Katmai National Park and Preserve

National Park Service
U.S. Department of the Interior

Visitor and Bear Use of Moraine and Funnel Creeks, Katmai National Preserve, 2006

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Front Cover: **A brown bear fishes in Funnel Creek, Katmai National Preserve, Alaska. Photo NPS.**

VISITOR and BEAR USE of MORAINE and FUNNEL CREEKS, KATMAI NATIONAL PRESERVE, 2006

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Abstract

Brown bear (Ursus arctos) and human activity in the vicinity of Moraine and Funnel creeks was monitored from 9–20 August 2006. Most people accessed the area via aircraft that landed on or near Crosswinds Lake, approximately 0.5 km south of the Moraine-Funnel confluence. During the 12 days that we monitored aircraft traffic in the vicinity of the confluence, we documented 265 aircraft events (landings, take-offs, and over-flights), including 91 aircraft landings on or near Crosswinds Lake. Ninety-six percent of Crosswinds Lake aircraft events with purpose noted were associated with fishing or rafting/camping groups (who fished in association with those activities); bear viewing groups accounted for <1% of these events. Visitor days recorded averaged 32 ± 9.7 *per day. Seventy-two percent of visitor days were associated with day-use activities. Human use was concentrated near the Moraine-Funnel confluence; in contrast, bear activity was concentrated along Funnel Creek. The number of independent bears seen during roving surveys of a 2.4-km section of Funnel Creek averaged* 13.6 ± 1.98 *(*5.6 ± 8.20 *bears/km). Forty-two different independent bears were identified during the field period, including 4 older males and 16 females with dependent offspring. Based on scan sampling and roving stream transect surveys, the proportion of single bears observed in the study area among all bears seen was 45% and 63% respectively. Although we did not observe any bear obtain food from people, the potential for food conditioning appeared to be one of the bear management issues of most concern at Moraine Creek. Some anglers fished in close proximity to bears, backpacks and other gear which may have contained food were sometimes left unattended, some campers stored food in containers that were not bear-resistant, and some rafters camped and prepared meals on gravel bars in the river corridor where bears often fished.*

Key Words

Alaska, bear-human interactions, bear-viewing, brown bear, Katmai National Park and Preserve, Moraine Creek, *Oncorhynchus nerka,* sockeye salmon, sport fishing, *Ursus arctos*, visitor use, wildlife viewing

Moraine Creek and Funnel Creek in Katmai National Preserve attract seasonal concentrations of brown bears (*Ursus arctos*) that come to feed on spawning sockeye salmon (*Oncorhynchus nerka*). In recent years, the area has also become popular with anglers and bear-viewers. Although the creeks are relatively remote, the number of visitor days averaged 31 per day during August 2004 (Groth et al. 2007). To obtain more detailed information regarding current visitor and wildlife use patterns within the Moraine-Funnel creeks area, we used observational sampling techniques to document human and bear activity along

Funnel Creek and in the vicinity of the confluence of Moraine Creek and Funnel Creek for a 12-day sampling period during August 2006.

Study Area

Moraine Creek is located in the northeast corner of Katmai National Preserve approximately 115 km northeast of King Salmon (Fig. 1). Our study focused on the Moraine-Funnel confluence vicinity, including Crosswinds Lake, and the lower 3.2-km section of Funnel Creek extending to the confluence (Fig. 1). The area largely consists of open alpine tundra with numerous lakes and ponds and limited shrub growth outside riparian zones. Tall open bluffs border sections of both Funnel Creek and Moraine Creek. Moraine Creek is relatively broad (40 to >100 m wide) and slow moving and has limited shrub cover. The lower portion of Funnel Creek is braided, shallower than Moraine Creek, and bordered by thick shrubs. Sockeye salmon (*Oncorhynchus nerka*) generally enter Moraine Creek by late July and salmon spawning continues through August (Troyer 1980). Many brown bears frequent the Moraine-Funnel creeks area during the salmon spawning period to feed on salmon, but bear activity is more dispersed at other times of the year.

Most people accessed the study area via floatplanes that land on Crosswinds Lake (Fig. 1). A secondary floatplane access point was a small lake about 2 km northeast of the Moraine-Funnel confluence that was known locally as "Just Enough Lake" (Fig. 1). In addition, parties on 1–4 day fishing float trips sometimes accessed the study area via raft from upstream of the Moraine-Funnel confluence (floatplane drop-offs at Spectacle Lake). During the summer people come to Moraine and Funnel creeks to fish for salmon, rainbow trout (*Oncorhynchus mykiss*), arctic char (*Salvelinus alpinus*), and other species, as well as to view and photograph brown bears and other wildlife. Sport fishing has been reported as the primary August activity in the study area (Olson et al. 2003, Groth et al. 2007). Sport hunting currently occurs in the Preserve under a system of alternating spring (May) and fall (October) seasons with a bag limit of 1 bear every 4 regulatory years.

Methods

Field Logistics

From 9 to 20 August 2006 (arrived 8 Aug and departed 21 Aug), 2 biological technicians worked out of a field camp established on the west side of Crosswinds Lake (Fig. 1). The camp location afforded wind protection from all sides, and it was close to an overlook from which visitor use data were collected (Fig. 1). The field camp was not exposed to frequent human traffic because many of the aircraft that landed on Crosswinds Lake parked along the east shore. Observational data were collected using binoculars (10x42) and a spotting scope (16-38x; usually set around 20x).

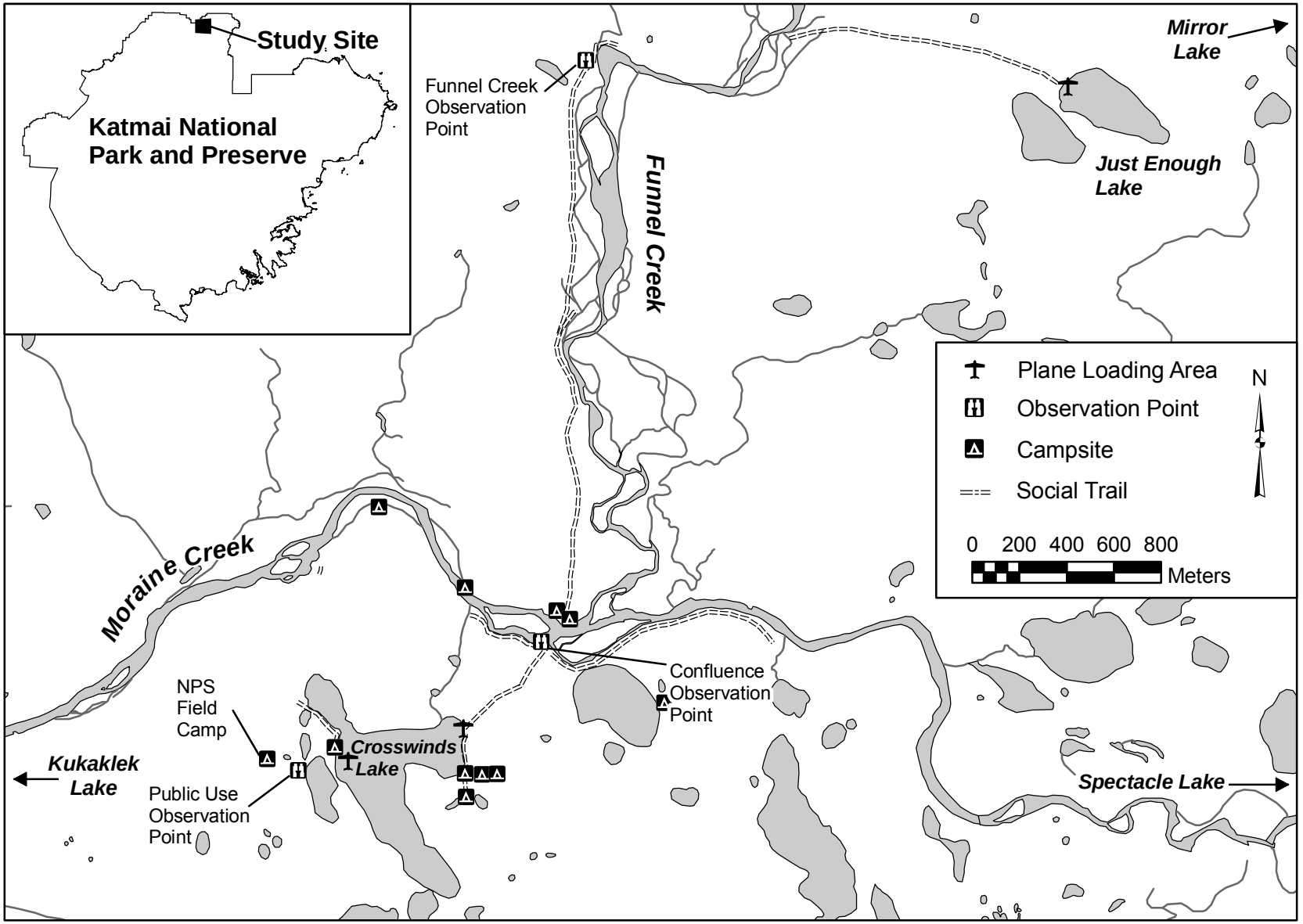

Figure 1. Monitoring locations, landing areas, social trails, and observed campsites at Moraine and Funnel creeks, Katmai National Preserve, Alaska, August 2006.

Crosswinds Lake Public Use Monitoring

We documented aircraft arrivals and departures at Crosswinds Lake and vicinity daily 9–20 August 2006 primarily from an observation point that overlooked Crosswinds Lake; we also recorded other aircraft traffic observed within the general study area whenever possible (Fig. 1). Because previous reports indicated that the majority of plane traffic occurred during early morning and late afternoon hours (Proffitt 2003, Olson et al. 2003, Groth et al. 2007), monitoring was scheduled for 2- to 3-hour sessions beginning about 0600 hours each morning. We also recorded aircraft detected outside the scheduled sample sessions whenever possible; however, occasionally other activities may have distracted us from recording planes, particularly when we were away from camp. Therefore, aircraft event statistics should be viewed as minimum estimates. When weather conditions limited visibility for flying, scheduling of sample sessions was sometimes adjusted to correspond with plane traffic changes.

Each record of an aircraft arrival/departure included the time, trip purpose if known, number of visitors and guides, aircraft tail number, company name, and whether the plane landed, took off, or flew over the area (see Appendix A for form and codes). We recorded observations of people arriving in the area via watercraft opportunistically using the same format. We surmised the number of clients and guides in each group based on the equipment carried and worn by each person. We assumed that guides: 1) tended to carry any packs or bigger packs, 2) either did not have fishing rods or carried those of their clients, and 3) usually led the people along their route (sometimes splitting off into smaller groups each led by a guide). The trip purpose of the group was inferred based on what equipment we observed (e.g., cameras, fishing rods, many bundles with a raft) and the type of waders worn (the bear-viewing groups that we observed wore hip waders, as opposed to the chest waders that anglers almost always wore).

In addition to our scheduled monitoring sessions, we sometimes contacted visitors and guides in the area (particularly at Crosswinds Lake during late afternoon). We compiled information on locations and conditions of some of the campsites and social trails that we encountered. We did not measure vegetation height or areas of bare ground observed, but we did note estimates of the extent of trampling impact. A handheld GPS was used to obtain coordinates for most campsites. Social trails were screen-digitized based on our field notes using a 1:5,000 scale base map; therefore, the mapped locations of trails should be considered approximate.

Visitor use of the area was calculated for visitor days (visitor day = 1 person present in the study area for any part of a day) and overnight stays (overnight stay = 1 person present overnight in the study area). In cases where we did not determine how many people occupied a camp we assumed a camp occupancy of 2 people (all camps with occupancy documented in 2001, 2004, and 2006 had ≥2 occupants). Therefore, overnight stay statistics should be viewed as minimum estimates. We did not include National Park Service (NPS) staff in the visitor use statistics.

Scan Sampling of Bear and Human Use

Our primary observation point for scan sampling of bear and human use was atop a cliff on the west side of upper Funnel Creek, approximately 2.4 km north of the Moraine-Funnel confluence (Fig. 1). In addition to conducting scheduled sampling sessions from the Funnel Creek observation point, when weather or time constraints prevented us from traveling to this observation point, we also opportunistically conducted scan sampling of bear and human use of the Moraine-Funnel confluence vicinity from the confluence observation point used in previous years (Fig. 1; Olson et al. 2003, Groth et al. 2007). Sampling sessions were 2 hours in length. We scheduled sessions to obtain a sample of midday (1500–1700 hr) and evening (1800–2000 hr) use on each sampling day, and we generally conducted sampling from each of the 2 observation sites on alternating days (Appendix B, Table B1). We sampled Funnel Creek on 6 different days from 9–19 August 2006 and the Moraine-Funnel confluence on 4 different days from 10–20 August 2006.

We divided the sections of Funnel Creek visible from the cliff-top observation point into 3 river observation zones for data collection based primarily on recognizable landmarks (e.g., bends in the river, high bluffs, etc.; zones 2F, 3F, and 4F; Figs. 2, 3). An adjacent tributary north of the observation site was also identified as a separate river zone (zone N) because it contained spawning salmon and was commonly utilized by bears (Fig. 2). We also established 7 land zones for visible land areas adjacent to the river zones (zones 2FW, 2FE, 3FW, 3FE, 4FN, 4FS, and NW; Fig. 2). Similar to previous study years, we divided the sections of Moraine Creek visible from the confluence observation point into 5 observation zones for data collection (zones 1, 2, 3, 4, and F; Fig. 4). However, because we found it difficult to sample activity in Zone 4, we dropped this zone from data analysis (and also excluded this zone from any 2004 data used in between-year comparisons). We also established observation zones for land areas visible north and south of the river zones (zones 1N, 2N, 3N, 4N, and 1S; Fig. 4).

