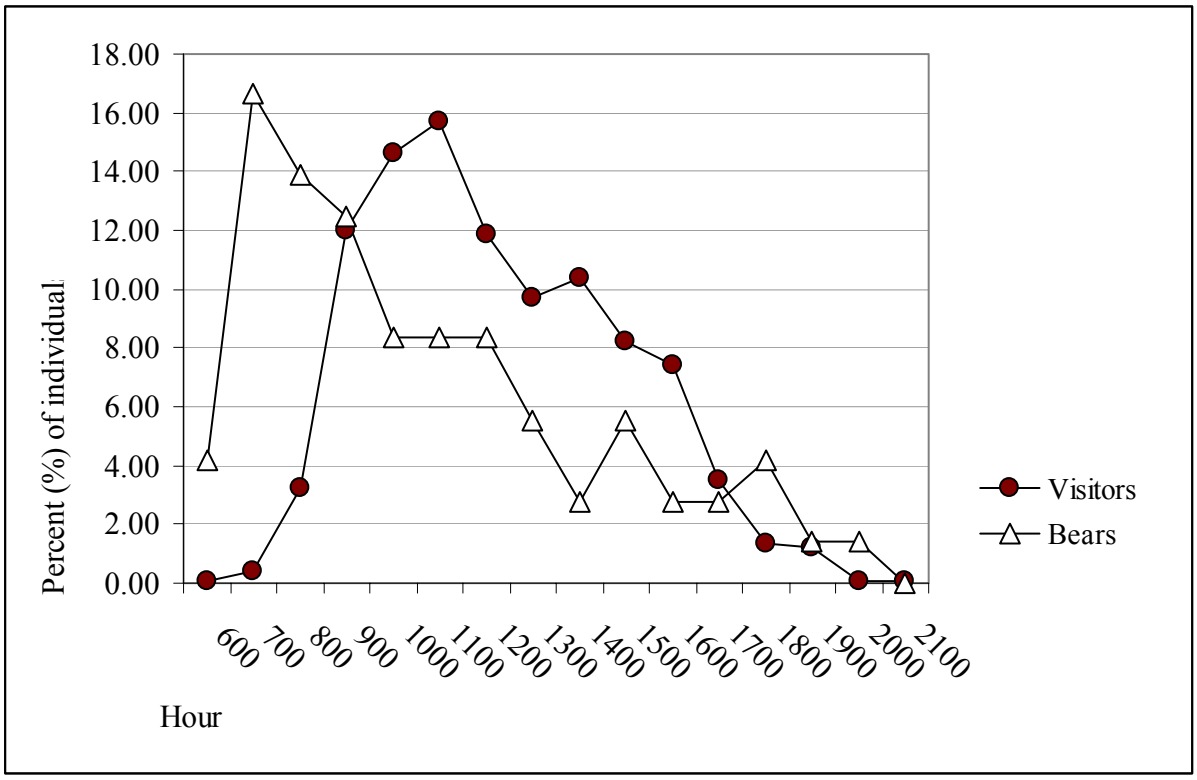

Figure 17. Diurnal patterns of visitor and brown bear use at Eva Creek
Baranof Island, Alaska, summer 2002.

4. Spatial Distribution of Bears in Relation to Visitor Distribution

The spatial distribution of bears and visitors differed (Fig. 18). Observations performed during the pink salmon migration indicated that most visitors were associated with the trail and south bank, while bears mostly used the creek itself and the north bank. Figure 18 graphically depicts the length of time that each bear or group of people spent in a general area before changing behavior or activity. Groups of people spent longer durations near places where there was access to the creek for sightseeing or fishing. Bears had longer durations at sites in and below the falls, and on large woody debris above the falls and near the tree stand.

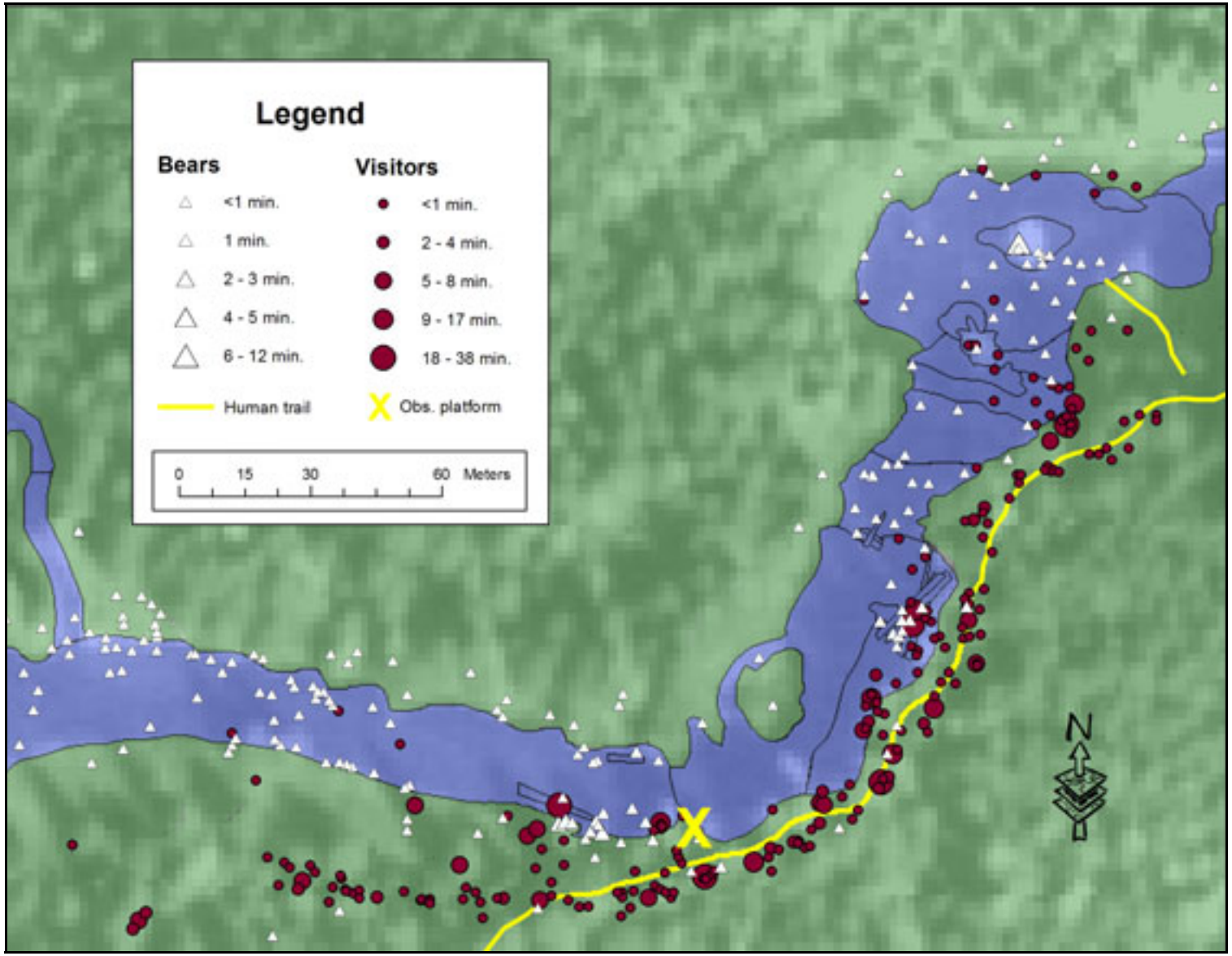

Figure 18. Brown bear and visitor observations at Eva Creek, Baranof Island, Alaska, 7 August - 9 September 2002.

B. Number of Observed Brown Bear–Human Interactions

Most bear–human interactions observed occurred with researchers (68% of total observations of bear–human interactions). Of 19 observations of bears interacting with humans, 13 were interactions with researchers, 2 were interactions with visitors, 3 were interactions with both visitors and researchers simultaneously and 1 was an interaction with people in a boat.

Bears were never observed while people were fishing, and interactions with hikers were limited in their frequency (n = 5) and duration.

Bears rarely interacted with visitors, but some bears that moved near to the tree stand interacted with researchers. About 95% of bear–human interactions occurred with a human group size of 4 or fewer. Most observations of bear–human interactions occurred when group size was 2 or less (68.5%). These were often researcher groups in the tree stand. Only 26.3% of bear–human interactions occurred with a group size of 3 or 4, and only 1 incident (5.3% of interactions) occurred with a group size of 13.

Most observations of bears interacting with humans occurred when humans were quiet, or making noise in conversational tones or less. Only 2 of 19 observed bear–human interactions were observed when humans were loud or making noise louder than conversational tones.

C. Undesirable Events between Bears and Humans

Little adverse contact between bears and humans was observed. For example, there were no observed events of aggressive behavior by bears, or bears obtaining human food. Only 5 instances of bears and visitors interacting were observed. Of those, 2 resulted in abandonment of bear activities as a direct result of human activity.

DISCUSSION

Nearly 2,000 people visited the Eva Creek watershed during 4 months in spring and summer 2002. Lake Eva's visitation is comparable to that of Pack Creek Cooperative Management Area, an intensively managed visitor destination. Pack Creek had 1,215 visitors during summer 2002, with 68% of them between July 5 and August 25. The record for the greatest numbers of visitors to Pack Creek was 1,402 visits in 2000 (J. Neary, pers. comm. 2002). In 2002, more than 1,300 hikers were estimated to visit Eva Creek. The primary difference is that Pack Creek visitation is limited to bear viewers only, while Eva Creek attracts anglers and hikers as well. Anan Creek bear viewing area received 2,634 visitors during summer 2002 (D. Galla, pers. comm. 2003), demonstrating the intensity of management that would be necessary if visitation at Eva Creek were to increase. Regardless of whether visitors are involved in wildlife viewing, the number of users at Eva Creek warrants increased planning and maintenance for the area. The current level of use at Lake Eva trail makes the area stand out as a place in need of immediate management attention.

Prior to construction of the 1924 trail, Eva Creek had substantial migrations of sockeye and pink salmon, and primarily subsistence harvest visitors. Eva Creek is far different today. Guided recreational use gradually increased from 761 in 1997 to 963 in 2001 (U.S. Department of Agriculture 2002b), bringing us to the situation observed in summer 2002. After the trail was built, sportfishing activity increased as the fishing opportunities became more well-known. Since 1980, float plane flights have been dropping off visitors at the lake's cabin from 1–3 times per week during the summer. The cabin is reserved nearly every day from May to September (NRRS 2003). Increased tourism in the 1990s created a scenario in which more than 60 people may visit the area at the same time. Sport fishers now frequent Eva Creek, primarily fishing from the stream riffle where bears also fish. The Lake Eva area has become dominated by recreational use by default. As a community planner said, "No place remains special by accident." (L. Propst, pers. comm. 1998).

The Low Number of Bears Observed

Contrary to Dufresne and Williams' estimate 70 years ago, few individual bears were observed using Eva Creek simultaneously in 2002. In 1934, Dufresne and Williams estimated that 13 bears concurrently used Eva Creek (L. Beier, pers. comm. 2003). During summer 2002, no more than 3 bears were ever observed in the study area in one day. Individual bears using the study area at Eva Creek were rarely observed for more than a few days. Potential reasons for the general absence of bear activity in summer 2002 might be the result of researcher presence, poor bear habitat, local bear abundance, food availability, visitor use, year effect and combined impacts.

Researcher Presence

First, it is important to question whether researcher presence displaced bears from the creek during summer 2002. The constant human presence in the study area surely altered some bear activities (Smith 2002, Warner 1987 , Olsen et al. 1990, Chi and Gilbert 1999, MacHutchon et al. 1998, Wilker and Barnes 1998). Anecdotally, it was clear that some bears avoided the tree stand entirely, and others were noticeably stressed when they approached the creek near the tree stand (Van Dyke 2003).

However, two examples suggest that researchers were less of a factor in the scarcity of bears in the area than were other human activities. Data collected from this observational study and from a habitat survey conducted by Southeast Alaska Wilderness Exploration Analysis and Discovery (SEAWEAD) suggest that researcher presence was probably less responsible than visitor presence for the scarcity of bears in the study area. Researchers observed bears from the tree stand for 643.5 minutes in the absence of visitors, and only 51.5 minutes when visitors were present. If researcher presence was extremely disruptive to bears, these numbers would probably have been closer. Secondly, in their habitat study, SEAWEAD naturalists documented a relatively high concentration of bear sign very near the observation platform during summer 2002 (Christensen 2003). This high concentration of sign, relative to other areas in the watershed where similar resources were available, also suggests bears were not significantly disrupted by the researchers and the observation platform.

Food Availability Cycles

Second, cycles in food availability, for example, pink salmon and berry abundance, may have influenced the number of bears using the area during summer 2002. Pink salmon abundance was not anomalous, although sockeye salmon abundance may have been low. An in-depth review of observed bear use in relation to salmon runs appears in Appendix 3. At Eva Creek, bears were observed most frequently in July, well before the peak of the pink salmon run in Eva Creek, indicating little reliance on this resource. The 2002 foot-count survey conducted by ADF&G indicated that the pink salmon run was average when compared with historical data (Appendix 3).

A poor sockeye salmon run in Eva Creek during summer 2002 may have failed to draw brown bears to the watershed in June. A regular visitor to Eva Creek since the 1940s, Larry Calvin said that bears typically fished Eva Creek during the sockeye run, which was contrary to what researchers observed (L. Calvin, pers. comm. 2002). However, bears may have been fishing for sockeye out of view, upstream from the lower falls during summer 2002.

Local Bear Density

The third argument for the small number of bears observed in the study area is that Eva Creek watershed may have lower brown bear density than other watersheds on Admiralty, Baranof and Chichagof (ABC) islands. The ABC islands have some of the highest bear densities that have been reported (Miller et al. 1991), yet we would expect bear densities to be significantly higher or lower in various watersheds depending on habitat quality. Local knowledge supports the hypothesis that the bear densities at the lower Eva Creek watershed has not been large in recent decades, despite the area's estimated relatively high-density bear use in the 1930s. Dr. Theodore Walker lived at Lake Eva from early April to late October 1970, and wrote a book about his experiences there. Although his intent was to film brown bears for a television special, he made a reference to the lack of observable bears toward the end of his stay. On September 8, he said, "Despite my sightings and all the tracks, the bears here are very infrequent and will have to be filmed elsewhere" (Walker 1971). Likewise, Dr. Robert Armstrong, a Dolly Varden researcher who operated a fish weir at the Eva Creek falls from 1962–1964, said that he never saw very many bears there (R. Armstrong, pers. comm. 2003).

Sitka resident Larry Calvin first visited the Lake Eva trail in 1941. After regularly visiting Lake Eva with his father for many decades, Larry began to bring his own sons for fishing and canoeing. He said that in the 60 years he visited Lake Eva, he had only seen bears once (L. Calvin pers. comm. 2003). Despite numerous reports of people interacting with bears at Eva Creek, the documented absence of bears by researchers and long-time visitors supports the conclusion that there have not been very many bears using the study area in recent decades.

SEAWEAD naturalists suggested that the habitat mosaic of the lower Eva Creek watershed does not have enough quality feeding habitat to attract or support consistently high concentrations of bears (Christensen 2003). The Eva Creek watershed has some patches of terrestrial habitat, such as berry patches and sedge meadows, but most of Eva Creek itself is

not easily fished. Nearby anadromous creeks have more 'fishable' terrain, including gravel bars and shallow pools. Therefore, SEAWEAD naturalists suggested that although habitat within the Eva Creek watershed has not changed much since the 1930s, habitat modification in adjacent watersheds may have altered movement patterns of bears in the greater region.

Human-Use Displacement

The fourth potential cause of limited bear observations is that current human use is temporarily displacing bears from the study area. The low number of observed bear–human interactions indicates that the bears using Eva Creek are not habituated to human presence, and avoid people even at foraging areas judged to be highly suitable. Researchers observed bears for significantly more minutes when visitors were absent. Regardless of whether bears were focused on foraging for salmon or not, there was clearly a pattern of increased bear activity during visitor absence. These data were not influenced by outliers, such as one bear observation lasting 2 hrs. Rather, several individuals were observed for relatively short time periods over the course of 2½ months. These findings correspond to research elsewhere, concluding that bears are more likely to forage when humans are absent, even when some bears are habituated (Warner 1987, Fagen and Fagen 1992, Olson and Gilbert 1994, MacHutchon et al. 1998, Olson et al. 1990, Braaten and Gilbert 1987).

It is reasonable to conclude that bears altered their movement patterns somewhat due to human use in 2002, but not likely that human use was entirely responsible for bears avoiding the study area. This result has perhaps the most important implications for future management, because it suggests that individual bears using Eva Creek may forage more in and near Eva Creek if anglers and hikers were not present.

Combination of Factors

The final hypothesis is that lack of bear observations at Eva Creek can be attributed to a combination of factors, including habitat features, local bear abundance, visitor presence, and seasonal food availability. Most likely, the combined factors in the Eva Creek watershed during summer 2002 were responsible for low numbers of observed bears. In poor quality habitat, for example, bears might abandon the area when human activity is high in a year of mediocre salmon abundance. Gilbert noted, "Where habitat quality is high, displaced bears will move to nearby food sources, perhaps within or near high security cover … populations in habitats of low quality, especially with limited choice of alternative foods, will be nutritionally stressed when displaced by disturbance from recreationists or [capture and tagging] research teams" (Gilbert 1989). It is difficult to know how much displacement can be attributed to researcher presence, population dynamics, food availability, or visitor activities.

Research Limitations

The naturalistic observation method focuses on the natural flow of behavior, without imposing the manipulation or controls of experimental design. The benefits of this low-restraint type of research design met the goals of the project to observe humans and bears acting in a natural setting, and to provide descriptive documentation about these activities. Naturalistic observation can identify contingent, probabilistic (rather than causal)

relationships among variables, such as human activity and bear behavior (Graziano and Raulin 2000). Controlled experimentation to investigate effects of human group size and activity type on bear behavior is an excellent idea for areas where logistically possible. For this project, however, it was not a reasonable option. First, frequency of bear sightings was not adequate. Additionally, manipulation of human group size and activity was not possible. Once groundwork is laid, however, cooperation with commercial tour companies may make such experimentation possible in other locations.

The research was designed to assess conditions on the site that were mostly non-existent, such as a high frequency of bear–human interactions. Because observations of bears and bear–human interactions were limited, the research approach could have been modified to more accurately characterize the situation at Eva Creek.

The data collection protocol was more detailed than necessary for conditions at Eva Creek. A more easily adaptable data collection protocol would have streamlined the data analysis process. For example, by early August, it was apparent that the sample size of bear–human interactions would not be large enough for statistical analysis of relationships between bear behavior and human activities. At that time (or perhaps earlier in the season), data collection could have been simplified. Researchers' time would have been spent more efficiently by aggregating behavioral classes and calculating a daily summary of frequencies of bear and human observations.

A weakness with the data collection procedure was the inability to estimate visitor and bear activity during researcher absence. Trail monitors were intended to count visitors during researcher absence, but the monitors proved less reliable than expected. Improving trail monitor use would require at least 4 reliable trail monitors, such as the Trailmaster™. Trail monitors could have been used more effectively by placing monitors on bear trails on the north side of the creek, and using more strategic placement of monitors on the human trail on the south side of the creek. Monitors placed on the human trail should have focused on areas where humans were likely to pass only twice during a stay, rather than lingering and milling about.

With a larger research team, a 'control' site with limited visitor activity could have been simultaneously assessed to allow comparison. Further, informal interviews with visitors and distribution of survey registration cards could have been much more thorough if one researcher was assigned responsibility only for those tasks. Also, more attention could have been paid to fishing activities near the mouth of Eva Creek, to more accurately gauge the amount of subsistence fishing occurring there.

MANAGEMENT RECOMMENDATIONS

Immediate decisions must determine whether it is desirable to reverse the trend of human use that contributes to changes in patterns of bear use, or to allocate the area primarily for human recreation. This research primarily focused on the impacts of human activities on brown bears, and the following management considerations therefore address options that focus on decreasing impacts to bears. Additionally, some consideration has been given to social factors of interest to the USFS. The USFS Land Use Designation (LUD) for the area surrounding the Lake Eva trail is "semi-remote recreation." The objective for semi-remote recreation LUDs is to "provide for recreation and tourism in natural-appearing settings where opportunities for solitude and self reliance are moderate to high" (U. S. Department of Agriculture 1997).

The following caveats should be considered for all management options:

Lake Eva / Eva Creek estuary meets the Unit 4 Brown Bear Management Team's definition of a 'Tier I Human–Bear High-Use Zone' (Alaska Board of Game 2000), and the guidelines and stipulations that the team recommended for such zones should be part of agency management in the area.

Tier I Human–Bear High Use Zones were defined as "areas with consistently good bear habitat with repetitive and frequent human use sufficient to generate immediate management concerns" (Alaska Board of Game 2000). Eva Creek fits within the criteria of an area where action is needed immediately because human use is currently high and the effects of high use are imminent or evident (Alaska Board of Game 2000). Stipulations for outfitter / guides and voluntary guidelines for non-commercial users in Tier I areas include: 1) no campfires, barbeques and picnics; 2) no camping in estuary areas or along salmon streams; and 3) no transport by airplanes, 4-wheelers, jet boats, or helicopters within the estuaries proper (Alaska Board of Game 2000). Under Tier I designation, commercial permits stipulate group size, number of groups, and timing guidelines based specifically on the site and circumstances. (Alaska Board of Game 2000).

Eva Creek is not a good place for bear viewing if the goal is to have a high frequency of bear sightings because 1) the habitat mosaic does not appear to support high densities of bears; 2) inconsistent human behavior in the study area does not lend itself to habituation; and 3) visibility in the area is poor and does not lend itself to distance viewing of non-habituated animals.

Bear viewing at Eva Creek is inconsistent because bears are rarely observable, even from an observation platform above the main bear foraging area. Researchers observed bears for only 19 of 468 observation hrs. Unlike established bear viewing areas such as McNeil and Brooks rivers, salmon are not concentrated at this creek within the region, so bears have opportunities to go elsewhere, both upstream and to adjacent creeks. Most importantly, visibility is limited due to a winding stream corridor that is heavily-forested all the way to the creek's edge. Therefore, even during times when bears and people are both present, it is difficult for people to see the bears.

One reason to habituate bears is that it encourages bears to use the area while humans are present (Aumiller and Matt 1994). Without the end-goal of bear viewing, little motivation for intentional habituation exists.

Managers may not be able to install a habituation regime, even if it were determined to be the best course of action. Horesji et al. implied that habituation could occur in any place where people modified the landscape (Horesji et al. 1998). However, other studies have focused on methods for intentionally habituating bears, and emphasize the importance of a consistent habituation program, for both bear and visitor safety (Aumiller and Matt 1994, Chi and Gilbert 1999, Smith 2001). Some of these habituation systems could be attempted at Eva Creek, although the likelihood of success is small, due to a low concentration of bears and inconsistent visitor presence at the site. Spring grazing and fall scavenging for salmon are two activities that draw bears, including sows with cubs, to the area. Both of these activities occur within the "shoulder season" for tourism (late May to early June and late September to October), and are not likely to attract the consistent numbers of people needed to habituate bears. Most bears I observed using Eva Creek during summer 2002 can be classified as wary, or non-habituated (Aumiller and Matt 1994). Decreased bear activity during and after visitor presence at Eva Creek may support the claim that observed bears were not tolerant of human activity. However, the observation that there was considerable bear activity just out of sight of the platform indicates that some bears were partially neutrally habituated.

When not possible to habituate bears, other measures must be taken to reduce negative impacts inherent in bear – human interactions. Management of human activities in bear country either directly, or indirectly by facilities design, is the preferred way to influence interactions between bears and people. Lessons learned at both bear viewing and backcountry camping sites in other areas with bears should inform management decisions where bears and people interact, such as on the Lake Eva Trail.

Limited visitor use, to either a few days per week, or to midday hours will give bears more foraging opportunities at Eva Creek.

Regulation of human use might make Eva Creek a place where brown bears will regularly return. To allow bears both morning and evening foraging times, visitor activities that currently displace bears from the lower falls should be concluded at approximately 5:00–6:00 p.m. in summer, or several hours before dusk. This practice could allow bears to use the area for a few hours before nightfall. Because most bears swim with heads submerged searching for carcasses rather than catching live fish in Eva Creek, nocturnal fishing is not practical there. For bears to see carcasses on the bottom of the creek, some daylight is necessary. Therefore, bear use during the morning and evening is essential to maximize productive foraging opportunities for bears that may return after being displaced midday by visitor presence. Some bears do use the area for spring and summer foraging, so limiting visitor use to a few days per week during spring and summer may increase bear foraging opportunities.

Design modifications to the existing trail could reduce conflicts between visitors and improve bear accessibility to potentially important habitats, but are unlikely to change use patterns of sport fishers.

The Lake Eva trail should be re-designed (Appendix 8) to direct visitor traffic away from stream reaches associated with bears, such as bear foraging sites (Christensen 2003). Re-routing the trail would benefit brown bears, guided hiking companies, and anglers. As a Semi-remote Recreation Area, the Lake Eva trail should provide visitors with the opportunity for solitude (U. S. Department of Agriculture 1997). Most conflict between hikers and bears, and some conflict between hikers and anglers could be reduced by re-routing the trail. (Information about visitor conflict is detailed in Appendix 7.) Large groups should be diverted away from the lower falls to minimize disturbance to foraging bears. The trail should be rerouted through the bog south of the current trail bypassing the stream for its lower reach (Appendix 8). If hiker access to the creek is deemed necessary, spur trails could be constructed leading to a platform in the lagoon and another above the falls where the tree stand was located. This configuration might lower the impact large hiking groups have on bears using the stream.

Visitor traffic should not be routed to the lake's inlet stream where sockeye salmon spawn. Human use should be routed away from the tributary stream (Fig. 2) if possible, because it currently shows signs of relatively heavy bear use during late summer (Christensen 2003). Angling at Eva Creek is likely a major deterrent to bear foraging activity, as evidenced by the absence of bear observations while any person fished in the creek during summer 2002. Indeed, many favorite fishing spots for people were frequented by bears during visitor absence. The popularity of stream riffles for sport and subsistence fishing makes it unlikely that human use will be effectively diverted from the lower falls. One potential solution would be to improve trail access to fishing spots adequate for people, but less favorable for bears (Appendix 8).