To map the river observation zone dividing lines, we plotted the GPS coordinates of zone dividing points, then used photographs of each zone and field sketches of the dividing lines (marked on topographic maps) to screen-digitize the lines. Boundaries of the land observation zones were approximated based on field notes, topographic maps, and photos of the zones. The visible river lengths in each zone sampled were estimated from 1:5,000 base maps of the area, photographs of the zones, and field notes regarding blind spots (Table 1). River zone lengths for Funnel Creek (which was wide and braided in some sections) were estimated based on measurements made through the center of the main river channel.

We used scan sampling (Altmann 1974) to record activity of people, bears, and other wildlife by observation zone at 20-minute intervals (see Appendix B). Data recording methods were similar to those described by Squibb and Wilker (1995). Depending upon weather conditions and activity levels on the

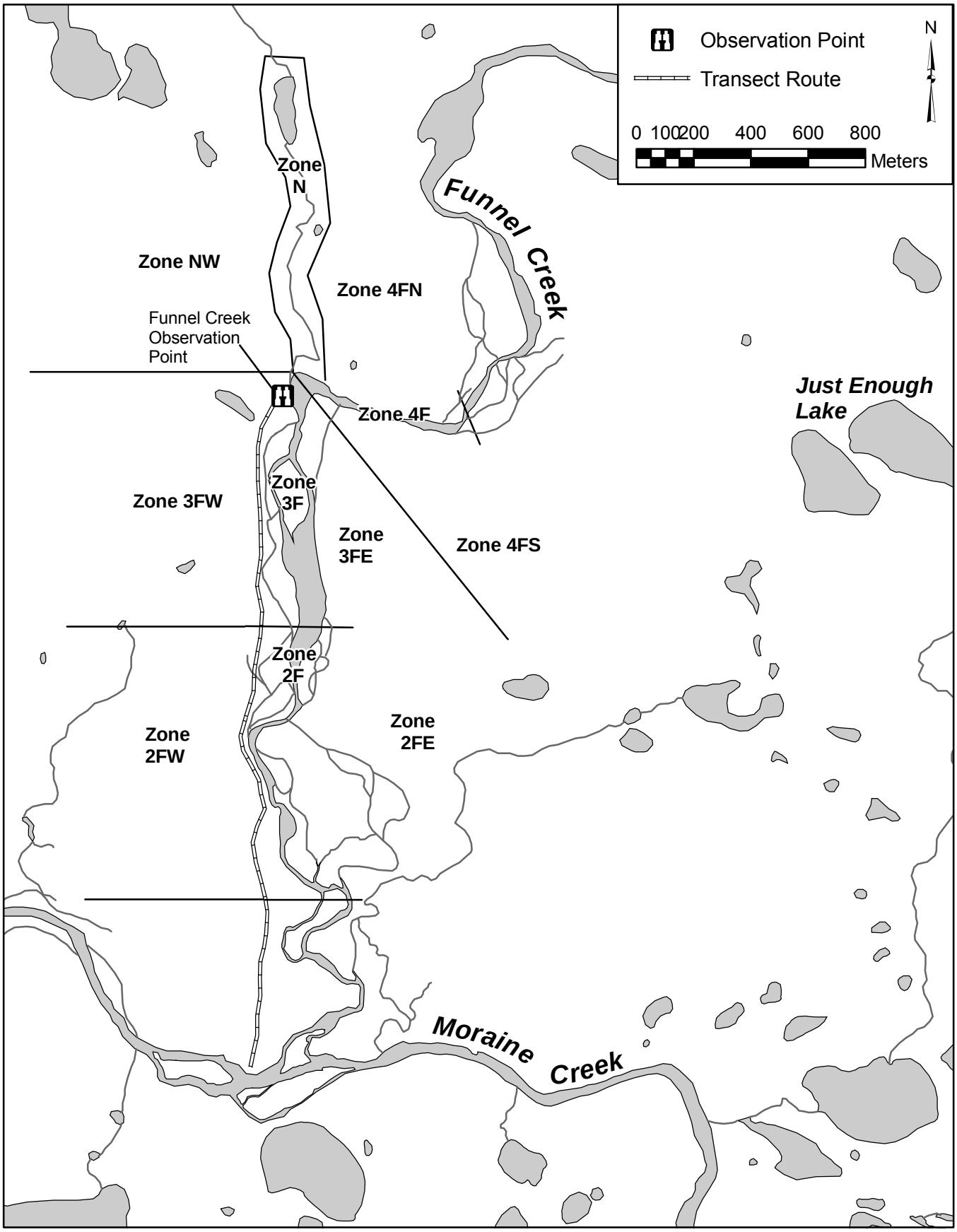

Figure 2. Observation zones visible from the Funnel Creek observation point at Moraine Creek, Katmai National Preserve, Alaska, August 2006.

Figure 3. Observation zones monitored from the Funnel Creek observation point, Katmai National Preserve, Alaska, August 2006. Figure 3a illustrates the view from the main observation point and Figure 3b illustrates the view from 30 m upstream of the main observation point. The downstream boundary of Zone 2F was delineated by where the cliff on the east side of Funnel Creek ended. Some parts of river zones 3F and 2F were thickly vegetated and braided.

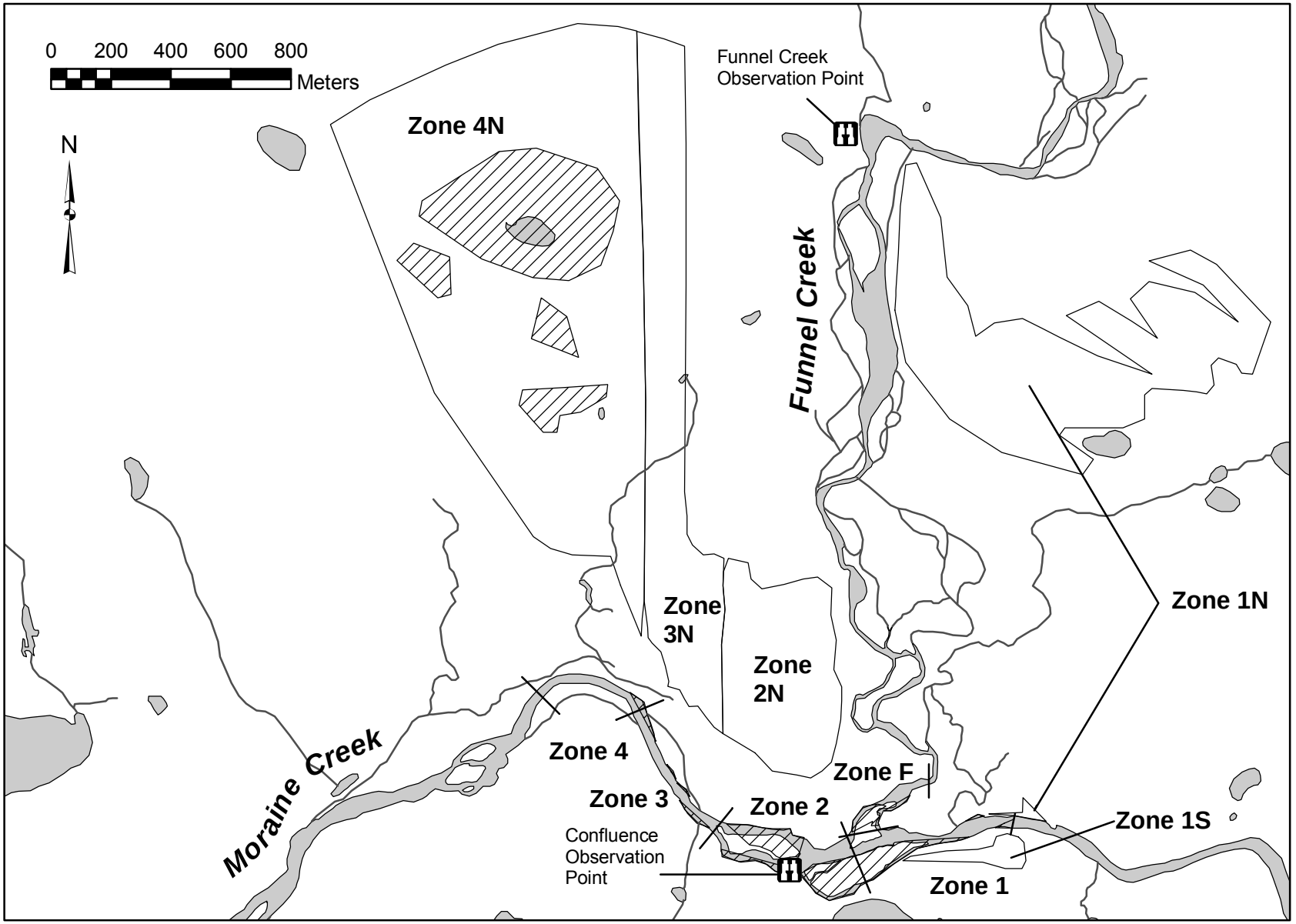

Figure 4. Observation zones visible from the Moraine-Funnel confluence observation point at Moraine Creek, Katmai National Preserve, Alaska, August 2006. Hatched areas indicate blind spots.

river, a scan took up to 15 minutes to complete. For each scan, we recorded the time taken to complete the scan, along with the current weather conditions. We recorded an estimate of visibility anytime it changed significantly during a sample session. For each scan, each observation of a group of people, bears, or other wildlife was recorded as a separate record (a family group was recorded with a count of 1; whereas, each independent animal was counted separately). For each record, we noted a group identification number (e.g., B1 for first bear group, R1 for first raft, etc.) along with the time of the observation, the number of individuals in the group, the zone, and the primary activity (see Appendix B). We also recorded age-sex class of bears when possible. To maximize the visible area sampled during sampling from the Funnel Creek observation point on the cliff, we recorded bears and people visible from the main observation point, as well as from a point about 20 m downstream and a point about 30 m upstream .

Occasionally weather conditions or bear activity in the vicinity of observers precluded completion of a scheduled scan during a sample session. When a scan was recorded both before and after a missing scan, we averaged data from these 2 scans to estimate the missing values. Missing values were otherwise not calculated. We summarized data separately for each of the 2 observation areas (and for the land and river zones within each area). We summarized human and bear activities per the activity categories listed in Appendix B. Human and bear activity rates were calculated per scan and per kilometer of river scanned for each sampling day. Because lengthy bear resting bouts sometimes resulted in prolonged repeated sampling of resting animals within scan sample sessions, we included only the first record of a resting bear in our age-sex class summaries of the scan data. In addition, because zone N was not included in stream transect surveys we also excluded scan data from this zone in age-sex composition summaries.

Stream Transect Surveys

During scan sampling sessions bears were often difficult to classify by age and sex. To obtain more detailed information regarding age-sex composition, we conducted roving stream transect surveys for

Table 1. The approximate lengths of river visible in each observation zone from the Moraine-Funnel confluence and Funnel Creek observation points, Katmai National Preserve, Alaska, August 2006.

Observation Point	Zone	Length (m)	% Total Length of Zones
Moraine-Funnel Confluence	1	560	26
	2	488	23
	3	478	23
	4	375	18
	F	206	10
Funnel	2F	480	15
	3F	917	29
	4F	678	21
	N	1,122	35

bears along Funnel Creek while traveling relatively continuously to and from the Funnel Creek observation point to conduct scan sampling sessions (route illustrated in Fig. 2). The open vegetation and rolling topography allowed us to track bears for considerable distances; thus, we avoided re-counting any bears seen along the transect route. To maintain a relatively consistent search area, we included in our counts only bears and people that were within 100 m of the river. Approximately 1 hour was required to survey the approximately 2.4-km transect route. Because Funnel Creek scan sampling sessions were conducted during scheduled afternoon and evening hours, the stream transect surveys were generally conducted between 1200–1400 hours and 1900–2100 hours.

For each independent bear that we observed along the stream transect route, we recorded, time, zone, age-sex class, number and age of any dependent offspring, approximate location of the bear(s) (locations were marked on topographic maps), and behavior. We also noted time, zone, group size, and group activity for any people observed. We based our bear age categorizations on a combination of relative body size, shape, and behavior.

In addition to notes regarding individual bears seen during the stream transect surveys, we also maintained an individual bear identification list for bears recognized during the transect surveys and scan sampling combined. Individual identifications were based on observable characteristics such as behavior, body shape, size, coat color, scars, ear shape and size, other facial characteristics, age-sex class, and number and appearance of dependent offspring. It should be noted that it was sometimes difficult to distinguish subadult bears (independent bears judged to be <5 years old). Therefore, we combined counts of subadult and adult bears into a single age-sex class for statistical comparisons.

Bear-Human Interactions

We documented human-bear interactions that we experienced or observed using the backcountry bear management report form (BMRF) as described in the Katmai NPP Bear-Human Conflict Management Plan (NPS 2006a; Appendix D). However, sometimes interactions went unrecorded due to other data collection priorities (i.e., the sampling previously described).

Statistical Analysis

We used 2-tailed 2-sample *t*-tests to compare the daily number of visitor days, daily number of overnight visitor days, daily number of aircraft events, and people and bears counted per scan in the Moraine-Funnel confluence river zones, between 2006 and similar data reported for 2004 (Groth et al. 2007). We also used 2-tailed 2-sample *t*-tests to compare bears counted per kilometer of river scanned between the Funnel Creek and Moraine-Funnel confluence observation areas, as well as to compare bears counted per stream transect between afternoon and evening transect surveys. We used chi-square tests to compare: 1) the proportion of aircraft events that involved Crosswinds Lake landings between 2004 and 2006, 2) the

distribution of bears counted among Funnel Creek observation zones between family groups and other bears (scan counts by zone), and 3) the distribution of bears counted among behavioral categories between the Funnel Creek and Moraine-Funnel confluence observation areas (scan counts). In addition, we used chi-square tests to determine whether bear age-sex composition data obtained from scan sampling and stream transect surveys reflected composition based on individual bear identification records. $P < 0.05$ was considered significant. Means are presented ± 95% confidence limit.

Results and Discussion

Visitor Use

Crosswinds Lake Public Use Monitoring.—During the 12 days that we monitored aircraft activity (9–20 Aug 2006), we recorded 265 aircraft events (landings, departures, and over-flights), including 91 aircraft landings on Crosswinds Lake. Ninety-six percent of Crosswinds Lake aircraft events with purpose noted (excluding aircraft pick-up records without a specific purpose recorded) were associated with fishing or rafting/camping groups (most of whom fished in association with those activities). The daily number of documented aircraft events in 2006 averaged 22 ± 5.6 ($\bar{x}$ ± 95% CI; range: 6 to 38, similar to 2004 (t_{22} = -1.88, P = 0.08). The daily number of documented aircraft landings at Crosswinds Lake was also similar between study years ($\bar{x}_{2006}$ = 9 ± 1.6; t_{22} = -1.02, P = 0.32). It should be noted that a smaller lake known locally as "Just Enough Lake" was also a popular drop-off point for anglers that fished their way down Funnel Creek to the confluence at Moraine Creek, and then walked to Crosswinds Lake for pick-up (Fig. 1). Many of the over-flights that we documented appeared destined for this lake or another lake downstream toward Kukaklek Lake.

We observed 17 different commercial operators at Crosswinds Lake (Appendix F). Two to 7 different operators were seen there each day ($\bar{x}$ = 4 ± 0.94 per day). Nine different commercial operators (8 that were sport-fishing lodges) each accounted for ≥5% of the documented Crosswinds Lake landings/departures (where operator identity was known): Alaska Sportsman's Lodge (14%), Alaska Valhalla Lodge (13%), Enchanted Lake Lodge (9%), Royal Wolf Lodge (9%) Katmai Lodge (8%) Newhalen Lodge (6%), Branch River Air (9%), Alaska Wilderness Lodge (6%), and NoSeeUm Lodge (6%). The few guided bear viewing groups that we observed were almost exclusively with Emerald Air Service. This commercial operator was observed twice landing on Crosswinds Lake, but appeared to more commonly access Funnel Creek at its inlet by landing on Mirror Lake (outside of the area that we regularly monitored).

We documented 378 visitor-days of use during the 12 monitoring days (Table 2). The average daily number of visitors recorded in 2006 was 32 ± 9.7 (range: 13 to 59), similar to 2004 (t_{20}= 0.05, P = 0.96).

One-hundred-seven visitor-days (28% of total visitor days) were associated with overnight stays by 14 different camping/rafting parties. The number of overnight visitor-days that we recorded each day ranged from 2 to 14, with a mean of 9 ± 2.6, similar to 2004 (t_{23} = 1.80, P = 0.09). The average number of nights for an overnight visitor was 2 ± 0.8.

Scan Sampling.—We documented human use during both Funnel Creek and Moraine-Funnel confluence scan sampling sessions. During scan sampling from the Funnel Creek observation point, 73% of people were observed in river zones (2F, 3F, 4F, and N) and 27% were seen in land zones (2FE, 2FW, 3FE, 3FW, 4FN, 4FS, and NW; see Figs. 2 and 3 for a map and images of the zones). The average number of people counted per scan in the river zones was 2.0 ± 2.33 (0.6 ± 0.73 people per km of river scanned). The maximum number of people counted in the river zones during a single scan was 17. A single bear viewing group of 14 people that was present in zone 3F during most scans on 19 August contributed noticeably to the average and maximum counts. Excluding this bear viewing group, the average number of people counted per scan in the river zones was 1.4 ± 1.37 (0.5 ± 0.43 per km of river scanned).

Human use was concentrated in zones 2F and 3F (Fig. 5). One group of 3 anglers observed on 2 different sampling days accounted for all of the human use of zone 4F. No people were seen utilizing

Table 2. Average daily number of aircraft events, Crosswinds Lake landings and departures, and visitor days observed at Crosswinds Lake, Katmai National Preserve, Alaska, August 2006.

Date	Aircraft Events	Crosswinds Lake Landings	Visitor-Days
8/9/2006	26	7	32
8/10/2006[a]	35	14	33
8/11/2006	19	3	13
8/12/2006	13	4	17
8/13/2006	24	8	21
8/14/2006	20	6	26
8/15/2006[a]	32	13	45
8/16/2006	13	4	16
8/17/2006	21	6	29
8/18/2006	6	3	29
8/19/2006	24	9	59
8/20/2006	32	14	58
Total	265	91	378
Mean ± 95% CI	22 ± 5.6	8 ± 2.4	32 ± 9.7

[a] We were often unable to see visitors disembarking from planes due to bad weather and poor visibility.

zone N, likely because the stream was very small, shallow, and brushy. People were also observed in land zones 2FW, 3FW and 4FN in 3 different sessions. A social trail that led to the Funnel Creek observation point and passed through zones 2FW and 3FW was typically used by people walking to Crosswinds Lake. We observed 11 people in zone 4FN on 15 August who appeared to be walking downstream after accessing the area via Just Enough Lake. No camps were seen along Funnel Creek.

At the Moraine-Funnel confluence, 74% of people counted were in river zones and 26% were in land zones (see Fig. 4 for a map of the zones). The average number of people counted in the river zones during a scan was 3.2 ± 2.21 (1.5 ± 1.05 people per km of river scanned), similar to 2004 (t = -0.18, P = 0.86). The maximum number of people counted in the river zones during a single scan was 9. Also similar to 2004, in the river zones human use appeared to be concentrated primarily in zones F, 1, and 2 (Fig. 6). Activities of people observed during scans included: fishing (48%), walking/wading (40%), and occupying/establishing a camp or setting up rafting equipment (12%).

Bear Spatial Use Patterns

Scan Sampling.—We documented bear use during both our Funnel Creek and Moraine-Funnel confluence sampling sessions. During Funnel Creek scan sampling sessions, 78% of independent bears were observed in the river zones and 22% were seen in the land zones (see Figs. 2 and 3 for a map and images of the zones). Across all river zones, the number of independent bears counted per scan averaged 6.1 ± 0.94 (1.9 ± 0.30 bears per km of river scanned). The maximum number of independent bears

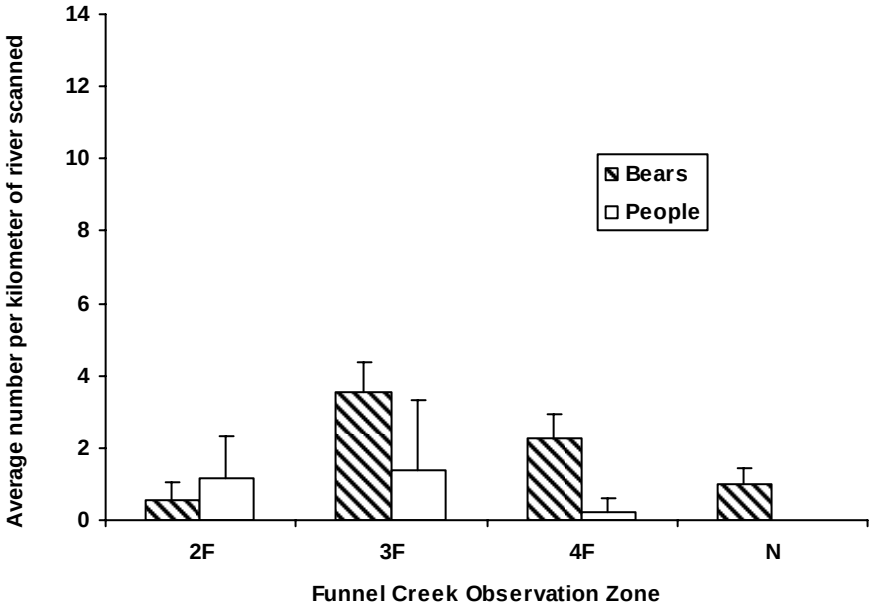

Figure 5. Average number of bears and people observed per kilometer (± 95% CI) of river scanned in the Funnel Creek observation zones (land zones excluded), Katmai National Preserve, Alaska, 9–19 August 2006.

counted in a scan of the Funnel Creek river zones was 13 and in a scan of the adjacent land zones was 7. Across the Funnel Creek land and river zones combined, the maximum scan count of independent bears was 13.

Bear use of the Funnel Creek river zones appeared primarily concentrated in zones 3F and 4F (Fig. 5). Family groups distributed their use among the river observation zones differently than other bears (χ^2_3 = 97.65, $P < 0.001$; Fig. 7). In particular, family groups favored zone N (42% family groups counted), which other bears used infrequently (4% single bears counted). In contrast, single bears favored zone 3F (59% single bears counted), which family groups favored secondarily (37% family groups counted), and zone 4F (32% single bears counted; 16% family groups counted).

The number of independent bears counted per scan in the Moraine-Funnel confluence river zones (see Fig. 4 for a map of the zones) averaged 2.0 ± 1.36 (1.2 ± 0.78 independent bears per km of river scanned), greater than the average number of bears seen in 2004 (t_6 = 2.80, P = 0.01). The maximum number of independent bears counted during a scan of the Moraine-Funnel confluence river zones was 6 and in a scan of the adjacent land zones was 6. Across the Moraine-Funnel confluence land and river zones combined, the maximum scan count of independent bears was 8. Counts of independent bears per kilometer were lower on average in the Moraine-Funnel confluence river zones than in the Funnel Creek river zones (t_7 = -2.64, P = 0.02). We believe that this difference was at least in part due to what appeared to be better fishing conditions for bears along Funnel Creek—intermittent cover provided for many

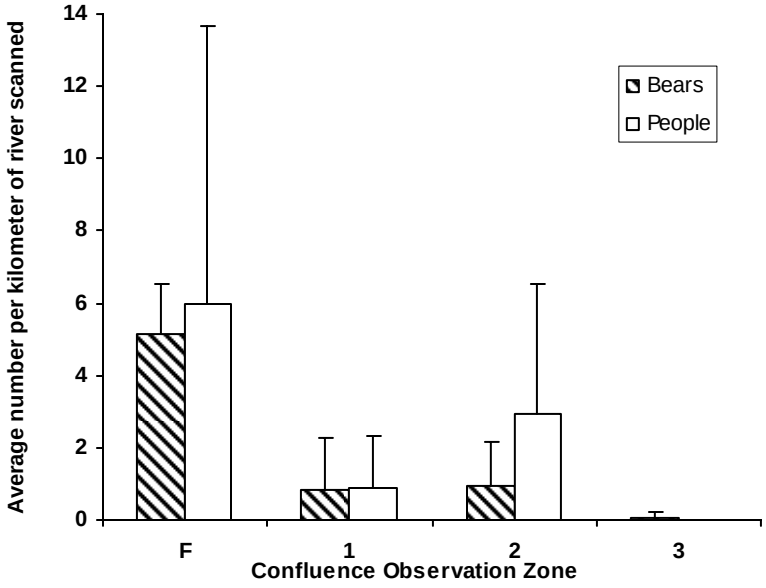

Figure 6. Average number of bears and people observed per kilometer (± 95% CI) of river scanned in the Moraine-Funnel confluence river zones (land zones excluded), Katmai National Preserve, Alaska, 10–20 August 2006.

visually separated fishing spots, and the creek was relatively shallow in many places, which left fish vulnerable to bear predation.

Bear use in the Moraine-Funnel confluence river zones was concentrated in Zone F (Fig. 6), where 52% of independent bears were counted during scans. Bear activities recorded during scans were similar in the Funnel Creek and Moraine-Funnel confluence observation areas, except that more play and other interactions between bears were documented for bear groups at the confluence (χ^2_5 = 14.55, P = 0.01; Fig. 8).

Stream Transect Surveys.—We conducted 6 afternoon (1200–1400 hr) and 6 evening (1900–2100 hr) stream transect surveys along Funnel Creek from 9–19 August 2006 (transect route illustrated in Fig. 2). The number of independent bears seen per transect was similar between afternoon and evening evening surveys (t_9 = -1.71, P = 0.12). Overall, the average number of independent bears seen per kilometer of transect surveyed was 5.6 ± 0.82 (average number of independent bears seen per 2.4-km transect surveyed was 13.6 ± 1.98 [range: 8–17]). The majority (85%) of independent bears observed during the transect surveys were within river zones (Table 3). Family group observations were most often observed in the upstream river zones (zones 3F and 4F; 75% of family groups were within river zones). A total of 15 observations of adult males were recorded during stream transect surveys, primarily in zone 2F.

Figure 7. Percent females with dependent offspring and independent single bears recorded during scan sampling in each Funnel Creek observation zone, Katmai National Preserve, Alaska, 9–19 August 2006.