Anglers should be encouraged to use best management practices for sport and subsistence use in the presence of bears.

Eva Creek's public fishery plays an important role in local subsistence and sport fishing activities. Eva Creek has runs of several high-value sport species and sockeye salmon, which is a key, yet relatively scarce subsistence resource. Therefore, potential for cooperation from anglers exists if best management practices increase the likelihood of continued use of the fishery. Human presence can reduce available habitat for bears (Smith 2002, Olsen et al. 1990). Anglers should be encouraged to avoid the tributary stream (Fig. 2) all summer, and the lake's inlet stream during sockeye salmon spawning in late summer. Guidelines for visitor activity should include suggestions for quiet, slow activity. It is worth noting that most bears at Eva Creek did not exhibit stress in response to silent stationary researchers (Van Dyke 2003), suggesting that silent, stationary visitors may be less likely than mobile visitors to displace bears at the study site.

Adaptive management should be implemented to address changes in bear and human use patterns over time as documented in a long-term monitoring program.

Some precautionary steps should be taken to anticipate future problems and preserve conditions that are currently desirable at Eva Creek area, if tourism and recreation are permitted to grow there. For example, a primary objective of brown bear management is the reduction of negative bear-human interactions, such as bear attacks and resultant defense of life and property (DLP) kills (Alaska Department of Fish and Game 1998a). Additionally,

managers are concerned about bear displacement and stress during important foraging seasons that limits bear survival and reproduction (Alaska Department of Fish and Game 1998b). As humans gain access to what were formerly pristine areas, more bear-human interactions are likely (Titus and Schoen 1993). Currently, direct bear–human interactions are limited at Eva Creek, and no evidence of food-conditioning among bears was found. However the potential for negative bear–human encounters will increase if visitor numbers increase there. Some visitors left litter such as food containers on and near the trail in summer 2002, a trend which could lead to food-conditioning if increased. Ranger patrols may become necessary at Lake Eva if reports of negative bear encounters are received.

After initial management actions are implemented, monitoring at the Eva Creek study area should include a habitat use assessment, as performed by SEAWEAD naturalists in 2002 (Christensen 2003). Changes in bear trail, and ephemeral bear sign (such as scat) densities and bear bed locations over time can be used to measure changes in bear movement patterns and timing of use. For example, bear bedding areas surrounding the lagoon and bear trails near the falls should also be monitored to evaluate changes. Regular monitoring can indicate whether changes in bear habitat use are related to resource availability or human use.

All commercial tour operators should be scheduled to use the study area at different times of the season and at different times of day. Permit-holders should receive education about best management practices in the study area.
Scheduling would lessen the spatial 'footprint' of guided groups in watersheds and bays adjacent to Eva Creek. When commercial tour operators arrive at an anchorage where another boat is already anchored, many move on to the next watershed or bay to provide their guests with a 'wilderness' experience, or the opportunity for solitude. This trend spreads the impact of onshore tourism to an entire region surrounding a special place, such as Eva Creek.

Scheduling already occurs somewhat naturally, because visitor use at Eva Creek tends to flow according to relatively well-defined trends. Anglers were present for most of the summer in 2002, but their use was most intense before salmon fishing was productive offshore. Groups fly-fishing for Dolly Varden and Cutthroat trout were present nearly every day in June and early July. Guided hikers arrived most frequently during the peak of tourism season, approximately 3–4 days a week from mid-July to late August. Some guided hikers came in June, but not many. Non-guided hiker visitation tended to be dispersed evenly throughout the season. Because salmon migrations and tour operator logistics will continue to play an important role in the seasonal trends of visitation at Eva Creek, planning should be based on existing temporal trends. For example, anglers could be scheduled to use the area most frequently in June and July, and on alternating days in the rest of the summer. Guided hikers could be scheduled for midday a few days per week all summer long, with slightly more use scheduled in July and August. Timing of non-guided use could be influenced by making the schedule for guided use available to the public. People seeking solitude would plan visits to the Eva Creek area during times when guided groups were not scheduled to visit.

Daily trends in visitor activity were also fairly well defined. Most visitor activity occurred between 9 a.m. and 5 p.m., in accordance with tour boat logistics and visitor preferences. Anglers and non-guided hikers occasionally arrived as early as 5 a.m., and departed as late at

9 p.m., maximizing use of daylight in the forest. However, most human activity was clustered around midday. Like seasonal patterns, predictable current daily patterns should be incorporated into temporal zoning when planning future visitor use. For example, guided hikers could be scheduled to visit the area between 10 a.m. and 3 p.m. Discussions with outfitters and guides would be necessary to select the best time periods for each type of use.

Enforcement of commercial permit use should be increased.
A comparison between reported and observed use by commercial operators during summer 2002 indicated that more guided use is occurring at Eva Creek than is being reported to the USFS. Enforcement officers should be encouraged to reprimand non-permitted commercial users.

Cooperation from user groups should be sought in future management planning.
Because mid-size and small cruise ships bring groups to the study area, the main activities in the area are directed by guides from these ships. In planning future management of the area, cooperation from commercial tour operators and anglers should be sought for both strategizing and implementation.

Interagency cooperation should remain a high priority.
Research at Eva Creek supported by multiple agencies in summer 2002 set a successful precedent for cooperative management of the area. Future cooperation between management agencies (such as USFS and ADF&G) should be practiced to ensure that a host of environmental and social concerns are adequately addressed. An interagency cooperative management plan could incorporate recommendations from the USFS Shoreline Outfitter / Guide Draft EIS, the Unit 4 Brown Bear Management Team Report, and other agency management plans.

Lake Eva trail may be a good place for an "enclave" with intensive large group visitation at an anadromous stream compared to alternative sites nearby. If the study area is designated as an enclave, commercial use for northeastern Baranof Island should be concentrated there, and adjacent proposed enclaves should not be designated for commercial outfitter / guide use. Further research is necessary for an adequate comparison.
The Lake Eva trail may be a suitable place for a large group enclave, because few bears were observed there, and the area has recent history as a place for recreational activity. Large increases in tourism and recreation should not be permitted at Eva Creek until bear habitats at alternate sites in the immediate region have been identified through comparative on-the-ground site assessments. Assessments performed on a regional scale would provide information useful in determining the impacts of human and natural disturbances to bears. For example, if visitor use is permitted to increase at Eva Creek, there is currently no knowledge of where bears in the area might go when displaced.

Admiralty and Chichagof island male brown bears have mean home ranges of 115 km², and females range only 24 km² (Schoen et al. 1986). While there are anadromous streams in the vicinity, the nearest sockeye stream is 24 overland kilometers to the northwest. Beyond that stream, the next closest is approximately 80 km away, near Sitka (R. Christensen, pers.

comm. 2003). Eva Creek is locally unique because most of the adjacent watersheds have been heavily logged, with drastic modification to bear habitat. Other human activities on northeastern Baranof Island may additionally alter bears' use of habitat. An assessment of such anthropogenic disturbances across the landscape should be performed in conjunction with a ground-truthed habitat suitability model for regional shorelines. Landscape and regional level modeling are most effective when model assumptions are based on data collected on site (Brooker et al. 1999). Studies on habitat connectivity and wildlife movement have used such models (Jennings 2000, Bascompte and Solé 1996, Gardner et al. 1989, Monkkonen and Reunanen 1999, With et al. 1999). For example, the National Gap Analysis Program (GAP) uses spatially explicit data to catalogue and analyze biological information at multiple scales (Jennings 2000). A cumulative effects analysis (CEA) could predict critical thresholds for bear populations by calculating combined impacts from different types of disturbance such as habitat alteration and a range of human disturbances (Schoen 1990, Schoen et al. 1986). This approach could assess threats to bear population viability by calculating cumulative risks in adjacent watersheds. All anadromous streams within at least 115 km² (Schoen et al. 1986) should be assessed for bear habitat and use by bears.

Although consumer demand for remote hiking areas necessitates designating some areas for large group activity, evaluation of regional impacts from dramatically increased visitor use is a prudent precaution. Although Eva Creek may be a good place for a large group enclave, further research is necessary to draw an adequate comparison between sites in the region similarly suitable for human needs. Many visitors to the Eva Creek area noted that using the Lake Eva trail was the main purpose for visiting the study area. It is reasonable to assume that other sites would be equally attractive to humans if trails were built there.

The Lake Eva trail would be an ideal site for a long-term recreational study regarding changes in human use patterns and conflicts between visitors in high-use areas.
Some areas may need to accommodate large tour groups. Managers must anticipate use of natural areas in 25–50 years that does not exist today. For example, the USFS Shoreline Outfitter / Guide EIS has outlined large group enclaves and 15% areas to plan for an intensity of use that is currently rare outside of cities and large towns in Southeast Alaska (U. S. Department of Agriculture 2002a). The current use at Lake Eva provides an example of how area operating at "15% capacity" may function in practice. The Eva Creek area may provide an ideal long-term monitoring location for planning other tourism sites, if management decisions continue to favor intensive tourism and recreation.

MANAGEMENT OPTIONS

Following are 6 potential management options for the Lake Eva trail and Eva Creek. This section is intended to provide general information about the range of potential management options, not to endorse one option as preferable over another. Note that a table summarizing each option follows the descriptive text, in which differences between options are emphasized with italicized lettering (Table 5).

1. No Change

The Lake Eva Trail is currently operating as a tourism and recreation area with a substantial amount of recreational use.

Prescription:

- Maintain current levels of outfitter / guide permits.
- Allow guided and non-guided sport fishing, subsistence fishing and brown bear hunting.
- No management decision regarding whether bears should be habituated or not.
- No agency presence.

Outlook:

- Current trail should receive immediate repairs.
- Regular (annual) trail repairs will be necessary.
- No apparent change in current bear use patterns.
- Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase over time.

This option is not preferable because of increased pressure to manage activities at the site from management agencies considering both wildlife and visitor needs. Bears are likely altering movement patterns and currently there is small payoff in terms of bear viewing.

2. Designate the Area as a '15% Area' for 15% of Possible Guided / Commercial Use Days

Under the USFS Shoreline Outfitter / Guide DEIS, I estimated current use by large groups (21–75 people) at Eva Creek to be approximately 11% of the days in summer. Such use might qualify Eva Creek as a "15% area" under the DEIS (U.S. Department of Agriculture 2002a). That is, during 15% of the days during the primary use season, large groups of up to 75 people could occur at the area from one to several times per day. *This option is different than the current management regime because it formally distinguishes a management protocol for the area and slightly increases permissible commercial use.*

Prescription:

- Increase current levels of outfitter / guide permits to permit large group visitation during 15% of summer days.
- Allow guided and non-guided sport fishing, subsistence fishing and brown bear hunting.
- Some agency presence.
- Increased guided use could occur almost immediately.
- Monitoring would be necessary to evaluate impacts and conflicts over time.
- An adaptive system for managing the area would include timely response to impacts and conflicts, trail maintenance and adjustments, and spatial or temporal separation of users.

Outlook:

- Current trail should receive immediate repairs and be rerouted. (Appendix 8)
- Regular (annual) trail repairs will be necessary.
- No apparent change in current bear use patterns.
- Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase over time.

This option is preferable because it will provide structured guidelines for use of an area with marginal bear habitat, a poor bear viewing setting, and historic importance as a public fishery. Provisions should be made to accommodate most users, by making specific consideration for subsistence and sport fishers, and re-routing the trail away from the creek side. Further, management recommendations in the previous section should be incorporated.

3. Designate the Area as an 'Enclave' for 100% of Possible Guided / Commercial Use Days

Under the USFS Shoreline Outfitter / Guide DEIS, Lake Eva trail is designated as a "large group enclave" (U.S. Department of Agriculture 2002a). As written, a large group enclave is a place where groups of up to 75 people could occur on a regular basis throughout a day or season, but not simultaneously. Such permitting could increase the current large group guided use by a magnitude of 9. For example, if large groups can be estimated to currently visit the study site 11 out of 100 days, this management option would potentially increase that use to 100 out of 100 days. A reconstructed trail would likely attract more use, as would closures of adjacent areas to commercial use.

Prescription:

- Increase current levels of outfitter / guide permits to permit large group visitation during every day of the summer.
- Allow guided and non-guided sport fishing, subsistence fishing and brown bear hunting.
- Some agency presence.
- Increased guided use could be phased in, but would require proportionate increase in management of the area.
- Monitoring would be necessary to evaluate impacts and conflicts over time.
- An adaptive system for managing the area would include timely response to impacts and conflicts, trail maintenance and adjustments, and spatial or temporal separation of users.

Outlook:

- Current trail should be reconstructed and rerouted. (Appendix 8)
- Frequent trail repairs will be necessary throughout the summer.
- Change in current bear use patterns and potential decrease in bear numbers.
- Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase immediately.
- Anglers dissatisfied because of degraded aesthetic values (e.g. solitude).

This option is preferable only if several considerations are examined. It is preferable because the area has marginal bear habitat, is a poor bear-viewing setting, and has a long history of human use such as for fishing. *However, the drastic increase in conflict between users must be weighed heavily.* Provisions should be made to accommodate most users, by making specific consideration for subsistence and sport fishers, and re-routing the trail away from the creek side. *If designated as an enclave, the Lake Eva trail should be the sole location for intensive (100% of possible user days) large-group outfitter / guide commercial activity on northeastern Baranof Island until landscape-scale studies of bear movements have been performed.* Furthermore, management recommendations in the previous section of this report should be incorporated.