Bear Age-Sex Composition

During the August 2006 field period, 42 different independent bears were identified including 16 females with dependent offspring (7 females with spring cubs and 9 females with yearlings; 38% of the independent bears identified), 8 subadults, and 18 single adults (8 male, 8 female, and 2 sex undetermined; Appendix E). Litter size averaged 2.6 ± 0.90 for spring cubs and 2.2 ± 0.51 for yearlings, relatively similar to litter sizes reported by Butler (2007) for 3 aerial stream surveys conducted in the same drainage as our ground-based project during August 2006. Notable individuals among the bears identified included 4 different distinctly scarred older large males and a female with 4 spring cubs. It is important to note that females with dependent offspring were often easier to recognize than some single bears; consequently, we believe that percent family groups based on individual identification records is a maximum estimate. In addition, subadults were sometimes difficult to distinguish from young adults, so our estimates of age composition of single bears (based on individual identification records) should also be interpreted with caution.

We also obtained bear age-sex composition information from the Funnel Creek scan sampling and stream transect survey efforts. Given the previously mentioned difficulties with consistently distinguishing single adult bears from subadults, we grouped all single bear counts together for analysis, thus limiting our composition summaries for the scan and transect data to females with dependent offspring and other independent bears. The proportions of independent bears classified as females with dependent offspring during scan sampling and transect surveys were lower than expected based on the

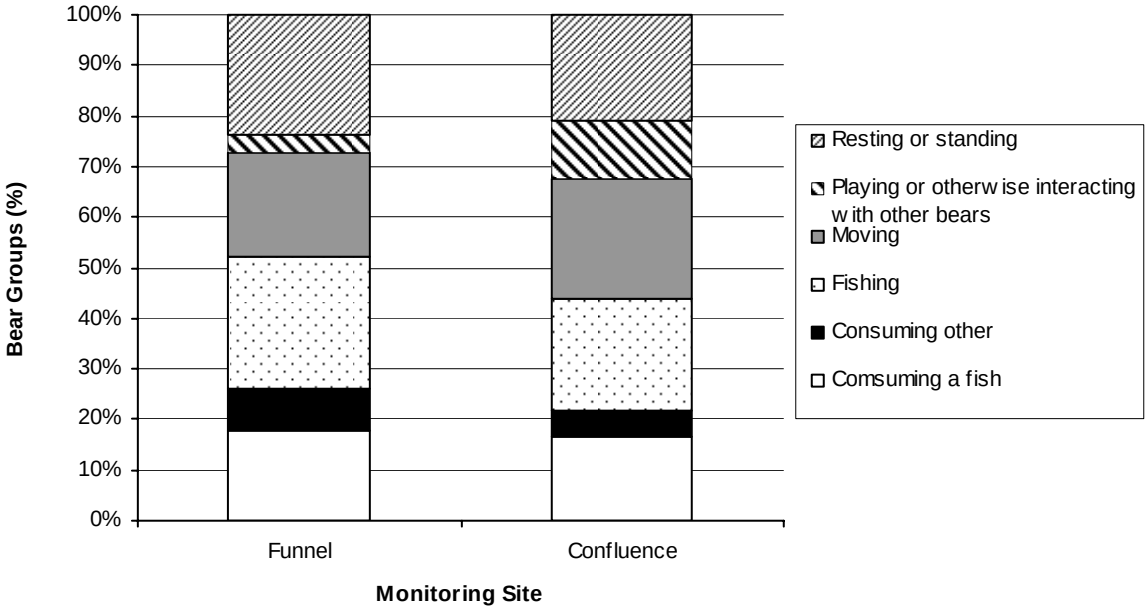

Figure 8. Percent independent bears recorded in each behavioral category during scan sampling of the Funnel Creek and Moraine-Funnel confluence observation areas, Katmai National Preserve, Alaska, 9–19 August 2006.

composition of independent bears identified (28% and 15% family groups in scan sampling and transect surveys respectively; scans: $\chi_1^2 = 19.17$, $P < 0.001$; transects: $\chi_1^2 = 32.73$, $P < 0.001$).

We believe that the stream transect survey composition data under-represent the proportion of family groups present in the study area because some zones clearly favored by family groups during scan sampling sessions (particularly zone N) were not included in the transect survey route. Conversely, we believe that the scan sampling data may over-represent the proportion of family groups present in the study area because family groups appeared to move less than other bears, which resulted in family groups being counted during sequential scans more often than other age-sex classes. In comparison, during August 2006 Butler (2007) reported that family groups accounted for 35% of independent bears observed during aerial transect surveys conducted in the same drainage as our ground-based work, relatively similar to the 38% family groups in our individual bear identification records..

Sellers (1994) suggested that the proportion of single bears of all bears (including dependent offspring) observed during aerial stream surveys may provide a general indication of the effects of harvest rate, with >60% single bears indicative of light harvest, <25% single bears indicative of possible over-harvested, and 35–40% single bears indicative of moderate harvest. The proportions of single bears observed based on individual bears records, stream transect surveys, and scan sampling were 33%, 64% and 45% respectively. In comparison, Butler (2007) observed 38% single bears during aerial stream surveys conducted in this drainage in August 2006. It should be emphasized that percent single bears calculated from our sampling were based on relatively limited data for a subarea of the Moraine-Funnel creeks drainage, and that the previously mentioned interpretive considerations regarding our sampling methods also apply. In addition, we note that markedly increased salmon escapements in recent years in the Moraine-Funnel drainage (Westing et al. 2006) may have attracted more bears from a broader

Table 3. Bear age-sex composition by river zone recorded during stream transect surveys of Funnel Creek, Katmai National Preserve, Alaska, 9–19 August 2006.

	River Zone							
Age-Sex Class	1	2	F	2F	3F	4F	Total	% Total
Adult Male	0	1	3	8	3	0	15	12
Adult Female	0	1	5	4	8	6	24	19
Family Group	1	3	0	1	6	9	20	16
Unclassifed Adult	1	0	0	1	4	2	8	6
Subadult	1	5	7	16	25	4	58	45
Unclassifed Single	1	0	0	0	2	0	3	2
Total	4	10	15	30	48	21	128	
% Total	3	8	12	23	38	16		

geographic area than in some years past. It is unknown how any such increase would be reflected in terms of bear age-sex composition.

Human-Bear Interactions

Because scan sampling and stream transect surveys were our priority for data collection, we only used backcountry bear management report forms (BMRFs) to record more notable human-bear interactions. Four BMRFs documented situations in which we observed anglers approach and/or fish <<50 m from bears that were using the river corridor (e.g., see Fig. 9). Two of these incidents resulted in displacement of fishing bears. In addition, 1 BMRF documented an interaction in which a guided bear-viewing group approached a sleeping bear to within <50 m, which caused the bear to get up and relocate farther away. On several occasions, we also observed guided bear viewing groups sitting on gravel bars in Funnel Creek while bears fished/approached to within 20 m. All of the previously described interactions appeared easily avoidable, and were inconsistent with Katmai National Park and Preserve's wildlife distance requirements (see 36 CFR 13.66(d) and NPS 2006).

Other bear-management-related issues of concern that we observed involved unattended gear and improper food storage (food not stored in bear-resistant containers or per other bear-resistant storage options identified in NPS 2006). For example, we observed some anglers leave backpacks that contained lunches and other food items unattended on gravel bars while they fished some distance away. In addition, we observed large plastic containers and coolers being used for food storage at some campsites. Unattended gear was also observed in and around camps. Particularly notable was a rafting group that camped on a gravel bar near the Moraine-Funnel confluence. We observed this group leave a case of beer in a pile of unattended gear while they set up camp ≥100 m away in thick brush. In addition, although an

Figure 9. Examples of close-range interactions between anglers and bears at the confluence of Moraine and Funnel creeks, Katmai National Preserve, Alaska, 11 August 2006.

electric fence was installed around the camp, bears sometimes passed very close to the camp due to its location in a commonly used bear travel corridor and feeding area.

Vegetation and Soils

Trampling effects on vegetation were apparent at locations where planes commonly loaded/unloaded on Crosswinds Lake, similar to those reported by Olson et al. (2001) and Groth et al. (2007). Several commonly used social trails led from Crosswinds Lake to Moraine Creek, also similar to those previously reported. In addition, our campsite west of the lake (Fig. 1) continued to show vegetation impacts. An approximately 4-m^2 patch of dead vegetation and scattered dying vegetation was evident there upon our initial arrival. Due to the nearly constant rain during our stay in 2006, the campsite showed particularly noticeable vegetation impacts over the course of our stay.

Away from Crosswinds Lake, we observed numerous other social trails. A few of the more heavily used ones are depicted in Figure 1. For example, a trampled social trail used by anglers dropped off at Just Enough Lake was evident leading to Funnel Creek. In addition, a well-worn social trail led from the Moraine-Funnel confluence area north along the west side of Funnel Creek. Also, a fairly worn social trail led from the Moraine-Funnel confluence upstream along the south side of Moraine Creek.

Data Limitations

1. Our public use monitoring was focused at Crosswinds Lake during the hours in which most aircraft activity occurred (largely morning hours). We also attempted to record any other aircraft observed outside of these sessions. However, it is likely that some aircraft traffic went unrecorded. Therefore, counts of aircraft event should be regarded as minimum estimates.
2. We did not thoroughly patrol the area on a daily basis. Consequently, some overnight use may have been missed.
3. Some sections of Funnel Creek were not visible from the stream transect route, especially along lower Funnel Creek (zones F and 2F). This was also the case for some areas within each of the zones as viewed from the scan sampling observation points.
4. Although the scan sampling and stream transect survey data are useful for general knowledge regarding bear and human use patterns, sampling of Moraine and Funnel creeks was of relatively low intensity over a 12-day sampling period.
5. Bear sex and age was sometimes difficult to determine, particularly when bears were observed at a distance. Classification of bears as subadults or adults was at times especially difficult.

Conclusions

Aircraft traffic and visitor use was relatively heavy for a remote site. Aircraft traffic at Crosswinds Lake was primarily associated with day-use sport-fishing, and most human activity observed on Moraine Creek

was associated with sport-fishing. Impacts to vegetation and soils from human traffic were particularly evident near Crosswinds Lake—at the commonly used plane landing area, at multiple campsites, and in the form of social trails leading to Moraine Creek. Another lake downstream (west) of Crosswinds Lake also received regular use and although we haven't inspected it, most likely shows similar impacts.

Within the study area we identified 42 different independent bears. We believe that this is a minimum estimate because we only assigned bear identification numbers to animals that were clearly recognizable and that were typically seen on >1 occasion. Bear numbers and activity levels appeared higher along Funnel Creek than in the vicinity of the Moraine-Funnel confluence. We believe that this was due to better fishing conditions for bears along Funnel Creek, where braided channels divided by sometimes thickly vegetated gravel bars provided numerous sheltered shallow spots that left fish vulnerable to bears.

Both bear viewers and anglers were sometimes observed for more than brief periods of time <<50 m from bears, contrary to regulatory requirements. It is likely that these close encounters enhanced human habituation in some bears. Increased human habituation may increase the likelihood of a bear obtaining improperly stored food and/or of more direct bear-human conflicts. In addition, bear hunting occurs in Katmai National Preserve. It is unknown whether human habituation results in increased vulnerability of bears to hunting; however, even a perceived relationship could result in user conflicts.

The potential for food-conditioning appeared to be one of the bear management issues of most concern at Moraine Creek. Although we did not observe any bear obtain food from people, such incidents have been reported in the past (e.g., Katmai National Park and Preserve case incident reports). Backpacks left unattended likely sometimes contained food, anglers sometimes fished in close proximity to bears, and we observed some campers cooking meals at their campsites (which were established on gravel bars in the river corridor where bear traffic was common) and/or storing food in containers that were not bear-resistant. NPS efforts to increase public education (including commercial operators during the off-season) and enforce regulations governing proper storage of food, garbage, and fish could help reduce the chances of bears becoming food-conditioned.

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Appendix A

2006 Crosswinds Lake Public Use Monitoring, Data Sheet and Code List

Figure A1. Data form layout used to record visitor use data at Moraine Creek, Katmai National Preserve, Alaska, 2006.

Moraine Creek Visitor Use Monitoring Data Sheet, Attribute Definitions

The following information was recorded for each aircraft and watercraft observed from the Crosswinds Lake observation point (Fig. 1). Observations were also recorded occasionally while conducting river monitoring sessions.

Date – Date of observations

Observers – Initials of observer(s)

Time In/Out – Time at which the aircraft/watercraft was first seen, and the time at which it departed. Note: Sometimes planes made more than 1 flight to shuttle people to an alternate location where the plane could take off fully loaded. In such cases, there may be more than 1 Time In/Out noted for that same group.

Plane # – Tail number of aircraft.

Make/Description (Veh) – Description of aircraft/boat/raft make, including whether on floats (FP) or wheels (WP) (P = unknown).

Commercial Operator– Company name of commercial operator if known.

Purpose (Purp) – Apparent primary purpose of visit.

- RAFT or R – Rafting (rafts may be used for sport fishing).
- FISH or SF – Day-use sport fishing.
- CAMP or C – Camping. Because campers often engaged in multiple activities, this category was used whenever a drop-off was known to be camping and rafting was not involved; specific activities may have been noted under comments.
- BEAR or BV – Day-use bear viewing.
- OVR – Overflight of area, purpose unknown.
- P/U or PU – Picking up passengers.
- NPS – Katmai NPP operations.
- UNK – Unknown.

V – Observed number of visitors.

G – Observed number of guides.

Tot – Total number of people

Comments – Additional comments, including notes regarding whether the plane was dropping off or picking up passengers, activities of people observed, etc.

Figure A2. Data form codes used to record visitor use data at Moraine Creek, Katmai National Preserve, Alaska, 2006.

Appendix B

2006 Moraine-Funnel Confluence and Funnel Creek Sampling, Data Sheets and Code Lists

Table B1. Schedule of scan sampling sessions at the Moraine-Funnel confluence and Funnel Creek observation points, Katmai National Preserve, Alaska, 2006.

Observation Site	Date	Start TIme	End Time	No. Scans
Moraine-Funnel Confluence	10 Aug 2006	15:00	17:00	6
	11 Aug 2006	14:00	16:00	6
	11 Aug 2006	17:00	19:00	6
	14 Aug 2006	16:40	18:40	6
	20 Aug 2006	14:00	16:00	6
	20 Aug 2006	17:00	19:00	6
Funnel Creek	9 Aug 2006	14:00	16:00	6
	9 Aug 2006	17:00	19:00	6
	12 Aug 2006	14:00	16:00	6
	12 Aug 2006	17:00	19:00	6
	13 Aug 2006	14:00	16:00	6
	13 Aug 2006	17:00	19:00	6
	15 Aug 2006	14:00	16:00	6
	15 Aug 2006	17:00	19:00	6
	17 Aug 2006	14:00	16:00	6
	17 Aug 2006	17:00	19:00	6
	19 Aug 2006	14:00	16:00	6
	19 Aug 2006	17:00	19:00	6

SCAN DATA – FUNNEL/MORAINE 2006

Observers:_____ Page __ of __

Date:_____

_ Session_Begin:_____ Session_End:_____

Scan No.:	Scan Begin:	Scan End:			
Weather	Temp:	Beaufort:	Wind Dir:	Cloud Cover:	Precip:

Time	Zn	Grp_ID	Species	Count	Activity	Notes

Scan No.:	Scan Begin:	Scan End:			
Weather	Temp:	Beaufort:	Wind Dir:	Cloud Cover:	Precip:

Time	Zn	Grp_ID	Species	Count	Activity	Notes

Figure B1. Data form layout used to record scan sampling records at the Moraine-Funnel confluence and Funnel Creek, Katmai National Preserve, Alaska, 2006.

FOCAL DATA – FUNNEL/MORAINE 2006

Observer:_________________________________ Page __ of __

Date:________________ Focal_Begin:___________ Focal_End:____________ Scan Nos.:___________

Time	Zn	Activity	No. People (Zn)	Dist(m)	Comments

Figure B2. Data form layout used to record focal sampling records at the Moraine-Funnel confluence and Funnel Creek, Katmai National Preserve, Alaska, 2006.

Codes & Definitions, Funnel/Moraine 2006:

Weather

>*Temperature*-In degrees Fahrenheit
>*Beaufort Scale Wind Force*-
0 Wind <1 mph; Calm-smoke will rise vertically, tree leaves don't move
1 Wind 1–3 mph; Light Air-Rising smoke drifts, tree leaves don't move
2 Wind 4–7 mph; Light Breeze-Tree leaves rustle, can feel wind on face, flags wave slightly
3 Wind 8–12 mph; Gentle Breeze-Leaves & twigs in constant motion & light-weight flags extend
4 Wind 13–18 mph; Moderate Breeze-Small branches move, raises dust & paper, flags flap
5 Wind 19–24 mph; Fresh breeze-Small trees sway, flags flap & ripple
6 Wind 25–31 mph; Strong breeze-Large tree branches move, open wires "whistle", flags beat & pop
7 Wind 32–38 mph; Moderate gale-Large trees sway, difficult to walk
>*Wind Direction (from)*- N, S, E, W, NE, SE, NW, SW
>*Cloud Cover*-
0 Clear
1 Scattered (few clouds)
2 Broken (mostly clouds)
3 Overcast (all clouds)
>*Precipitation*-
0 None 1 Fog 2 Light rain 3 Moderate rain 4 Heavy rain

Activity

>*People*-
FI/F Fishing from shore or in river (in waders) (note boat or raft if present)
W Walking/wading
R Resting
BV Photographing or viewing bears
C At camp
0 Other (describe)

>*Bears*- (Also, use codes for other mammal observations)
S Standing stationary
M Moving
F Fishing
EF Consuming a fish
EO Consuming other
P Playing
IB Interacting with another bear (include obvious sniffing toward another bear, scanning, or staring; not play)
IP Interacting with people (include obvious sniffing toward people, scanning, or staring)
OT Other (describe)
U Unknown (bear present but unable to discern activity)

>*Waterfowl & Eagles*-
0 Stationary on water/land
1 Flush from water/land
2 Feeding on fish (eagle)
3 Other (describe)

Figure B3. Code sheet used to record focal, scan, and stream transect survey data at the Moraine-Funnel confluence and Funnel Creek, Katmai National Preserve, Alaska, 2006.

Appendix C

2006 Funnel Creek,
Transect Data Sheet and Code List

RIVER WALK DATA FORM – FUNNEL/MORAINE 2006

Observers:____ Page __ of __

Date:_____________ Time Start:____________ Time_End:_____________ *If river zones established, note time start/end for each zone in record lines and use these fields to note absolute begin/.end times.*

Coordinates at Start: Lat______________________________ Datum:______________ Lon______________________________	Coordinates at Start: Lat_____________________________ Datum:______________ Lon_____________________________
If walking an established route with already recorded zone break points, please specify route name /reference to consult for zones:	

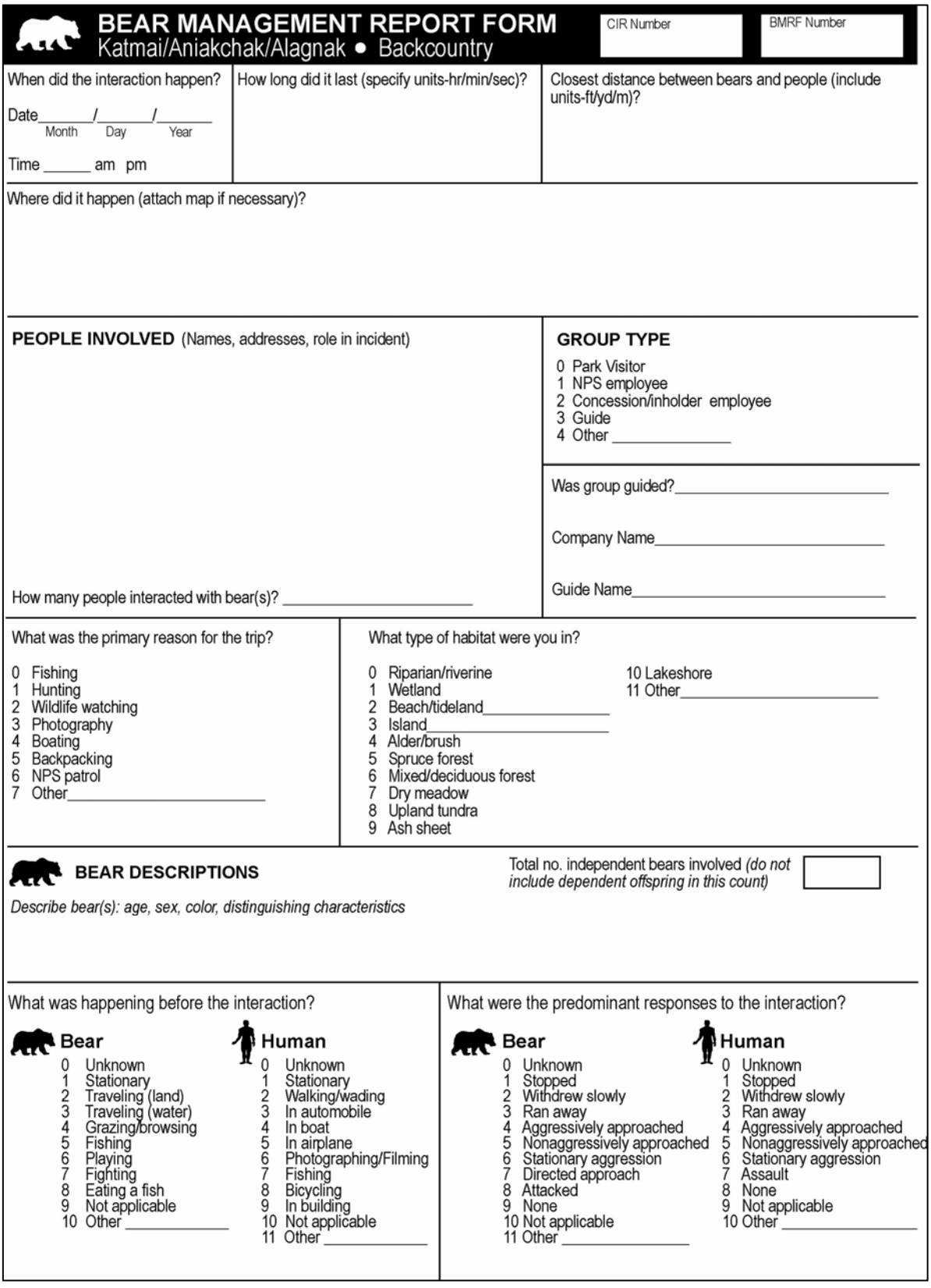
Weather	Temp:	Beaufort:	Wind Dir:	Cloud Cover:	Precip:

Time	Zn	Grp_ID	Age	Sex	DepOff	Count	Activity	Notes

Figure C2. Data form layout used to record Funnel Creek stream transect survey data, Katmai National Preserve, Alaska, 2006. Data were coded using the same codes as for scan sampling (Fig. B3).

Appendix D

2006 Backcountry Bear Management Report Form (BMRF) and BMRF Instructions



BEAR MANAGEMENT REPORT FORM
Katmai/Aniakchak/Alagnak • Backcountry

CIR Number

BMRF Number

When did the interaction happen?

Date_____/_____/_____
Month Day Year

Time _____ am pm

How long did it last (specify units-hr/min/sec)?

Closest distance between bears and people (include units-ft/yd/m)?

Where did it happen (attach map if necessary)?

PEOPLE INVOLVED (Names, addresses, role in incident)

How many people interacted with bear(s)? _____

GROUP TYPE

0 Park Visitor
1 NPS employee
2 Concession/inholder employee
3 Guide
4 Other _____

Was group guided?_____

Company Name_____

Guide Name_____

What was the primary reason for the trip?

0 Fishing
1 Hunting
2 Wildlife watching
3 Photography
4 Boating
5 Backpacking
6 NPS patrol
7 Other_____

What type of habitat were you in?

0 Riparian/riverine
1 Wetland
2 Beach/tideland_____
3 Island_____
4 Alder/brush
5 Spruce forest
6 Mixed/deciduous forest
7 Dry meadow
8 Upland tundra
9 Ash sheet
10 Lakeshore
11 Other_____

BEAR DESCRIPTIONS

Describe bear(s): age, sex, color, distinguishing characteristics

Total no. independent bears involved *(do not include dependent offspring in this count)*

What was happening before the interaction?

Bear

0 Unknown
1 Stationary
2 Traveling (land)
3 Traveling (water)
4 Grazing/browsing
5 Fishing
6 Playing
7 Fighting
8 Eating a fish
9 Not applicable
10 Other _____

Human

0 Unknown
1 Stationary
2 Walking/wading
3 In automobile
4 In boat
5 In airplane
6 Photographing/Filming
7 Fishing
8 Bicycling
9 In building
10 Not applicable
11 Other _____

What were the predominant responses to the interaction?

Bear

0 Unknown
1 Stopped
2 Withdrew slowly
3 Ran away
4 Aggressively approached
5 Nonaggressively approached
6 Stationary aggression
7 Directed approach
8 Attacked
9 None
10 Not applicable
11 Other _____

Human

0 Unknown
1 Stopped
2 Withdrew slowly
3 Ran away
4 Aggressively approached
5 Nonaggressively approached
6 Stationary aggression
7 Assault
8 None
9 Not applicable
10 Other _____

Figure D1. Page 1 of the Bear Management Report Form (BMRF) used to document human-bear interactions of note at Moraine and Funnel creeks, Katmai National Preserve, Alaska, 2006.

Where did the group receive bear safety information?
(Circle all that apply)

0 None
1 Printed material (Katmai NP)
2 Brooks Camp Visitor Center
3 Interpretive program (Brooks Camp)
4 Ranger contact
5 King Salmon office
6 Phoned Katmai
7 King Salmon Visitor Center
8 Non-Katmai source (Who? What?) _____
9 Lodge staff (Lodge name?) _____
10 Guide (Affiliation?) _____
11 NPS-sponsored staff training
12 Unknown
13 Not applicable
14 Other: _____

Was there food in the area?_____

If food was present, indicate category:

1 Angler-caught fish, not secured per park regulations
2 Fish on line near bear (<50m)
3 Beverage only, not secured per park regulations
4 Human food, not secured per park regulations
5 Garbage containing food, not secured per park regulations
6 Harvested game (describe storage)
7 Human food/fish/garbage secured per park regulations
8 Other_____
9 Unknown

Comments:

Was property damaged?_____

Estimated cost of damage?_____

Describe:

What was the source of this BMRF?

0 Unconfirmed rumor
1 Personal experience
2 Direct observation
3 Direct report
4 Observed report

What happened (attach additional sheets if necessary)?