4. Create an Exclusive Bear Viewing Area

An area managed exclusively for bear viewing might resemble other bear viewing areas in Southeast Alaska, such as Pack Creek Cooperative Management Area (Pack Creek) or Anan Creek Wildlife Observatory (Anan Creek). Intensively managed bear viewing areas limit visitor activities and numbers. During summer 2002, for example, 1,215 people visited Pack Creek (J. Neary, pers. comm. 2003), and Anan Creek received 2,634 visitors (D. Galla, pers. comm. 2003). Visitor activities at those areas are restricted to make human use as consistent and predictable as possible. For Eva Creek, similar restraints would be placed on visitor numbers and activities in attempts to habituate the bears.

Prescription:

- Decrease current levels of outfitter / guide permits.
- Disallow guided and non-guided sport fishing, subsistence fishing and brown bear hunting.
- Agency presence.
- Management would actively expose bears to viewers to encourage habituation.

Outlook:

- Current trail should receive immediate modifications.
- Regular (annual) trail repairs will be necessary.
- Habituation of bears to people at site.
- Conflict between bear viewers and hunters likely.
- Limited bear sightings.
- Anglers dissatisfied because of degraded aesthetic values (e.g. solitude).

The area is not well-suited for an exclusive bear viewing area because of its relatively poor potential for bear viewing, and its importance as a subsistence and sport fishery.

5. Create a 'Human / Brown Bear Special Use Zone'

The Interagency Unit 4 Brown Bear Management Team defined a 'brown bear special use zone' as an area in which hunting and bear viewing would be managed as equal in priority, and where bears would not be habituated to people (Alaska Board of Game 2000). *For Eva Creek, this management option differs from current management practices in that it officially declares that habituation of the bears is not desirable there.*

Prescription:

- Maintain current levels of outfitter / guide permits.
- Allow guided and non-guided sport fishing, subsistence fishing and brown bear hunting.
- Some agency presence.
- Management would actively separate viewers and bears to avoid habituation.
- Some management effort could be devoted to enhanced viewability of bears, but preferably at a distance.

Outlook:

- Current trail should be reconstructed and be rerouted. (Appendix 8)
- Regular (annual) trail repairs will be necessary.
- Some change in bear use patterns but not in numbers of bears.
- Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase over time.

This option is probably not advisable, because the study area does not meet the criteria for site selection outlined by the brown bear management team (Alaska Board of Game 2000). Primarily, the Eva Creek area does not afford consistent opportunities to view bears. Additionally, the Eva Creek area does not have several vantage points suitable for viewing at a distance, therefore viewers would be concentrated at a single point. Bear viewing is not likely to occur on a large scale at Eva Creek, although other types of wildlife and nature viewing will.

6. Permit Non-guided Use Only – Divert Guided Use Away from Eva Creek

Prescription:

- Disallow outfitter / guide permits.
- Allow only non-guided sport fishing, subsistence fishing and brown bear hunting.
- Some agency presence.

Outlook:

- Infrequent (bi-annual) trail repairs will be necessary, although not nearly the level currently necessary.
- Some change in bear use patterns but not in numbers of bears.
- Tour companies dissatisfied.

Elimination of guided use is not desirable because present impacts from guided users are not at high levels and management options to help limit impacts of guided users currently exist.

Table 5. Management options for Eva Creek, Baranof Island, Alaska: prescriptions and outlooks

	Prescription						**Outlook**		
Management Option	Outfitter / guide permits	Sport fishing	Subsistence fishing	Brown bear hunting	Intent to Habituate	Agency presence	Trail	Bear Use Patterns	User Satisfaction
1. No change	Maintain current levels	Allow	Allow	Allow	N/A	No	Current trail repaired immediately, *annual trail repairs* will be necessary.	*No apparent change* in current bear use patterns.	Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase *over time*.
2. 15% area	Increase small and large groups to permit use 15% of summer days.	Allow	Make specific provision for continuance	Allow	N/A	Some	Current trail repaired immediately and *rerouted, annual trail repairs* will be necessary.	*No apparent change* in current bear use patterns.	Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase *over time*.

	Prescription						**Outlook**		
3. Enclave	Increase small and large groups to permit use every day of summer.	Allow	Make specific provision for continuance	Allow	N/A	Some	Current trail repaired immediately and *rerouted*, *frequent* trail repairs will be necessary throughout the summer.	*Change* in current bear use patterns and *potential decrease* in bear numbers.	Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase *immediately*. *Anglers dissatisfied.*
4. Exclusive bear viewing area	Decrease large groups, increase small groups	Prohibit	Prohibit	Prohibit	Yes	Yes	Current trail repaired immediately and *modified*, *annual trail repairs* will be necessary.	*Habituation* of bears to people at site.	Conflict between *bear viewers and hunters* likely. Limited bear sightings. *Anglers dissatisfied.*
5. 'Human / brown bear special use zone' bear viewing area	Maintain current levels	Allow	Allow	Allow	No	Some	Current trail repaired immediately and *rerouted, annual* trail repairs will be necessary.	*Some change* in bear use patterns but not in numbers of bears. Bears not habituated.	Conflict between guided and non-guided users, and small and mid-size tour companies is likely to increase *over time*.
6. Non-guided use only	Abolish	Non-guided only	Allow	Non-guided only	N/A	Some	Infrequent trail repair, lower level than is currently necessary.	*Some change* in bear use patterns but not in numbers of bears.	Tour companies dissatisfied.

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APPENDIX 1 - VISITOR SATISFACTION: RESULTS FROM VISITOR SURVEY

Data Collection

All visitors to the study area were invited to participate in a voluntary online survey. Signs that explained the purpose of the study and the survey were attached to survey registration boxes at the trailhead and near the lower falls. Pencils and brief optional survey registration cards were stored in the registration boxes. Researchers collected completed survey cards daily. By September 9, 2002, ninety-seven completed survey registration cards were collected.

Questions for the online survey were developed in cooperation with management agencies and professional survey administrators. Bob Christensen of SEAWEAD created an interactive website (http://www.seawead.org/bearsurvey.html) where participants responded to the questions. A complete list of survey questions is located at the end of this section (Table 1-1).

The 69 valid email addresses collected from survey registration cards comprised the sampling pool for an online survey. Visitors were contacted via email on October 2, 2002 and given instructions about how to complete the survey on the internet. Because only a small percentage of visitors responded immediately, a reminder email was sent to remaining visitors on October 2, 2002, and a final email was sent on December 5, 2002. Once a person responded, he or she was not contacted again. By December 31, 2002, thirty-five visitors had completed the online survey, for a final response rate of 51%. This appendix summarizes key findings from the visitor survey.

Results

A. Visitor Expectations

Most visitors wanted to see brown bears, and expected to see them at Eva Creek. Nearly all Eva Creek visitors expected to see a brown bear during their stay. 94.3% (n = 33) of survey respondents anticipated viewing or encountering brown bears while planning their trip to Lake Eva. Twenty-three (23) survey respondents said that is was either extremely or somewhat desirable to view or encounter a brown bear at Eva Creek. Alternately, 6 respondents said that it was extremely or somewhat undesirable to see a brown bear.

B. Visitor Crowding

Only half (51.4%; n = 18) of visitors reported seeing a brown bear at Eva Creek. That number may be higher than the actual number of visitors to actually see a bear at Eva Creek. The reader should note the discussion on this result at the end of this appendix. Fourteen (40%) visitors reported feeling crowded while visiting Eva Creek. Eight of those who felt crowded said that the trail was the location of their discomfort. Three respondents noted feeling crowded at the falls.

C. Visitor Sense of Safety

Survey respondents reported an overall sense of safety regarding brown bears during their visits to Eva Creek. Fifteen (42.9%) said they felt very safe, and eight (22.9%) felt somewhat safe. Only 8 felt either very or somewhat unsafe about having a possible encounter with a brown bear. Feelings of safety may seem to have been influenced by the presence of a guide. However, 9 out of twelve (75%) non-guided visitors reported feeling either somewhat or very safe. A slightly lower 14 out of 23 (60.9%) guided visitors reported similar feelings.

D. Purpose of Visit

Of 35 respondents, twenty-nine (82.9%) rated hiking as a purpose for visiting Eva Creek. Of those, 65.5% (19) rated hiking their highest priority. An additional seven (24.1%) hikers ranked hiking as a high priority. Eighteen of the 35 respondents (51.4%) ranked wildlife viewing as a purpose for visiting Eva Creek. Only 16.7% of those (n = 3) ranked it as their highest priority for visiting the site. An additional 6 people (33.3%) rated wildlife viewing highly. Seventeen of the 35 respondents (48.6%) ranked fishing as a purpose for visiting Eva Creek. Thirteen (76.5%) of the 17 rated fishing their highest priority.

E. Self-reported Human–Brown Bear Interactions

Eighteen of 35 survey respondents reported seeing a brown bear at Eva Creek. Of those, 7 people said that the bear's proximity was between 25–100 feet. Another 7 said that the bear was within 100–300 feet of the group. Four visitors reported seeing a bear at a distance greater than 300 feet away.

1. Human Responses to Bears

Most of the visitors who saw a bear failed to report on their group's response to the bear. Twelve of the 18 survey respondents did not answer the question. The remaining 6 respondents were equally balanced in response, with half moving away from, and half moving around the observed bear. Visitors were willing to report their noise response to bears, and thirteen (72.2%) of those who saw a bear said they remained silent. The remaining 5 respondents said they made noise. Those reporting a silent response may have been influenced, or quieted by a guide, because eight of ten (80%) guided visitors said they remained silent, while only 5 of eight (62.5%) non-guided visitors reported a quiet response when encountering a bear.

2. Bear Responses to Humans

Many visitors who encountered bears (44.4%; n = 8) chose not to answer how the bear responded to human presence. Seven (38.9%) bear viewing visitors said that the bear moved away in response to the group of people. The remaining three (16.7%) said that the bear moved around the people. Of the 7 bears that moved away from people, 5 were reportedly within 25–100 feet of people. Two of the 3 bears that moved around people were said to be 100–300 feet away from people during the interaction. Based on low visitor response levels, bear reaction to visitor noise levels was not determinable from survey results.

F. Visitor Perspectives on Tourism and Wildlife Viewing at Eva Creek

Survey respondents were given the following options for preferred trail type at Eva Creek:

1. No change – likely to be muddy and require boots.
2. Graveled – little development, likely to be muddy in places.
3. Wooden planks – moderate development, raised off the ground and sometimes slippery.
4. Wheelchair accessible – intensive development, wide and secure.
5. Combination of the above (respondents were asked to describe their ideas).

Twenty-four of the 35 respondents (68.6%) chose the option for no change to existing trail conditions. Five people (14.3%) suggested a combination of proposed changes. Four people (11.4%) preferred graveled trails, and only 2 people (5.7%) thought wooden planks would be preferable. None of the respondents chose the option for intensely developed, wheelchair accessible trails at Eva Creek.

Some visitors provided suggestions, which are quoted in the following:

- "It would be nice if the trail received some maintenance as to avoid the extensive erosion that was obvious in some of the muddier areas. Perhaps putting in some wooden plank bridges over the excessively wet areas, or digging drainage ditches to divert some of the water from these areas would be a good idea. I feel that it should remain a 'wild' trail (no gravel, etc.), but it would be necessary to do some sort of maintenance so visitors don't walk around bad areas and create other eroded spots."

- "Some better maintenance of existing trail. After much rain was almost impassable above upper falls."

- "Some planks over bogs to protect the environment."

- "No change in trail, except to protect the bears and the ecosystem."

- "The less development in Southeast Alaska the better it is for the wildlife that lives there."

- "Keeping these areas as natural as possible is the best, but agree that some gravel at dangerous spots or deep holes would be OK."

- "Just fix a few bad spots."

Visitors were asked whether they agreed with the following statement: "I support increased development of visitor facilities at Lake Eva." Of 35 respondents, twenty-four (68.6%) visitors disagreed with the statement, six (17.1%) neither agreed nor disagreed, and only five (14.3%) agreed.

G. General Visitor Wildlife Viewing Preferences
Thirty-one visitors (88.6%) agreed that they would like to see a brown bear in the wild, or at least evidence of a bear at a place they visited, and seventeen (57.1%) of those strongly agreed. Twenty-eight (80%) respondents agreed that they would like to see bear sign, such as tracks or scat, in the wild.

H. Visitor Perspectives on Tourism and Wildlife Viewing Planning
Most visitors (71.4%; n = 25) agreed with the statement "Agencies should provide natural conditions for brown bears even if this means more visitor restrictions." Nearly half (40%; n = 14) of those strongly agreed. More visitors (47.1%; n = 16) felt it was unreasonable for bear viewing and bear hunting to occur in the same area, even if conducted at different times of the year, compared to those who felt it was reasonable for them to occur in the same area (32.4%; n = 11).

Discussion: A Note on the Accuracy of Results

There are at least 4 major sources of potential error in survey research (Dillman 1978):
1. Coverage error – how adequately the sampling frame covers or is inclusive of the actual sample population;
2. Measurement error – how well the survey questions measure what they are intended to measure;
3. Sampling error – how large the sample size is as a function of the target population; and
4. Non-sampling error (non-response) – how much bias is introduced through non-participation.

Survey limitations were most evident in the non-sampling error. A large amount of non-response occurred before the actual survey was administered. Of the estimated 1,964 people to visit the Lake Eva area during Summer 2002, only 97 (4.94%) filled out the survey registration card.

Both cover and measurement errors are possible, as evidenced in one particular question response. Half (51.4%) the survey respondents reported seeing a brown bear at Eva Creek. Because silent, immobile researchers observed bears less than 5% of the time it seems unlikely that half of Lake Eva's visitors saw bears. There are two possible rationales for this biased sample: either visitors who saw bears were more likely to complete the survey, or visitors who completed the survey confused Lake Eva with another area they visited in Southeast Alaska. In either case, it is clear that the results from this survey should be evaluated as a coarse measure of public attitudes only.

Table 1-1. Online visitor survey questions

Question	Possible Answers
While planning your trip to Lake Eva, did you anticipate viewing or encountering brown bears?	1 = yes / 2 = no
If YES, how desirable was it for you to view or have an encounter with a brown bear?	1 = extremely desirable / 2 = somewhat desirable / 3 = neither / 4 = somewhat undesirable / 5 = extremely undesirable
During this visit to Lake Eva, how safe did you feel about having a possible encounter with a brown bear?	1 = very unsafe / 2 = somewhat unsafe / 3 = neither safe nor unsafe / 4 = somewhat safe / 5 = very safe
Did you visit Lake Eva by yourself or in a group?	1 = self / 2 = group
If in a group, what was your total number?	
If in a group, were you professionally guided?	1 = yes / 2 = no
Please type the name of the guide company.	1 = Lindblad / 2 = Boat Company / 3 = other
4. What did you and/or your group come to the Lake Eva area for? *Please rate order of importance 1-5(low-high)*	
day hiking	1 /2 / 3 / 4 / 5
fishing	1 /2 / 3 / 4 / 5
camping / cabin stay	1 /2 / 3 / 4 / 5
bear viewing	1 /2 / 3 / 4 / 5
overnight	1 /2 / 3 / 4 / 5
other	Open-ended
5. How much time did you and/or your group spend hiking in the Lake Eva watershed?	
Please enter the # of hrs for day trips or # of days for camping.	hrs
Please enter the # of hrs for day trips or # of days for camping.	days
6. Did you travel with a dog?	1 = yes / 2 = no

Question	Possible Answers
7. a) Did you encounter or see brown bear(s) in the Lake Eva watershed?	1 = yes / 2 = no
b) Describe location(s) of bear sighting(s) below. *Use map at top for place names and orientation.*	Open-ended.
c) List minimum distance(s) between you and bear(s) in feet. (*<25, 25-100, 100-300, >300)*	1 = <25 / 2 = 25-100 / 3 = 100-300 / 4 = >300
8 a) Pick one that best describes you or your group's response to bear(s).	1 = moved away from bear(s) / 2 = remained still / 3 = moved toward bear(s) / 4 = moved around bear(s) / 99 = n/a
b) Pick one that best describes you or your group's response to bear(s).	1 = made noise / 2 = kept silent
c) Pick one that best describes the bear(s) response to you or your group.	1 = moved away from you / 2 = no change of behavior / 3 = moved toward you / 4 = moved around you / 99 = n/a
9. a) Did you feel crowded by other visitors using the lake Eva area?	1 = yes / 2 = no
b) If YES, please choose one that best describes where.	1 = in the bay / 2 = on the beach / 3 = on the trail / 4 = in the lagoon / 5 = at the falls / 6 = up the creek / 7 = on the lake.
10. For each statement listed below, please indicate how much you agree or disagree.	
a) I would like to see a brown bear in the wild.	1 = strongly agree / 2 = agree / 3 = neither agree nor disagree / 4 = disagree / 5 = strongly disagree
b) It is reasonable for bear viewing and bear hunting to occur in the same area if conducted at different times of the year.	1 = strongly agree / 2 = agree / 3 = neither agree nor disagree / 4 = disagree / 5 = strongly disagree
c) I would like to see bear sign(tracks, trails, scats, etc.) in the wild.	1 = strongly agree / 2 = agree / 3 = neither agree nor disagree / 4 = disagree / 5 = strongly disagree
d) Agencies should provide natural conditions for brown bears, even if this means more visitor restrictions.	1 = strongly agree / 2 = agree / 3 = neither agree nor disagree / 4 = disagree / 5 = strongly disagree

Question	Possible Answers
e) I would like to see more places developed for bear viewing in Southeast Alaska.	1 = strongly agree / 2 = agree / 3 = neither agree nor disagree / 4 = disagree / 5 = strongly disagree
f) I support increased development of visitor facilities at Lake Eva.	1 = strongly agree / 2 = agree / 3 = neither agree nor disagree / 4 = disagree / 5 = strongly disagree
11. The type of trail I would prefer to see at Lake Eva is:	1= no change - likely to be muddy and require boots / 2 = graveled - little development, likely to be muddy in places / 3 = wooden planks - moderate development, raised off the ground and sometimes slippery / 4 = wheelchair accessible - intensive development, wide and secure / 5 = combination of the above (describe below).
Anything else you would like to tell us about your visit to Lake Eva? Do you have recommendations for managing Lake Eva? Use the area below to say whatever you like!	Open ended.

APPENDIX 2 - OBSERVATION CODING

Type

Bear Type: Age and sex classification.

- Uncertain – age and sex not distinguishable.
- Male – urine stream projects forward, or male genitalia is visible (Braaten and Gilbert 1987). May have a smooth, darker coat, blocky head, wide shoulders that are broader than the head, and a long, thick neck (Yukon Fish and Game).
- Female – urine stream projects behind bear, prominent mammary glands, or a bear accompanied by cub (Braaten and Gilbert 1987). May have a fluffy, lighter coat, a long nose, delicately shaped face, square shoulders, and a short, thin neck (Yukon Fish and Game).
- Adult – larger bear, with ears small relative to head size, and a square head. May move steadily in one direction before stopping (Yukon Fish and Game).
- Sub-adult – smaller bear, appearing less than 7 years old. May have fluffy fur, prominent ears in relation to head size, narrow head, and lanky legs. May move slowly and wander (Yukon Fish and Game).

Human Type: Guided vs. non-guided use. (Verified with informal interview.)

- Research personnel – member of the research team.
- Guided visitors – group of 2 or more people that arrives in a commercial vehicle, or appears to have one person giving instruction.
- Non-guided visitor – any individual or a group that does not appear to have one person giving instruction.

Vessel Type: General shape and function.

- Kayak / Canoe – non-motorized boat.
- Skiff – small non-covered boat with an outboard motor.
- Dingy – non-motorized paddle-ashore boat from a larger vessel.
- Small cabin cruiser – medium sized boat with some wheelhouse covering and a motor.
- Yacht – larger private pleasure boat.
- Fishing vessel – boat with commercial fishing gear visible.
- Cruise ship – small and mid-size cruise ships with more than 6 berths.
- Other – with comments to describe.

Activities

Bear Activities: Activities of bears

- Feeding – pursuit of, or consumption of food.
    - Digging – any digging activity, including digging for clams in the inter-tidal area, and digging for plants in the forest and riparian zones.
    - Grazing – active feeding on sedges and grasses while standing or sitting.
    - Fishing – actively searching for, or feeding on live fish.
    - Catching – catching a live fish.
    - Eating – eating a fish, whether scavenged or caught.

    - Scavenging – feeding on dead fish.
    - Searching – searching the area for fish.
    - Stealing – stealing a fish from another animal.
- Resting – lying down for more than 15 seconds.
- Bedded down – lying in a bed for more than 15 minutes.
- Alert – head raised, body stationary.
    - Stand – erect on hid legs.
    - Scent – nose raised, with nostrils flaring.
    - Look around – moving head.
- Traveling – moving at a pace greater than one-half meter per minute.
    - Aggressive – interaction with a bear or human that involves signs of stress, such as jaw-popping, tensioning, or salivating; or lunges / charges.
    - Evasive – moving away from, or displaced by a human or other animal.
    - Transient – walking, apparently without motivation from interaction with a human or another bear.
- Stationary – standing still for more than 15 seconds.
- Play – intraspecific play and playing with other animals (crows, eagles) or inanimate objects.

Human Activities: Activities of humans

- Stationary – standing in one place for more than 15 seconds.
- Fishing – any activity using a fishing pole.
    - Fly Fishing – any activity using a fly fishing pole, whether in the water or on shore.
    - Spin-cast Fishing – any activity using a spin cast fishing pole, whether in the water or on shore.
- Traveling on foot / Hiking – any type of walking activity. Comments on upstream / downstream.
- Milling – moving around a small area, occasionally stationary.
- Hunting – person or people carrying firearm(s), confirmed by conversation with subject.
- Avoiding a bear – moving away from, or displaced by a bear.
- Approaching bear – moving toward a bear, after apparently sensing the bear's presence.
- Other – with comments.

Vessel Activities: "Activities" of vessels

- Passing by – moving past the observation station at a rate greater than one meter per minute.
- Anchored out – floating in water at least 1 meter from shore, not moving, and anchored.
- Landing on beach – moving toward within one meter of shore.
- Departing from beach – moving away from within one meter of shore.
- Traveling upstream – moving up the stream at a rate greater than one meter per minute.

- Traveling downstream – moving down the stream at a rate greater than one meter per minute.
- Approaching bear – moving toward a bear.
- Other – with comments.

Condition

Bear Condition: Observed stress level of bears

- Not stressed – no change in activity in response to potential stressor.
- Mildly stressed – bear raises head in response to potential stressor, and resumes previous activity within one minute.
- Moderately stressed – bear changes activity in response to potential stressor, and remains in same location.
- Very stressed – bear changes activity in response to potential stressor, and leaves location.

Human / Vessel Condition: Observed potential for humans or vessels to cause stress to bears.

- Quiet with minimum movement – noise in conversational tones or less, and stationary at one location.
- Loud with minimum movement – noise louder than conversational tones, and stationary at one location.
- Quiet with some movement – noise in conversational tones or less, and moving from one location to another.
- Loud with some movement – noise louder than conversational tones, and moving from one location to another.
- Quiet with excessive movement – noise in conversational tones or less, and moving quickly from one location to another.
- Loud with excessive movement – noise louder than conversational tones, and moving quickly from one location to another.

General

Tide: General level of tide.

- High tide – 1½ hrs before to 1½ hrs after high tide in local tide book.
- Ebbing tide – 1½ hrs after high tide to 4½ hrs after high tide in local tide book.
- Low tide – 1½ hrs before to 1½ hrs after low tide in local tide book.
- Flooding tide – 1½ hrs after low tide to 4½ hrs after low tide in local tide book.

APPENDIX 3 - BROWN BEAR USE OF THE STUDY AREA IN RELATION TO SALMON RUNS

A. Timing of Brown Bear Use of the Area

Bears were observed from the tree stand most frequently during the month of July, which corresponded to a small chum salmon run (Fig. 3-1). However, bears were observed fishing more frequently during the pink salmon run in August. So although bears were seen more in July, this use did not correspond to observed foraging behavior.

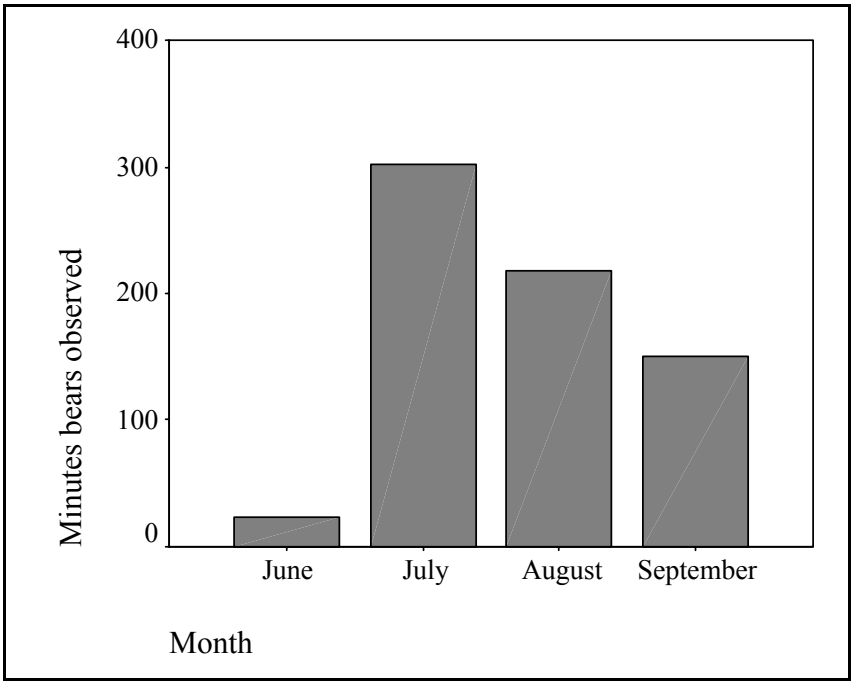

Figure 3-1. Minutes brown bears observed per month at Eva Creek Baranof Island, Alaska, summer 2002.