Report taken by _____ (NPS staff) Date _____

FOR MANAGEMENT USE ONLY

NPS Staff Action

0 None
1 Interpretation
2 Verbal Warning
3 Written Warning
4 Citation
5 Not Applicable
6 Other_____

Other BMRFs:

Bear Management Action

0 None
1 Monitored
2 Too late
3 Unsuccessful hazing
4 Successful hazing
5 Posted warnings
6 Closure
7 Killed bear
8 Not applicable
9 Other_____

Number of people in the area during the management action:

_____

Hazing Technique ≥1

0 Yelling/Clapping
1 Air Horn
2 Cracker Shells
3 Bird Bangers
4 Screamer Siren
5 BD-100
6 Margo Strike
7 Bean Bag Round (Type?) _____
8 Other_____

Human Offense ≥1

0 None
1 Too close
2 Didn't yield right-of-way
3 Continued fishing
4 Didn't break line
5 Stacked fish
6 Improper food storage
7 Harassment
8 Gear left unattended
9 Unknown or not applicable
10 Other_____

Primary Incident Category (secondary may be noted as such)

1 Food related
2 Surprise encounter
3 Dominance interaction
4 Trespass
5 Planned management action
6 Property damage
7 Curious investigation
8 Other_____

Predominant Management Consequence (secondary may be noted as such)

0 None
1 Human withdrew
2 Bear withdrew
3 Aggression unchallenged
4 Property damage
5 Fish stolen
6 Obtained human food
7 Bear killed
8 Human contact/injury/fatality
9 Trespass unchallenged
10 Enhanced habituation
11 Unknown or not applicable
12 Other_____

Infer proximate cause leading to interaction:

0 Unknown
1 Chance event
2 Human error/action
3 Bear initiated
4 Not applicable

Revised April 2002

Figure D1, Continued. Page 2 of the Bear Management Report Form (BMRF) used to document human-bear interactions of note at Moraine and Funnel creeks, Katmai National Preserve, Alaska, 2006.

Bear Management Report Form (BMRF) Instructions
Backcountry Form
Revised 2006

The BMRF is the primary tool for documenting bear-human interactions throughout the park. It is a means for monitoring bear activity, evaluating the bear management program, and identifying potential problems that need attention. Use the form to document all serious and unusual bear-human interactions. This includes the obvious such as bears obtaining food/garbage/fish from humans or their facilities, hazing of bears, property damage, bears behaving aggressively towards humans, human injuries/fatalities, bears killed in defense of life and property (DLP), and poaching incidents.

When humans behave such that one would expect a bear to respond aggressively, the interaction should be reported regardless of the bear's behavior. This does not mean that a form must be filled out every time that someone breaks the "50-yard rule." If someone approaches a bear within a short distance or harasses it in some way, a form should be completed. This will be a subjective interpretation on your part.

Bears entering backcountry residence areas such as lodges (trespasses) should be documented. When bears investigate backcountry camps and facilities, such as the Swikshak cabin, a BMRF should be completed. All bear management activities such as hazing and closures must be reported.

A Ranger will also complete a case incident report (CIR) whenever a bear damages property, a bear injures or kills a human, or if a violation is involved. In those cases, a copy of the CIR should be attached to the BMRF.

Whenever NPS personnel discharge a firearm or bear pepper spray to haze a bear, or a bear charges a human, a CIR number should be obtained from Park Dispatch or the Chief Ranger and recorded on the BMRF (see section 5.0, BMP). For each BMRF assigned a CIR number, a copy of the form should be submitted to a Bear Management Technician or the Park Wildlife Biologist for incorporation into the BMRF database, and the original form should be submitted to the Chief Ranger.

Visitors should be able to fill out this form with minimal assistance. When a visitor completes a BMRF, be sure to read through it to be sure it is as complete as possible and that a sufficient description of the interaction was written in the "What happened" section. Then complete as much information in the "Management Use Only" section as you can. A Bear Management Technician or the Park Wildlife Biologist can determine the "Management Consequences" if you aren't sure, assuming the interaction is sufficiently described.

If you do not have all the information requested on the BMRF, fill out as much as you can. A partially completed BMRF is better than no BMRF. Record exactly what you observed or exactly what the witnesses observed; do not fill in the missing parts or record witnesses attempts to do so. Make sure the observations described are tangible such as specific behaviors, sizes, or distances. Do not record intangible interpretations such as a bear's intent or mood.

If you are not sure whether you should fill out a form, go ahead and do it.

Backcountry BMRF:

Use this form for human-bear interactions occurring in Katmai National Park and Preserve, Aniakchak National Monument and Preserve, and the Alagnak Wild River, excluding the Brooks Camp area. There is a different form for the area within a 5-mile radius of Brooks River, along the VTTS road, and near the Three Forks cabin.

Leave the "BMRF #" in the upper right corner of page 1 blank. A Bear Management Technician will assign each form a unique record number.

CIR number - Include the case incident report number if applicable. If a CIR was written but you don't know the number, write "Y-unknown" in pencil and the Bear Technician will add the number later.

When did the interaction happen? - Use numbers to indicate month, day, and year. Be sure to circle a.m. or p.m.

How long did it last? - Indicate the length of the interaction. Be sure to include units, i.e., hours, minutes, seconds.

Closest distance between bears and people? - How close did the bear and nearest person get during the interaction? Write a range if necessary, e.g., 20–30 m. Be sure to include units, i.e., feet, yards, meters. Write "Unknown" or "Not Applicable" if appropriate.

Where did it happen? - Describe the location of the incident. Attach a map or draw one in the "What happened?" section if necessary.

People involved - List the names and addresses of the people involved in the interaction and the role each person played. Include the total number of people involved in the interaction.

Group type - Circle the group type. If "Other", describe. Indicate if the group was guided and the guide's and company's names if applicable.

What was the primary reason for the trip? - Circle all that apply and describe if "Other".

What type of habitat were you in? - Circle the habitat type that best describes the location of the interaction. If "Other", include a description.

0 Riparian/riverine - corridor of a watercourse, including banks and vicinity.
1 Wetland - marshes or bogs that are not in the vicinity of a watercourse and are not tidal.
2 Beach/tideland - anything between low, low tide and the high strand line of severe winter storms; note type of beach as sand, cobble, or boulder.
3 Island - either lake or ocean; note which. If an island or bar in a river, use "0."
4 Alder/brush - dense or open shrublands.
5 Spruce forest - any stand of conifers of reasonable size.
6 Mixed/deciduous forest - any stand of trees of reasonable size, dominated by deciduous trees.
7 Dry meadow - upland grasslands or very open shrublands.
8 Upland tundra - dry tundra.
9 Ash sheet - exposed ashflow of 1912 eruption.
10 Lakeshore
11 Other - Describe.

Bear descriptions - Indicate the total number of independent bears involved in the interaction in the box in the upper right corner. Do not include dependent offspring in this count. Use the blank space to describe the bears. Include whatever information you think is pertinent.

What was happening before the interaction? - Circle the activity the bear and human were engaged in immediately before the interaction occurred. If multiple bears or people interacted, circle the predominant activity exhibited by each species. For family groups, the predominant activity is typically considered that of the sow. For instance, if 5 people encountered a bear while 3 of them were fishing and 2 were simply watching, circle "Fishing." If someone encountered a bear family in which the sow was fishing, one cub was playing with a pine cone, and another cub was sleeping, circle "Fishing."

Choices in Bear column:

0 Unknown - There was no data or no bear was involved.
1 Stationary - The bear was standing, sleeping, suckling young, or otherwise not going anywhere.
2 Traveling (land) - The bear was walking or running to go somewhere.
3 Traveling (water) - The bear was swimming or wading to go somewhere. Do not include fishing.
4 Grazing/browsing - The bear was foraging for vegetation.
5 Fishing - The bear was apparently foraging for fish.

What was happening before the interaction? - Choices in Bear column, Continued.

6 Playing - The bear was engaged in play. (Bears do not vocalize while playing.)
7 Fighting - Bears were engaged in dominance interactions with each other. This does not necessarily involve bears making physical contact with each other.
8 Eating a fish – The bear was eating a fish.
9 Not applicable
10 Other - Describe.

Choices in Human column:
0 Unknown - There was no data or no humans were involved prior to the interaction.
1 Stationary - People were not going anywhere and were not involved in other activities listed below.
2 Walking/wading - People were going somewhere by foot.
3 In automobile - People were in or traveling in a Cushman, Suburban, truck, bus, etc.
4 In boat - People were in or traveling in a boat. This includes fishing from a boat.
5 In airplane - People were in or traveling in a plane.
6 Photographing/filming - People were photographing, video taping, etc. bears. Report photographing other subjects as "Stationary."
7 Fishing - People were actively fishing. Record fishing from a boat as "In boat."
8 Bicycling - People were riding bicycles.
9 In building – People were inside a building.
10 Not applicable
11 Other - Describe.

What were the predominant responses to the interaction? – Circle the response category that best describes the main, predominant, or most noteworthy behavior for each species during the interaction. Prior activities and predominant behaviors do not necessarily relate in a chain of actions and reactions, i.e., they are not meant to document that the bear did this, them the person did that, then the bear did this, etc. For example, if an angler throws rocks to move a fishing bear out of the area, the bear charges, and then the angler runs away, circle "Assault" rather than "Run" as the predominant human behavior. The predominant bear behavior is "Aggressive approach." The prior activity is "Fishing" for both the bear and the angler. If a group of three people encountered a bear while hiking to the Falls Platform, and one person talked to the bear while slowly backing away, one person played dead, and one person took a photo, the predominant human response would be recorded as "Other" with the specifics written in the blank space below the choices.

A note regarding hazing: use the guidance above to determine what the predominant behavior of humans was during the interaction. Two examples: (1) When people withdraw into a building in response to a bear in camp, then NPS staff arrive and use deterrent rounds to displace the bear, the predominant human response should be recorded as "Withdrew slowly", and the primary bear response as "Nonaggressively approached." (2) If staff responded to a trespassing bear with deterrent rounds and other people were not involved, then the predominant human response should be recorded as "Assault" and the bear's predominant behavior as "Nonaggressively approached."

Choices in Bear Column:
0 Unknown - There were no data or no bear was involved.
1 Stopped - A bear's progress was stopped by human actions.
2 Withdrew slowly - A bear left the immediate vicinity of the interaction without running.
3 Ran away - A bear ran from the immediate vicinity of the interaction.
4 Aggressively approached - A bear's attention was obviously focused on the person it approached and it exhibited aggressive behavior(s) such as vocalizing, excessively salivating, jaw popping, baring teeth, lowering its head, flattening ears, approaching on hind legs, charging, swatting forepaws against the ground, or swinging forepaws in the air. A bear that approached a human while charging another bear would be recorded as "Inadvertently approached", regardless of how terrified the human was.
5 Nonaggressively approached - A bear moved closer to a person, gear, vehicle, or facility in the course of continuing its ongoing behavior, i.e., traveling, foraging, play, etc. It would have likely followed a similar route even if these elements had not been there. Its behavior did not include aggressive elements.

What were the predominant responses to the interaction? - Choices in Bear Column, Continued.

6 Stationary aggression - A bear's behavior indicated aggression focused on an object it did not approach.
7 Directed approach - A bear's movements appeared directed toward a person or object in its environment, but no aggression was expressed. For example, a bear may have appeared to be traveling or foraging, but there was an acceleration or change of direction towards the person. A bear may run at someone in a bounding lope with ears up to steal a fish off the line in the same way that a subadult may run at gulls to flush them. Sometimes bears, especially subadults, will approach people out of curiosity.
8 Attacked - A bear aggressively made physical contact with a person.
9 None - A bear's behavior did not appear to change in response to the interaction.
10 Not applicable
11 Other – Describe.

Choices in Human Column:

0 Unknown - There were no data or no humans were involved.
1 Stopped - Someone's progress was stopped by a bear's actions.
2 Withdrew slowly - The people left the immediate vicinity of the interaction.
3 Ran away - At least one person ran from the immediate vicinity of the interaction.
4 Aggressively approached - People approached a bear aggressively with obvious intent to displace it; includes use of air horns, shouting, and banging of pots and pans while approaching a bear. This includes vehicles used for this purpose.
5 Non-aggressively approached - People approached a bear without intending to displace it. The bear's awareness of the approach and its perception of the intent are not important.
6 Stationary aggression - People did not approach a bear, but aggressively tried to displace it. This includes stationary yelling, banging of pots and pans, and use of airhorns to displace a bear.
7 Assault - Humans threw things at a bear, used chemical repellents, used deterrent rounds, or struck at a bear. Even if assault was initiated from a stationary position, report it as assault.
8 None - The people's behavior did not appear to change in response to the interaction.
9 Not applicable
10 Other - Describe.

Where did the group receive bear safety information? - Circle all that apply.

0 None - Received no information
1 Printed material (Katmai National Park) - This includes all Katmai publications, i.e., park newspaper, brochures (not Bear Facts), etc.
2 Brooks Camp Visitor Center
3 Interpretive program, Brooks Camp
4 Ranger contact
5 King Salmon office - Katmai National Park office in King Salmon.
6 Phoned Katmai
7 King Salmon Visitor Center
8 Non-Katmai source (Who? What?) - Please describe.
9 Lodge staff - Include name of lodge.
10 Guide - Note business affiliation.
11 NPS-sponsored staff training
12 Unknown
13 Not applicable
14 Other - Describe.

Was there food in the area? - Write "Yes", "No", or "Unknown." Consider items provided by humans that a bear might eat like human food, garbage, scented toiletries, fish caught by anglers, and carcasses killed by hunters. List all of this type of food items that were in the area. Do not include natural food sources like vegetation, salmon that was not caught by anglers, and carcasses that died of natural causes.

Was there food in the area? - Continued.