B. Timing of Salmon Species Runs

The salmon season began on June 25 at Eva Creek, when sockeye began running. Sockeye were observed in the creek from 25 June–17 July, 2002. Chum salmon overlapped with the sockeye and pink runs, and were observed in the creek from 6 July–25 August, 2002, although not on every day during that time. Pink salmon represented the longest run, and were present in the creek from 29 July–9 September, 2002, the last day of the field season. Coho were expected to run in mid-to-late September, and were not observed.

C. Strength of Salmon Runs

Data on salmon counted within one hr of high tide were used to describe trends in the abundance of each salmon species from June to early September. Because observations were performed during alternating time blocks, a high tide salmon count was not available for each day. Of salmon counted at high tide, the largest single group of pink salmon was 200, with a total count of 2,472 for the season. The largest pulse of sockeye was 120 at high tide, with a total run of 302 over the season. Chum salmon totaled 315 fish, but the largest count at high tide was 46 fish.

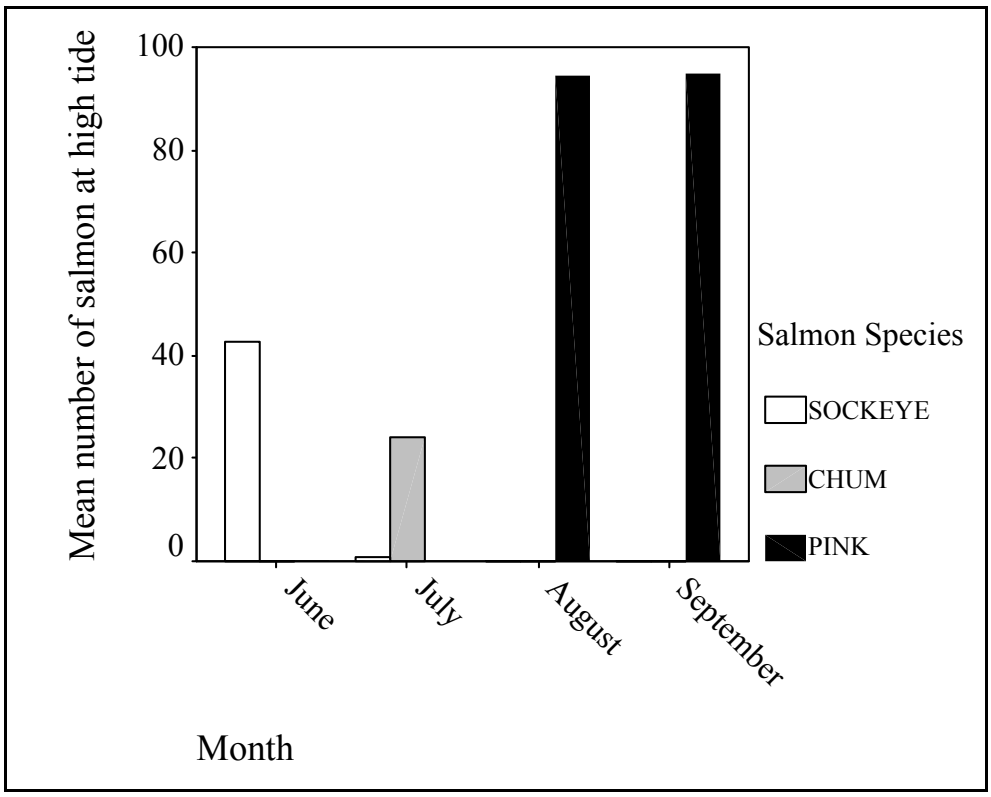

Figure 3-2. Monthly average of salmon counted at high tide at Eva Creek Baranof Island, Alaska, summer 2002.

D. Timing of Brown Bear Observations in Relation to Salmon Runs

Neither total number of bears nor the total minutes bears were observed during the summer were significantly correlated with mean sockeye ($r = 0.057$; $p = 0.360$), pink ($r = 0.146$; $p = 0.179$) or chum ($r = 0.048$; $p = 0.381$) per day. No adequate data were available for coho.

E. 2002 Pink Salmon in the Context of Historic Pink Salmon Runs at Eva Creek (1979-2002)

The number of pink salmon counted in Eva Creek by ADF&G for 2002 was average for the stream, when compared with historical data (Fig. 3-3). There was no significant difference between the number of pink salmon counted in 2002 (22,500) compared with other years where foot counts were the survey method used. (t =-0.582; p = 0.579).

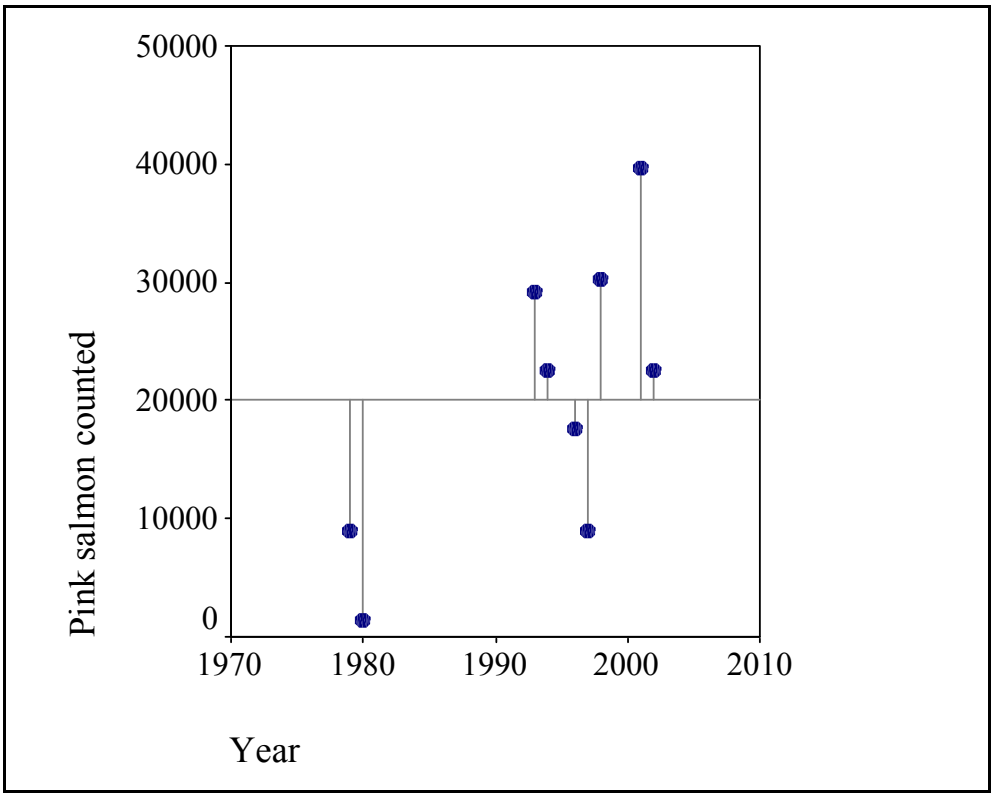

Figure 3-3. Pink salmon counted by ADF&G at Eva Creek, Baranof Island, 1979 – 2002. Line represents mean (20,000) for all years.
Data source: ADF&G Sport Fish Division unpublished data (Alaska Department of Fish and Game 2002).

However, the bi-annual nature of pink salmon runs in Southeast Alaska warranted additional investigation. Available foot count data were plotted and counts in opposite years were visually compared (Fig. 3-4). It appeared that odd years had slightly higher counts than the following even years. For example, more pink salmon were counted in 1979 than 1980, in 1993 than 1994, and in 2001 than 2002. From 1996–1998, however, even-numbered years had higher counts of fish. There was no visible difference between pink salmon numbers counted by foot survey in even and odd years over time. Therefore, a general difference in pink salmon abundances in opposite years cannot be assumed.

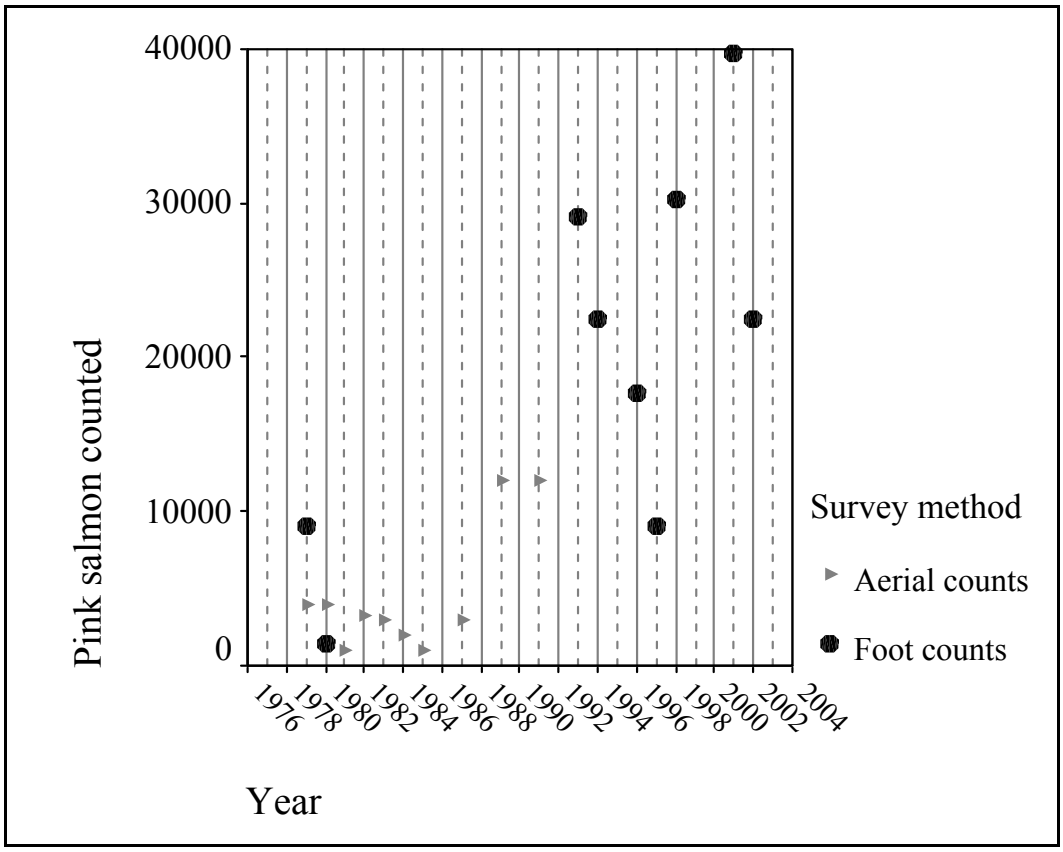

Figure 3-4. Comparison of pink salmon counted by ADF&G on opposite years at Eva Creek, Baranof Island, Alaska, 1979 – 2002. Dashed lines indicate odd-numbered years.
Data source: ADF&G Sport Fish Division unpublished data (Alaska Department of Fish and Game 2002).

F. 2002 Sockeye salmon in the context of historic sockeye salmon runs at Eva Creek (1962-2002)

Whether the 2002 sockeye run was anomalous is uncertain. Sockeye migrations seemed small at Eva Creek in 2002, however, lack of historic data on sockeye made it difficult to quantify. Weir data provide the only adequate estimates of sockeye numbers, and there were only 4 weir counts performed (Fig. 3-5). ADF&G does not focus monitoring efforts on Eva Creek's sockeye run because it is not much of a management concern from the point of exploitation (Dave A. Gordon, pers. comm. 2003). The difference between sockeye counts in August 1964 (1,448) and August 1995 (7,605) indicate that great variability in sockeye salmon numbers is possible at Eva Creek.

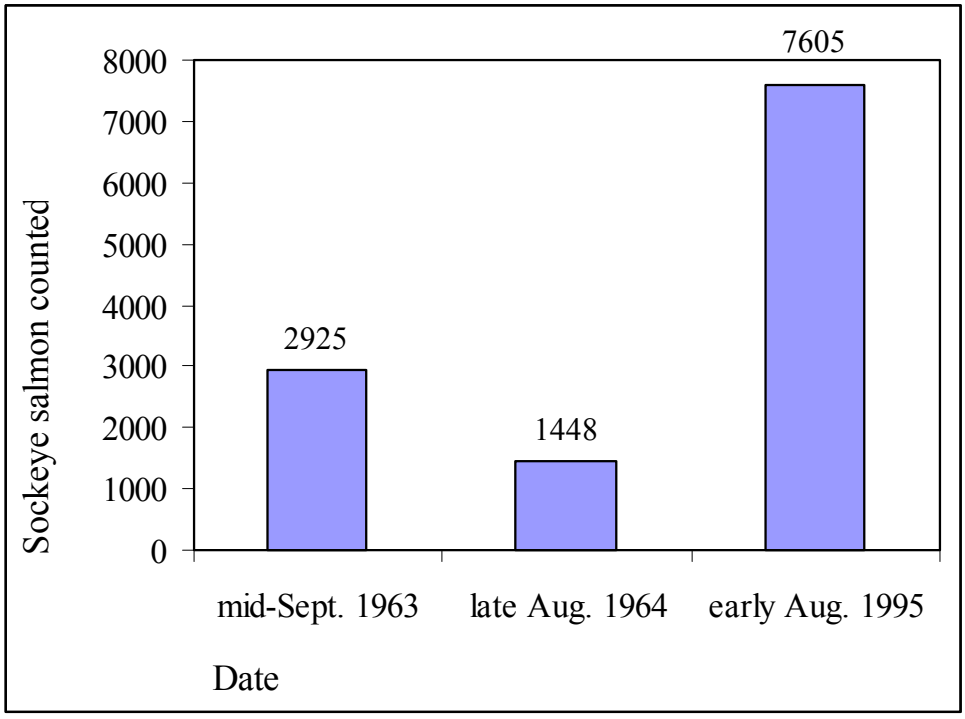

Figure 3-5. Sockeye salmon counted at Eva Creek Weir, Baranof Island, Alaska, 1963-1964 and 1995. Numbers recorded were for live fish captured in a weir located at the falls in one day. **Data source: ADF&G Sport Fish Division unpublished data (Alaska Department of Fish and Game 2002).**

The importance of sockeye to bears in the Eva Creek watershed remains unknown. Bears were not observed scavenging or fishing for sockeye salmon in Summer 2002, but one cannot assume that bears never fish for sockeye at the creek. It is likely that bears would primarily forage for sockeye at the lake's inlet creek, far outside the viewshed of the study area. Spawning activity at the inlet creek may draw bears to the area.

APPENDIX 4 - VISITOR PROFILES

Informal Interview Data Collection

This appendix and the 3 following appendices are composed from information gathered in informal interviews. Informal interviews were performed whenever a visitor group was encountered. Often, interviews took place at the trailhead, when researchers were arriving at, or departing from the study area. Many visitors also stopped at the researchers' tree platform and initiated conversations. Question and answer sessions were conducted on board the mid-size cruise ships (Lindblad Expeditions' Sea Lion and Sea Bird, and the Boat Company's Observer and Mist Cove) when scheduling allowed. During those sessions, researchers gave an initial overview of the project, and answered visitors' questions. Afterward, researchers informally interviewed guests and guides. Questions researchers asked visitors included: "Where are you from?" "How long have you been visiting this area?" "Why did you come here?" (e.g. fishing, hiking, bear viewing) and "Is there anything you would you change about the Lake Eva trail?" Excerpts from informal interviews are included in the following 3 appendices, along with general observations.

I noted common characteristics for different types of visitors during observations and informal interviews. Following are some generalizations about how different types of people use the Eva Creek study area and Lake Eva trail.

A. Guided hikers

Typically, guided hikers came to Lake Eva trail with Lindblad Expeditions or the Boat Company tours. Others came from chartered yachts, such as the S/V Alaskan Song. Hikers came for day trips only. Hiking groups from the Boat Company vessels and chartered boats came ashore as one group less than 12 people, and often hiked all the way to the lake.

Lindblad Expeditions' hiking groups were usually dropped off in 2 segments: 3 hiking groups of about 15 people each were dropped off at the trailhead for hiking. Simultaneously, up to 30 people launched kayaks from the beach. The "fast" hiking group tended to hike all the way to the lake, and often to the large trees (Fig. 2). The 2 "slower" groups tended to hike to the falls and a little bit beyond. After about an hour and a half, the 2 slower hiking groups returned to the beach and began kayaking while the kayakers began hiking.

B. Non-guided hikers

Many non-guided hikers were visitors staying at the cabin (Fig. 2) who hiked to the trailhead during one day of their visit. Some were vacationers from private yachts.

Others were crew members from commercial fishing vessels anchored in Hanus Bay. Commercial fishermen seeking refuge from bad weather or waiting for season "openers" frequented Hanus Bay because of its proximity to Peril and Chatham Straits.

C. Guided anglers

Almost all guided anglers came on chartered sport-fishing boats from Sitka. Group size ranged from 2–15 people. Anglers tended to fish in the lagoon, at the falls and at the islands, with spacing between group members sometimes spanning hundreds of meters. Some boats, such as the *M/V Caledonia*, and the *M/V Magic Time* frequently brought anglers to the area, although guides did not always accompany the anglers. Some of these groups stayed on the boats overnight and fished for 2–3 consecutive days. Occasionally, small groups of people from the Boat Company's vessels or chartered yachts participated in some guided fishing.

D. Non-guided anglers

Most non-guided anglers observed were people staying at the Lake Eva cabin for several days. These anglers tended to fish at the falls for a portion of their stay at the cabin, but also reported fishing at the lake and inlet creek. Many non-guided anglers were Sitka residents – some who rented the cabin, and others who made the day trip from Sitka in personal vessels. A few subsistence dipnetters from Sitka and Angoon also visited the falls, although their numbers were small. Some subsistence fishing was anecdotally observed at the mouth of the creek during researcher transit, but that activity was not visible from the summer study site.

APPENDIX 5 - STUDY AREA FEATURES: HUMAN ATTRACTIONS

Because of its range of unique qualities, the Lake Eva system is a special place to many different types of people. The purpose of this appendix is to provide site-specific details about social factors at Lake Eva to land managers and trail planners. Information in this section was compiled from general observations and visitor anecdotes, and was not quantified in any way.

A. Natural Attractions

A variety of flora and fauna are visible from the Lake Eva cabin and trail throughout the summer.

1. Coastal Temperate Rainforest

Many visitors arrive at Lake Eva trail before having set foot in any other natural area in Southeast Alaska. As the first on-shore excursion of a 7-day boat trip between Sitka and Juneau, Lake Eva trail makes the initial impression of the Tongass National Forest for hundreds of visitors each year. For hundreds of others, Lake Eva trail is the final stop on the tour, and provides the lasting image of a memorable trip. Many people we talked to were in awe of the forest itself – everything from the moss color and bark texture to squirrel holes and beaver-chewed trees inspired questions. Even those who had visited the site for many years commented on interesting features of the forest that they enjoyed each time they returned.

2. Fish

The usual months for each fishing season follow:

- Dolly Varden – May to September
- Cutthroat trout – May to June
- Sockeye salmon – Late June to early July
- Chum salmon – Early July to late August
- Pink salmon – Late July to early September
- Coho salmon – Mid to late September

3. Birds

Frequently seen or heard:

- Red-breasted sapsucker (*Sphyrapicus ruber*) – abundant in spring.
- Rufous hummingbird (*Selaphorus rufus*) – abundant in early summer.
- Common merganser (*Mergus merganser*) – broods with 5-10 chicks often swim, bathe, and eat in the lagoon and near shoreline.
- Belted kingfisher (*Ceryle alcyon*) – abundant in late summer.
- Bald eagle (*Haliaeetus leucocephalus*)
- Common raven (*Corvus corax*)
- Varied thrush (*Iyoreus naevius*)
- Hermit thrush (*Catharus guttatus*)
- Swainson's thrush (*Catharus ustulatus*)
- Chestnut-backed chickadee (*Parus refescens*)

- Dark-eyed junco (*Junco hyemalis*)
- Tree swallow (*Tachycineta bicolor*)
- Winter wren (*Troglodytes troglodytes*)
- Northwestern crow (*Corvus caurinus*)
- American robin (*Turdus migratorius*)
- Hairy woodpecker (*Picoides villosus*)
- Three-toed woodpecker (*Picoides tridactylus*)
- Golden-crowned kinglet (*Regulus satrapa*)
- American dipper (*Cinclus mexicanus*)
- Common sandpiper (*Actitus hypoleucos*)
- Spotted sandpiper (*Actitus macularia*)
- Great blue heron (*Ardea herodias*)

Occasionally seen or heard:

- Red-tailed hawk (*Buteo jamaicensis*)
- Merlin (*Falco columbarius*)
- American kestrel (*Falco sparuerius*)

4. Mammals

- Beaver (*Castor canadensis*) – very active in early evenings in and along Eva Creek.
- River Otter (*Lutra canadensis*) – travel late in the day in large groups along creek and shore.
- Harbor seal (*Phoca vitulina*) – move into lagoon at high tide during salmon runs.
- Red squirrel (*Tamiasciurus hudsonicus*) – very vocal, visible and abundant.
- Sitka black-tailed deer (*Odocoileus hemionus sitchensis*) – occasionally seen in lagoon and near creek.
- Brown bear (*Ursus arctos*) – the potential to see a brown bear can be an attraction in itself. Bear sign is often visible on the trail: either scat or fresh bear tracks are regularly seen by visitors, even if the bears are not.
- Mink (*Mustela vison*) – live along the creek banks, although tend to be elusive.
- Marine mammals, such as orca & humpback whales are sometimes visible from the trailhead on the beach.
- Meadow vole (*Microtus pennsylvanicus*)
- Deer mouse (*Peromyscus keeni*)
- Little Brown Bat (*Myotis alaskensis*)
- Shrew (*Sorex spp*.)
- Deer Mouse (*Peromyscus sitkensis*)
- Tundra Vole (*Microtus oeconomus sitkensis*)
- Short-tailed weasel (*Mustela ermina initis*)

5. Flowers

- Common red paintbrush (*Castilleja miniata*)
- Chocolate lily (*Fritillaria camschatcensis*)
- Few-flowered shooting star (*Dodecatheon pulchellum*)

- Western buttercup (*Ranunculus occidentalis*)
- Cow parsnip / Pushkey (*Heracleum lanatum*)
- Wild iris (*Iris setosa*)
- Western columbine (*Aquilegia formosa*)
- Yarrow (*Achillea millefolium*)
- Bunch berry (*Cornus canadensis*)
- Clasping twistedstalk (*Streptopus amplexifolius*)
- Western coralroot (*Corallorhiza mertensiana*)
- Queen's cup (*Clintonia uniflora*)

Many other flowering plants are found in the bogs and fens nearby, and would be visible if the trial were rerouted.

B. Specific Study Area Features

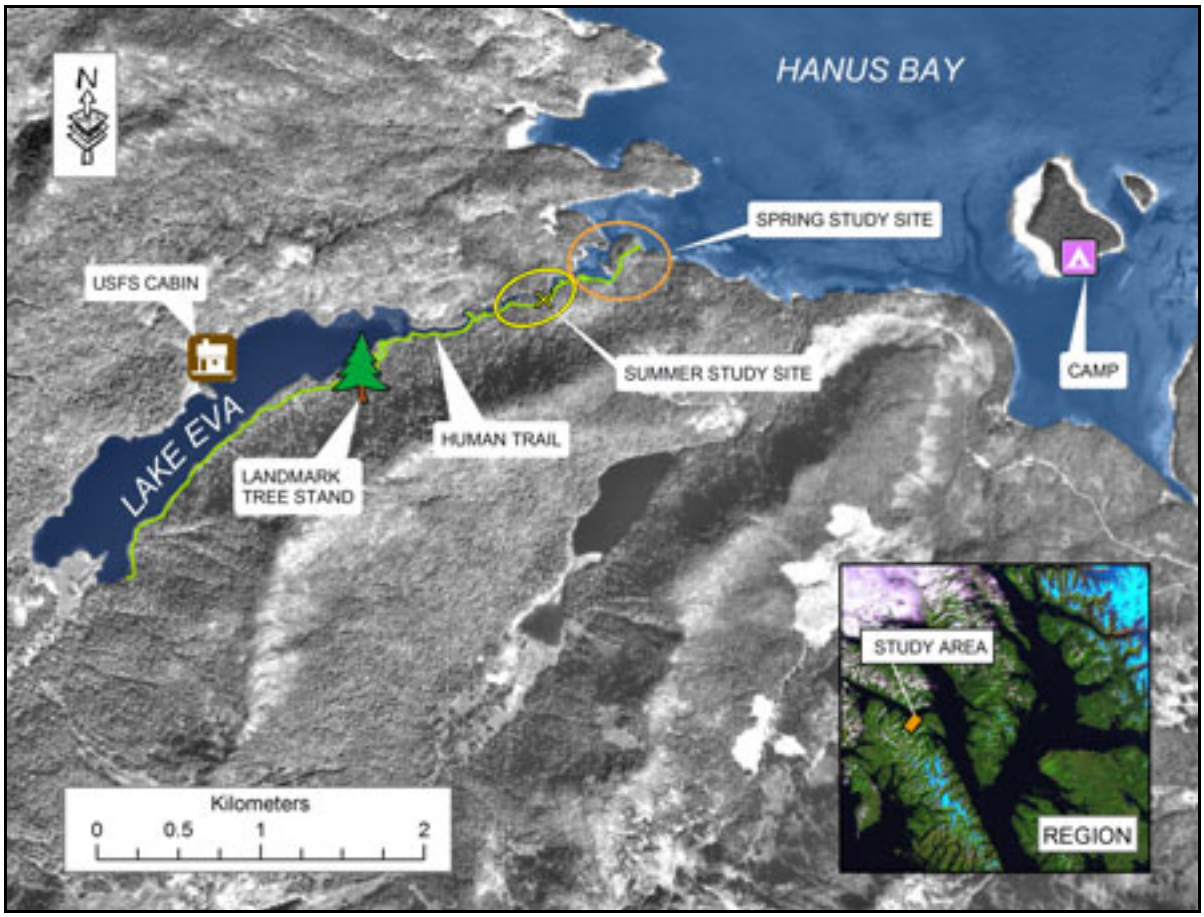

Figure 5-1. Study area features

1. Lake Eva Trail

The trail itself is the main attraction at Lake Eva. Less than 2 miles long and generally flat, the trail is suitable for people with a range of abilities. For example, on August 8, a woman from Petersburg was hiking on the trail with some friends. She commented on how much she

loved the blueberries and the trail. She said it was nice to walk on a trail maintained for people, because there aren't very many trails like that in Petersburg (Visitor, pers. comm. 8/8/02).