If food was present in the area, circle the applicable food category:

1 Angler-caught fish, not secured per park regulations
2 Fish on line near bear - Fish on line within 50 m or less of a bear.
3 Beverage only, not secured per park regulations
4 Human food, not secured per park regulations - Choose this category if unsecured food or unsecured food and beverage were present.
5 Garbage containing food, not secured per park regulations
6 Harvested game – Describe how the game was stored.
7 Human food/fish/garbage secured per park regulations
8 Unknown

Was property damaged? - Write "Yes", "No", or "Unknown." Estimate the cost of the damage. If a visitor plans to put a $2.00 patch on a $500.00 tent, write $2.00. Describe the items and level of damage to each. If more space is needed, continue in the "What happened? section.

What was the source of this BMRF? - Circle the source of the report.

0 Unconfirmed rumor - Source unknown, story cannot be confirmed, or otherwise doesn't fit below
1 Personal experience - Recorder was involved in a large part of the interaction
2 Direct observation - Recorder saw most of it happen
3 Direct report - Recorder interviewed someone who had personal experience or direct observation
4 Observed report - Recorder interviewed someone who received a direct report

What happened? - Describe the interaction in as much detail as possible. Include diagrams, drawings, etc. if helpful. Attach additional paper if necessary. This is the most important section on the form!

Report taken by - Write the name of the National Park Service staff member who completed the report. If a visitor completed the form, write the name of the staff member who helped them.

Date report taken - Write the date that the report was taken.

FOR MANAGEMENT USE ONLY - This section should only be completed by NPS staff. If you are uncertain how to complete of any of the sections, a Bear Management Technician will finish it for you.

NPS Staff Action - Circle the action NPS staff took toward the people involved in the interaction.

0 None - No action was taken or minimal communication occurred which did not include a discussion of bear safety and how the interaction could have been handled differently.
1 Interpretation - NPS staff discussed the aspects of bear safety relevant to the interaction and made suggestions for avoiding or improving similar interactions.
2 Verbal warning - Interpretation and a verbal warning that their behavior violated regulations were given.
3 Written warning - Interpretation and a written warning that their behavior violated regulations were given.
4 Citation - Interpretation and a citation notice were given.
5 Not applicable
6 Other – Describe.

Other BMRFs - Record the BMRF numbers of other interactions related to this event.

Bear Management Action - Circle the predominant action of NPS staff during or in response to the interaction. Because this section is used to evaluate the Parks' bear management program, do not include hazing conducted by other people here unless they were part of a hazing effort orchestrated by NPS personnel (but describe any hazing actions taken by other people under the "What happened" section). Also, indicate the number of people that were present during the management action (include in that total any people that you are aware of that were moved into buildings, etc.).

Bear Management Action - Continued.

0 None - NPS staff did not respond.
1 Monitored - NPS staff monitored the situation.
2 Too late - NPS staff arrived after the interaction was over.
3 Unsuccessful hazing - NPS staff tried to haze the bear(s) out of the area, but the bear(s) would not leave (although they may have eventually left on their own).
4 Successful hazing - NPS staff drove the bear(s) out of the area by hazing them.
5 Posted warnings - Signs informing visitors about potential dangers were posted.
6 Closure - A closure was imposed as a result of bear activities.
7 Killed bear - A bear was killed by NPS staff.
8 Not applicable
9 Other – Describe.

Hazing Technique - Circle all of the hazing techniques that were used by NPS staff. Because this section is used to evaluate the Parks' bear management program, do not include hazing conducted by other people here unless they were part of a hazing effort orchestrated by NPS personnel (but describe any hazing actions taken by other people under the "What happened" section). If multiple techniques were used, describe the progression and the bear's reaction to each in the "What happened?" section. Also report the number of times each technique was used, i.e., 3 cracker shells fired. If bean bag rounds were used, specify the model (e.g., MK Ballistics Deer Thumper).

Human Offense - Circle everything the person did that violated Park regulations and guidelines.
0 None - Nothing, or no knowledge of an offense.
1 Too close - People approached a bear to less than 50 m or remained less than 50 m from a bear utilizing a concentrated food source.
2 Didn't yield right-of-way - People did not withdraw to let a bear continue on its path.
3 Continued fishing - An angler continued fishing when a bear was within 100 m, or after being directed by NPS staff to stop or withdraw from the river.
4 Didn't break line - An angler tried to land a fish rather than break the line when a fish was within 100 m, or after being directed by NPS personnel to do so.
5 Stacked fish - An angler stored a caught fish on the bank rather than immediately taking that fish to the Fish Freezing Building.
6 Improper food storage - Park regulations regarding food/garbage storage or consumption were violated.
7 Harassment - People actively harassed bears beyond what was necessary or reasonable for protection or to drive bears from the campground or residence area.
8 Gear left unattended – People left gear unattended.
9 Unknown or not applicable
10 Other - Describe.

Primary Incident Category - Circle the primary category for the incident. If an incident falls into more than one category, identify the category that appears to have the greatest management consequences as the primary incident category, and mark any others as secondary. For example, if a bear damaged a bike while trespassing in camp, "Property damage" would be the primary incident category, and "Trespass" would be a secondary category.

1 Food related - Human food or garbage was obtained by bear; a bear stole a fish from an angler; a bear attempted either of above; or human handling, storage, or behavior related to human food, garbage, or fish was improper. A bear's attempt must be active, e.g. loitering near the incinerator building or fish freezing building. is "trespass"; whereas, attempted entry of a building containing food is "food related."
2 Surprise encounter - A bear responded when it was apparently surprised by a human at close range.
3 Dominance interaction - Competition for space occurred between bears and humans when a bear was not surprised (e.g., anglers did not withdraw for a bear coming down the river, photographers stalked too close to a bear, a taxiing floatplane displaced a bear, or a bear aggressively displaces people).
4 Trespass - A bear was within the campground or developed area (and not involved in categories 1, 2, 3, or 6—may then indicate trespass as secondary category), or a bear was on a viewing structure.

Primary Incident Category - Continued.

5 Planned management action - The incident was a planned action of bear management whether or not successful, excluding responses to bear incidents (e.g. closures, ambushes).
6 Property damage - A bear damaged property and the incident was not food-related.
7 Curious investigation - A bear investigated unattended property, a boat, a plane, etc., the incident was not food-related, and no property damage occurred.
8 Other - Describe.

Predominant Management Consequence - Circle predominant management consequence of the interaction; others that are secondary may be noted as such.

0 None - There were no significant management consequences.
1 Human withdrew - Humans left the general area.
2 Bear withdrew - The bear(s) left the general area.
3 Directed approach or aggression unpunished - Although physical consequences (5, 6, 7, or 8 below) did not occur, human responses to the bear's unprovoked directed approach or aggression may have resulted in undesirable learning by the bear. Incidents such as a bear repeatedly displacing human who had already gotten out of its path, or a bear rushing at anglers without stealing fish should be recorded here. An incident of a sow charging humans who could reasonably be perceived as a threat to her young should be recorded as 1 or 2 above.
4 Property damage - Property was damaged by a bear.
5 Fish stolen - A bear obtained a fish that it may associate with humans. This includes bears taking fish off fishing lines; bears obtaining fish from recently broken lines; bears obtaining recently abandoned fish; bears removing fish from boats, planes, coolers, or other human structures; and bears obtaining fish being transported by humans.
6 Obtained human food - A bear obtained items from people or their facilities that might be considered food (whether consumed or not). This includes human food and beverages, garbage, scented toiletries, fish caught by anglers, and carcasses killed by hunters. This does not include natural food sources like vegetation, salmon that was not caught by anglers, and carcasses that died of natural causes.
7 Bear killed - This includes bears being killed as Management Actions, Defense of Life and Property (DLP) kills, legal hunts, and incidents of poaching.
8 Human contact/injury/fatality - Any incident in which direct physical contact is made between a bear and a human.
9 Trespass unpunished and unchallenged - A bear was within a residence area and was neither punished nor challenged.
10 Enhanced habituation - The interaction likely contributed to habituation of the bear to humans, their activity, or habitation, although no immediately serious consequence resulted, e.g., people remained closer than 50 m from a bear and the bear did not obviously respond.
11 Unknown or not applicable
12 Other – Explain.

Infer proximate cause leading to interaction - Circle the cause of the interaction. Beware of observer bias. Do not guess. Circle "Unknown" unless the evidence strongly indicates a certain event. Proximate means the event immediately preceding the interaction, as opposed to ultimate cause. For instance, a proximate cause could be that an angler failed to cut his line soon enough resulting in a bear stealing the fish; do not assign an ultimate cause such as fishing is allowed in the river.

0 Unknown - If you are unsure whether to use this choice or another, then you probably do not know the proximate cause.
1 Chance event - The human behaved appropriately according to Park regulations and management plans, the bear behaved appropriately according to management plans, the bear was apparently unaware of or did not respond to the human presence, and the interaction resulted from coincidence, i.e., a surprise encounter.
2 Human error/action - A human violated Park regulations or otherwise exhibited inappropriate behavior according to management plans. Choose this category even when there was inappropriate behavior by the bear if it was triggered by inappropriate human behavior. For instance, choose this category when a bear was among the buildings because a departing float plane scared it from the beach.

Infer proximate cause leading to interaction - Continued.

3 Bear initiated - Human behavior was entirely appropriate according to Park regulations and management plans, it was not a chance event, and bear's behavior initiated the interaction. For example, a bear entered the residence area from the beach when the beach was completely clear of human activity.
4 Not applicable

Appendix E

2006 Moraine and Funnel Creeks
Bear Identification Records

Table E1. Independent bear identification records based on observational sampling, Moraine-Funnel creeks, Katmai National Preserve, 9–20 August 2006.

Bear Identification No.	Age-Sex Class	No. Dependent Offspring	Description
M601	Adult Male		Old, grizzled AdM, flopped over left ear, short muzzle, scar across nose, scar on right side of cheek/face
M602	Adult Male		Young AdM, shed out dark belly. Oval-shaped tall ears; light colors on hump
M603	Adult Female w/COY	4	AdF blonde/grayish, I cub runt
M604	Adult Male		'Swayback' AdM, dark rusty-blonde colored coat, grizzled head
M605	Adult Female		'Beaker' Shaggy, dark, narrow-muzzled AdF, shed out saddle-dark, scar on saddle
M606	Adult Female w/COY	3	Fat AdF, whitish ears, left ear flops, very faint collars on cubs
M607	Adult Female w/COY	2	AdF, cubs-1 light 1 dark, (like Brooks bear 438)
M608	Adult Female w/Yearlings	3	AdF stocky, all yearlings shaggy, blondish brown
M609	Adult Single		Young adult probably female, dark shed out
M610	Subadult Female		Small blonde shaggy subadult with shed out face, seen with M630, M631
M611	Adult Male		Medium-large AdM, shed out back, rump, with goatee
M612	Adult Female w/COY	3	Shaggy brown AdF, smaller than M606, cubs no collars
M613	Subadult Female		Small shaggy, white-blonde female subadult
M614	Adult Female w/Yearlings	3	AdF, white ears, short upturned, dished face, 3 toned yearlings, 1 blonde, 1 light brown, 1 brown
M615	Adult Female		Grayish brown AdF, totally shed out
M616	Adult Male		Shed out AdM, med-small, upturned nose, lighter ears, dark grayish brown with lighter patches on legs
M617	Subadult male		Shed out dark face AdM, wide set ears, dirty blonde shaggy coat, dark stripe down back, heartshaped face
M618	Adult Male		Young AdM similar to M616 Shed out but lighter fur patches on rump/back, more fur on face
M619	Adult Female		Young AdF, blonde, shedding on back/rump, pointy blonde ears
M620	Adult Female		Grayish brown AdF, light claws, dark stripe on rump
M621	Adult Female		AdF with long legs, slender, light claws, long muzzle, uniform gray color, short coat
M622	Adult Single		Adult sex unknown, shed out face, goatee dark stripe on rump, dark brown, lighter saddle, shaggy, likely female
M623	Subadult Male		Medium subadult, brown body, short coat, blonde patchy fur on head/shoulders part, dark eyes
M624	Subadult Female		Blondish gray fat subadult, darker face/legs

Bear Identification No.	Age-Sex Class	No. Dependent Offspring	Description
M625	Adult Female w/Yearlings	3	AdF, shed out face, round ears, rump shed; 1 dark yearling, 1 med yearling, 1 blonde yearling.
M626	Adult Female w/Yearlings	2	Blondish AdF, two furry yearlings
M627	Adult Female w/Yearlings	2	AdF with furred face, eyebrows, large yearlings possibly 2.5yo?, shed out offspring
M628	Adult Female w/Yearlings	2	AdF fairly shed out, yearlings with collars
M629	Adult Female w/COY	2	AdF dark, 1 cub lighter than other
M630	Subadult Female		Subadult, smooth coat, seen with M610, M631
M631	Unknown Subadult		Taller of 3 subadults, seen with M610, M630, shed out face
M632	Adult Female		Fat AdF, with teats visible, dark with red-brown fur on hump
M633	Adult Female w/Yearlings	2	AdF, uniform med brown shaggy, nose shed out, yearlings shaggy blonde
M634	Adult Female w/Yearlings	1	AdF, shedding out, longer fur on hump/head
M635	Adult Male		AdM with scar above tail, scar near right eye
M636	Adult Female		AdF, mostly shed out, small head, large rump/sway back light brown/lighter ears
M637	Unknown Subadult		Dirty blonde subadult, dark stripe, shed out face
M638	Adult Female w/COY	1	Fat shed out AdF, large ears, COY-grayish light collar
M639	Adult Female		AdF with dark coat, lighter toward front, short face, large rump, dished face, wide set pointy ears
M640	Adult Female w/COY	3	AdF, light brown, w/blonde head, large furred hump, narrow pointed muzzle, 1 COY runt
M641	Adult Female w/Yearlings	2	AdF with yearlings (1 looks like COY), AdF dark eye rings
M642	Adult Male		Large dark AdM, fat

Appendix F

2006 Crosswinds Lake Public Use Monitoring, Aircraft, and Watercraft Observation Records

Table F1. Aircraft and watercraft activity observed 9–21 August 2006 at Moraine Creek, Katmai National Preserve, Alaska. Records from 21 August were for only a partial day and so were not included in data summaries. Attribute definitions and abbreviations are specified in Appendix A. Fields were left blank if unknown or not applicable.