Unfortunately, the current trail condition is very poor in many spots where erosion and trail widening have occurred. Several spots along the trail have mud holes up to 15 inches deep after rain showers. A Sitka resident and his friend said, "Too many people use the trail, and it's muddy from overuse" (Visitor, pers. comm. 6/14/02). In the lagoon, the trail is obscured at high tide, causing some visitors on tight schedules to "overstep" their boots in order to get back to the trailhead on time.

2. Boat Landing Area / Trailhead
Of all the sites at the Lake Eva system, the trailhead is one that nearly all visitors see. Boats land on the beach there, and it becomes a busy place when groups are loading and unloading. It is a waiting area in addition to being a gateway to the trail. People rest on a log adjacent to the trailhead and occasionally explore intertidal areas at rocks near the creek mouth. Both guided and non-guided visitors dawdle at this site, making it an ideal place for placement of any informational items. For example, we discovered that some visitors took photos of the survey box located at the trailhead.

3. Lagoon
The lagoon is special to many visitors because it is less breezy and warmer than the surrounding area. Because it is open, the lagoon is much sunnier than the closed forest that the rest of the trail winds through. Opportunities for spring and early summer bear viewing are somewhat likely in the lagoon, and other wildlife also tend to congregate in the area. In the summer wildflowers abound in the lagoon, and many photographers choose to linger there. For hikers who have limited physical ability, the lagoon offers a refreshing change of pace after hiking briefly through the forest.

4. Lower Falls
Anglers and hikers both spend a lot of time at the lower falls. Hikers congregate in a couple of trail "pull-offs" to watch fish spawn or anglers fish. Anglers utilize every foothold they can in and around the lower falls. The preferred site for anglers is a big rock that is next to a deep fishing hole. Other frequently used sites are fallen trees that extend into the stream above the falls, and a gravel bar that is somewhat exposed below the falls at low tide.

5. Upper Falls
A small spur trail has been formed near the upper falls where anglers access the stream and hikers look at the lake.

6. Landmark Tree Stand
Two very large, very old trees rest on a flat piece of land between the main trail and the lake, about 2 miles inland from the beach. Those who make it all the way to the "big trees" are rewarded with a unique experience and a good photo opportunity. For many of the smaller tour companies, these trees are a main destination for hiking groups.

7. Lake View Access
Between the "big trees" and the lake, a muddy spur trail has been formed where hikers look at the lake, and cabin visitors tie off the dingy.

8. Public-Use Cabin
The Lake Eva cabin is a 12' x 14' Pan Abode cabin heated by an oil-burning stove. It sleeps 4–6 people and has barrier-free access features (United States Department of Agriculture 2003). Because it is one of a few wheel-chair accessible cabins in Southeast Alaska, the cabin's popularity is not likely to wane. The Lake Eva cabin is booked nearly every day of the summer, and many visitors said that they rent it every year.

APPENDIX 6 - STUDY AREA CONFLICTS: BROWN BEAR AND HUMAN OVERLAP

Data collected in summer 2002 suggest that bears and people are not simultaneously using portions of Eva Creek. However, throughout the spring and summer, both bears and people are present in the watershed. Management agencies requested information about how existing infrastructure affects bear–human interactions. Following are descriptions about how each location in the study area facilitates or discourages bear–human interactions.

1. Lake Eva Trail
Based on research from summer 2002, it appears that human activity on the Lake Eva trail influences bear movement patterns in the study area. Bear sign surveys and observations both indicated that bears tend to avoid areas near the trail in the spring and summer months.

2. Boat Landing Area / Trailhead
Bears do not appear to spend much time at the trailhead, and access the lagoon through a network of trails near the main human trail.

3. Lagoon
The lagoon is a travel corridor for bears, and many visitors reported seeing bears there. Because visitors slow down and spread out in the lagoon, the potential for bear–human interactions there is greater than at most other places on the trail. However, the openness of the lagoon generally makes it possible for both bears and people to see and respond to one another at comfortable distances.

4. Lower Falls
Bears search for fish at the lower falls, and anglers directly compete with bears for this space. During observations in summer 2002, bears and anglers never were seen simultaneously. The potential for bear–human site conflicts at the lower falls warrants more attention.

5. Public-Use Cabin
Visitor use at the public-use cabin was not studied in this project. The cabin journal, which includes several years of casual observational data, could be helpful in future studies of interactions between bears and humans at that location.

APPENDIX 7 - STUDY AREA CONFLICTS: VISITOR AND USER GROUP OVERLAP

A. General Observations
In addition to interactions between bear and humans, land managers must consider the current and desired types of interactions between visitor groups at Lake Eva.

1. Guided and Non-guided Visitors
Conflict exists between guided and non-guided visitors at Lake Eva trail. Non-guided groups reported feeling that their experience was ruined when small or large guided groups were encountered on the trail. Non-guided visitors were especially dissatisfied when they saw multiple groups with more than ten people each in a single day. Some excerpts from informal interviews follow:

On June 30, a couple from Juneau was interviewed. They flew a private plane to Lake Eva, and were visiting for a few days of fly-fishing. The couple said they were using deer trails because the tour groups were crowding them off of the main trail. The husband expressed intense frustration about increasing tourism in local fishing spots. He said that Lake Eva used to be a nice quiet place to fish, but now it is not. He mentioned that Juneau has been overrun by tourism and he has difficulty finding any place within flying distance of Juneau to get away from all of the commotion (Visitor, pers. comm. 6/30/02).

A USFS trail crew spent several days at the cabin while making trail improvements. Two of the men came over to talk on July 31, and said that there were too many people using the trail. They were surprised to hear that the USFS permits the commercial use at Lake Eva. One man said that people from Sitka spend a lot of time and money to visit Lake Eva, and should be able to have a nice fishing experience without being watched or disturbed by tour groups (Visitor, pers. comm. 7/31/02).

2. Small and Large Guided Groups
Guides from small and mid-size tour boats were informally interviewed throughout the summer. All guides said that they wanted to provide an experience for clients where no other people were seen. On August 20, a guide from one of the mid-size cruise ships was interviewed. He said that he liked the Lake Eva trail just as it was, and didn't think anything should be changed. He emphasized that when he brings a group to the trail, he wants his group to have the place "all to themselves" (Visitor, pers. comm., 8/20/02). From these types of comments it was clear that even large groups do not want to share the area with other visitors.

Small-group guides said they were especially dissatisfied when they arrived and saw a larger boat anchored in the bay. Many small-group guides said that they would take their clients elsewhere if a mid-size cruise ship was expected at Lake Eva that day. The implications of such attitudes are far-reaching. When small and mid-size cruise ships are anchored in Hanus Bay, the impact reverberates throughout the immediate region as smaller boats disperse to adjacent areas.

3. Anglers and Hikers
There seemed to be little conflict between anglers and hikers, though occasionally anglers noted they didn't like being observed and photographed by tourists, especially those in large groups.

APPENDIX 8 - SUGGESTIONS FOR ALTERNATE TRAILS

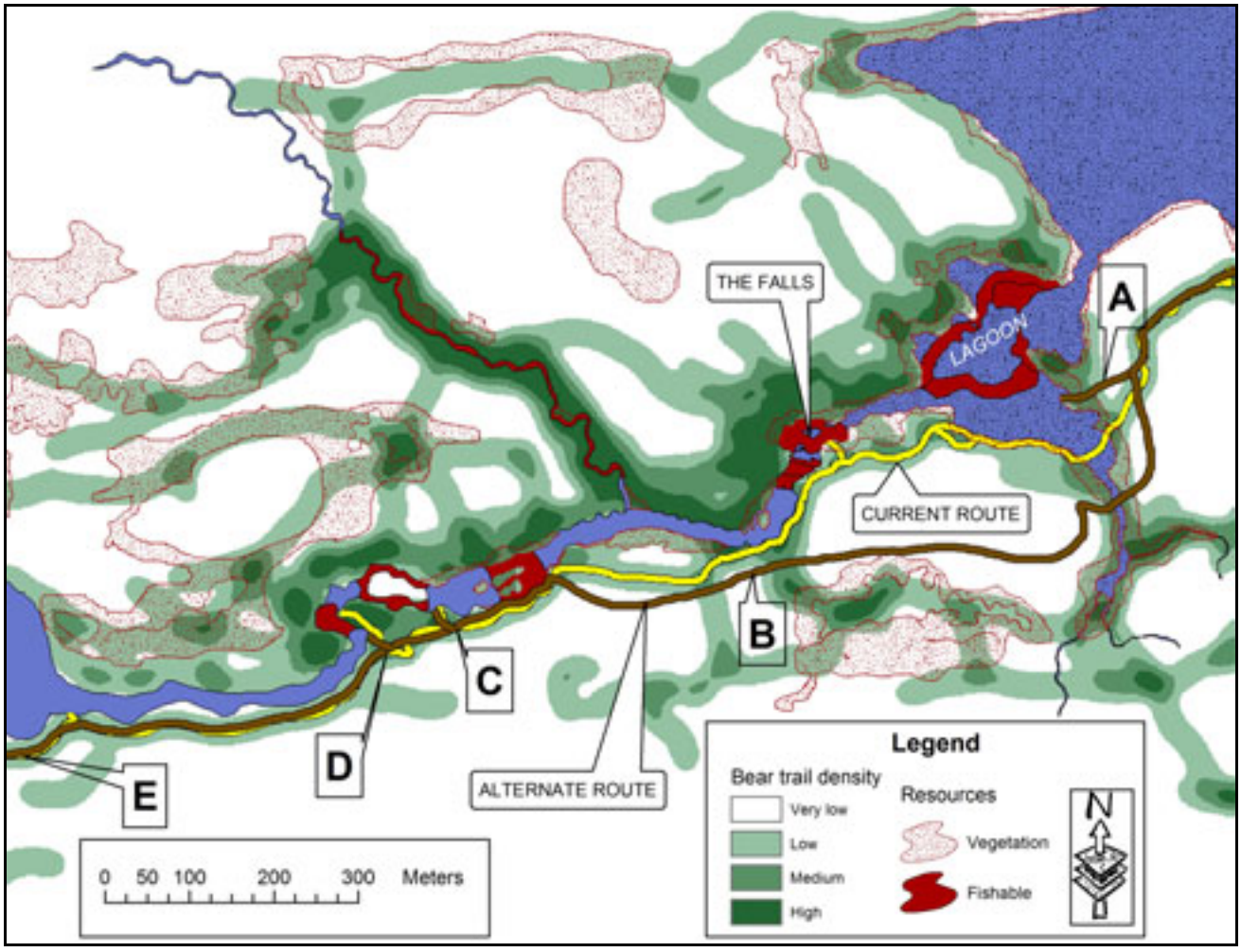

Figure 8-1. Alternate trail route suggestions.

A. Optional spur for visitors to view the lagoon in a way that provides a large viewable area but minimizes impacts to bears using the lagoon. The most likely opportunities to see bears are from May to June and in August. There is an opportunity at the fork for an interpretive sign that outlines "good behavior" for all user groups, e.g. "please keep your voices down," "do not go into the lagoon," and "refrain from using flashes if you take pictures of bears." An interpretive sign at the terminus of the spur could describe the animals that use the area.

Between A and B. The rerouted trail is designed to avoid the lagoon, falls and tributary areas as much as possible. There are opportunities for interpretation of forest succession where the trail parallels the northern edge of a muskeg and the terminus of an approximately 50-year-old landslide.

B. An area currently frequented by people. This area stands out as a place where trail modification can improve current patterns of use and improve wildlife access to critical habitat. Building the trail away from this area would probably be the most beneficial single step in improving bear access to fishing habitat. This and the surrounding area is where researchers found the highest concentrations of perennial trails that were not used in 2002.

Between B and C. To achieve multiple use management, this is the area proposed to be designated for human enjoyment. Here the trail descends to the creek bank near an important spawning bed for pink salmon. Though researchers believe this spawning area and the riffles just upstream have good potential for 'fishability' by bears, a moderate level of human interaction will be most appropriate here if such visitor use is part of the management intent for Eva Creek. If the primary resource area (lagoon, falls, tributary) can be protected from the majority of human traffic, (especially during the month of August) use of the areas around C may not preclude bear use of the lower watershed. An interpretive sign that outlines "good behavior" for all user groups and educates people on local fish population ecology could be placed here.

C. Optional spur location. The best alternative may be to keep it primitive because the primary users would probably be anglers.

D. Optional spur location. This location provides for a scenic view of the Lake Eva outlet and access to good fishing holes. An opportunity exists here for an interpretive sign highlighting the palustrine character of the lake outlet.

E. Potential terminus of the trail at the Landmark Tree stand. A "destination" for hiking groups, especially combined with a view of the lake, and also an opportunity for interpretation on subjects such as very large trees and cultural use of the lake.

Volunteer Maggie Wigen performing observations from the tree platform,
Eva Creek, Baranof Island, September 2002