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
8/9/2006	6:15					OVR		FP			Flew up Moraine
8/9/2006	6:24					OVR					Heard behind mtns going W to NE
8/9/2006	6:45					UNK					Heard plane taking off behind CW Lake
8/9/2006	6:52					UNK	Newhalen Lodge	FP	Beaver	N600NL	Circled upper Funnel; landed JE Lake
8/9/2006	7:00					OVR		P			Heard plane behind mountain to N
8/9/2006	7:14	7:20	6	4	2	SF	Royal Wolf Lodge	FP	Beaver	N9RW	Carrying bundles + cooler
8/9/2006	7:17					OVR					Heard plane land behind CW
8/9/2006	7:30	7:42				UNK	Rainbow Bay Lodge	FP	PA-18	N3930L	Circled and landed in upper Funnel; departs NE to SW
8/9/2006	7:44	7:55	5	3	2	SF/R	AK Sportsman's Lodge	FP	Beaver	N5154G	2 rafts, frames, 2 coolers, day trip
8/9/2006	7:55	8:10				UNK	Royal Wolf Lodge	FP	Beaver	N9RW	Flew to Funnel from W
8/9/2006	7:57					UNK	Rainbow Bay Lodge	FP	PA-18	N3930L	Took off on lake behind CW
8/9/2006	8:05	14:30	6	5	1	SF	NoSeeUm Lodge	FP	Beaver	N99NL	One of party may be pilot, plane left parked
8/9/2006	8:53	9:19	3	2	1	SF	AK Valhalla Lodge	FP	Helio	N6468V	Dropped off 3 and left
8/9/2006	9:02	17:51	1	1	0	SF		FP	Super Cub	N27??M	Mustard yellow w/black stripe N# too small to read; departed over Funnel
8/9/2006	11:02					OVR	Emerald Air	FP	Otter	N1018B	Flew over CW and Funnel; came from Mirror, went back to Mirror, poss. BV there
8/9/2006	11:39		2	2	0	SF/C		FP	Scout	N5029G	Returning to camp, group #1
8/9/2006	13:00					OVR	Newhalen Lodge	FP	Beaver	N600NL	From JE Lake
8/9/2006	15:03					OVR	Newhalen Lodge	FP	Beaver	N600NL	Up Funnel Cr. to JE Lake
8/9/2006	14:40					OVR		WP		N40872	Bigger plane, commercial?
8/9/2006	17:22	17:50				UNK	AK Valhalla Lodge	FP	Helio	N6468V	Over Funnel to CW then took off CW; back over Funnel
8/10/2006	6:17	6:20				UNK		FP	Beaver		Circled back W of CW, to lower Moraine
8/10/2006	6:18	6:33				UNK		FP	Beaver		Circled NW of confluence; returned back W; landed on small lake to W.
8/10/2006	6:18	6:22				UNK		FP	Beaver		Circled back W, very far off
8/10/2006	6:51	7:01				UNK		FP	Beaver		Circled and landed at small lake to W, took off 06:59

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
8/10/2006	6:57	7:20	4			SF/R	AK Sportsman's Lodge	FP	Beaver	N5154G	Lands CW; everyone carrying rafts and gear
8/10/2006	7:03	7:15				UNK		FP	Beaver		Lands small lake to W
8/10/2006	7:07					PU	Newhalen Lodge	FP	Beaver	N600NL	Picks up campers
8/10/2006	7:11	7:13				OVR	Royal Wolf Lodge	FP	Helio		Towards JE Lake
8/10/2006	7:11	8:24				UNK	Rainbow King Lodge	FP	Beaver	N123EF	Lands CW
8/10/2006	7:20	7:33				SF/R	Royal Wolf Lodge	FP	Helio	N717RW	Lands lake W of CW; 1 raft
8/10/2006	7:43	7:46				OVR	Royal Wolf Lodge	FP	Helio		
8/10/2006	7:44	8:05	6	5	1	SF	Katmai Lodge	FP	Otter	N17689	Lands CW
8/10/2006	7:44	7:56	6	4	2	SF	AK Sportsman's Lodge	FP	Beaver	N910AS	Lands CW
8/10/2006	9:02					UNK	NoSeeUm Lodge	FP	Beaver	N65223	
8/10/2006	9:28	9:55				SF	Katmai Lodge	FP	Otter	N17689	
8/10/2006	11:59					OVR		FP	Beaver		
8/10/2006	12:34	12:34				UNK	Newhalen Lodge	FP	C-206	N600NL	Took off from CW Lake
8/10/2006	14:51					UNK		FP	Helio		Lands on CW Lake, too far to see N#
8/10/2006	14:56					OVR	Newhalen Lodge	FP	C-206	N600NL	Flies over confluence and up Funnel
8/10/2006	15:26	15:38				OVR	Royal Wolf Lodge	FP	Helio	N295BA	Flies over confluence and up Funnel, then back to W
8/10/2006	15:40					UNK	NoSeeUm Lodge	FP	Beaver	N65223	Took off from CW Lake
8/10/2006	16:17					OVR		FP	Cessna	N9634Z	White and mustard brown; flew over confluence and up Funnel
8/10/2006	16:52	19:05				UNK	AK Valhalla Lodge	FP	Helio	N6468V	Parked on CW Lake when we arrive back to camp
8/10/2006	17:27	17:45	6			SF	Katmai Lodge	FP	Otter	N17689	Saw group of 6 anglers heading back to CW, assuming they got picked up
8/10/2006	18:54	19:21				UNK	Katmai Lodge	FP	Otter	N17689	Didn't see loading
8/11/2006	6:15	6:42				UNK					
8/11/2006	6:30	6:49				UNK	Newhalen Lodge	FP	Beaver	N600NL	Landed and took off from small lake to W, then flew up drainage to S of Moraine then back to CW area
8/11/2006	6:55					OVR	Newhalen Lodge	FP	Beaver	N600NL	Flew over and up Funnel
8/11/2006	7:11					UNK		FP			Heard plane flying E to W on N side of mountains from CW Lake; not seen
8/11/2006	7:30					OVR		P			Heard plane take off to far W of CW – didn't see plane
8/11/2006	7:31					UNK		P			Saw plane lights heading for small lake to W of CW

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
8/11/2006	7:36	7:46				UNK	Enchanted Lake Lodge	FP	Beaver	N97EL	Landing in small lake W of CW; came in from N
8/11/2006	7:50	7:59				UNK	Enchanted Lake Lodge	FP	Beaver	N98EL	Over CW Lake, up Funnel to JE Lake, landed, departed back over CW to W
8/11/2006	9:11	17:37	6	4	2	SF	AK Valhalla Lodge	FP	Beaver	N67112	Guide (Ryan) and group of two 20 m from bears at confluence
8/11/2006	10:47					OVR		P			Heard plane, not seen
8/11/2006	12:22					OVR		P			Heard plane E-W, didn't see
8/11/2006	12:44					OVR		FP	Beaver		Flew over us, but couldn't see N#
8/11/2006	13:50					OVR		FP			Flying Funnel to W; bad visibility, couldn't see colors
8/11/2006	14:10					OVR		P			Plane heard E to W, didn't see
8/11/2006	14:50					UNK	Newhalen Lodge	FP	Beaver	N600NL	
8/11/2006	15:51	16:00	3	2	1	SF	Enchanted Lake Lodge	FP	Beaver	N98EL	
8/12/2006	7:50	7:55				UNK	Newhalen Lodge	FP	Beaver	N600NL	To small lake to W on lower Moraine
8/12/2006	7:56	8:00				UNK	Newhalen Lodge	FP	Beaver	N600NL	Circled CW, left to W
8/12/2006	7:58	16:00	6	4	2	SF	Newhalen Lodge	FP	Beaver	N700NL	Lands CW
8/12/2006	10:09					OVR		FP			Visibility bad, difficult to see
8/12/2006	10:47					OVR		FP			Plane heard, not seen flying to W
8/12/2006	12:23					SF	NoSeeUm Lodge	FP	Beaver	N99NL	Parked at CW when going to session, prob the plane at 1000
8/12/2006	16:04					UNK	Newhalen Lodge	FP	Beaver	N600NL	Flying over West Gate of Funnel headed N
8/12/2006	16:23		3	2	1	SF		FP			Fishing Funnel; probably Royal Wolf
8/12/2006	16:57					UNK	Lake Clark Air	FP	C-206	N9939Z	Flew over Gates at Funnel to N
8/12/2006	17:51					SF	Royal Wolf Lodge	FP	Helio		Probably picking up 3 anglers spotted earlier at 1623
8/12/2006	19:27					OVR	Katmai Guide Service	WP	Husky	N54JK	Flightseeers? Listed as 2 different operators on CUA list, circled around up Funnel and down Moraine
8/13/2006	6:18	14:34	1		1	SF	Newhalen Lodge	FP	Beaver	N700NL	One person w/ pack got out and hiked W along Moraine (to meet clients?)
8/13/2006	6:23					UNK		FP			Difficult to see, poor visibility
8/13/2006	6:52					OVR		FP	Beaver		Over Funnel then back up Funnel; landed on JE Lake
8/13/2006	7:06					OVR	Newhalen Lodge	FP	Beaver	N600NL	Landed on small lake to W
8/13/2006	7:07					OVR		FP			Plane near small laketo W difficult to see; headed on opposite side of

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
											mountains N of Moraine
8/13/2006	7:09	7:19	6	4	2	OVR		FP	Beaver	N123EF	Headed up Funnel
8/13/2006	8:40	14:53	3	2	1	SF	Iliamna Air Guides	FP	Beaver	N87808	
8/13/2006	8:46	8:57				SF	Royal Wolf Lodge	FP	Helio	N717RW	Landed on small lake E of CW Lake; didn't see people
8/13/2006	9:20	9:35	5	4	1	SF	AK Valhalla Lodge	FP	Helio	N6468V	
8/13/2006	9:10	17:55				SF		FP	Super Cub	N27??6?M	Didn't see land; snuck in somehow so didn't see people but 2-seater so no more than 2; depart over Funnel
8/13/2006	11:19					OVR		FP	Beaver		Flying W to E
8/13/2006	12:22	17:54				SF	Iliaska Lodge	FP	Beaver	N105PB	Landed at CW; saw from gates, took off headed W
8/13/2006	13:51	16:45				UNK	AK Wilderness Lodge	FP	Beaver	N1455Z	Took off from JE Lake then landed on CW at 1447
8/13/2006	14:47	15:00				SF	Newhalen Lodge	FP	Beaver	N700NL	Had just taken off from CW so maybe forgot something
8/13/2006	14:54	15:16				OVR		FP			W to E, then E to W; too far away to see well
8/13/2006	16:19	16:38				OVR		FP	Beaver	N123EF	N to S over Gates/Funnel then S to N over Gates/Funnel
8/13/2006	16:45					OVR	AK Wilderness Lodge	FP	Beaver	N1455Z	Flew over Gates (Funnel)
8/13/2006	17:37	17:48				UNK	AK Valhalla Lodge	FP	Helio	N6468V	N to S over Gates (Funnel); landed on CW
8/14/2006	5:50	5:52				UNK		WP			Far to W
8/14/2006	6:37	6:39				UNK		WP			Far to W
8/14/2006	6:52	6:55				UNK		WP			Far to N
8/14/2006	7:17	7:20				UNK		FP			To circling over small lake to W
8/14/2006	7:25	7:28	6	4	2	UNK	Royal Wolf Lodge	FP	Helio	N717RW	To JE Lake
8/14/2006	7:31	7:34				UNK		FP	Beaver	N98EL	Towards Mirror Lake
8/14/2006	7:34	7:50	6	4	2	SF/R	Royal Wolf Lodge	FP	Beaver	N9RW	Lands CW; 1 raft
8/14/2006	7:37	7:41				SF/R	Royal Wolf Lodge	FP	Helio	N717RW	Return from JE Lake
8/14/2006	7:44	7:46				OVR	Enchanted Lake Lodge	FP	Beaver	N98EL	OVR CW to W
8/14/2006	7:54	8:11	6	4	2	SF/R	AK Sportsman's Lodge	FP	Beaver	N910AS	Lands CW ;2 rafts
8/14/2006	8:55	9:02	6	4	2	PU	Branch River Air	FP	Beaver	N5217G	Lands CW
8/14/2006	16:28					PU	Royal Wolf Lodge	FP	Helio	N717RW	Lands CW; pick-up 6 people
8/14/2006	16:40					PU	Enchanted Lake Lodge	FP	Beaver	N98EL	Takes off CW
8/14/2006	16:49	17:00				PU	Branch River Air	FP	Beaver	N5217G	

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
8/15/2006	6:30					UNK		P			Plane far off to W
8/15/2006	6:37					UNK		FP			Takes off from small lake to W
8/15/2006	9:20		1			SF		FP	Super Cub		
8/15/2006	6:57	8:50	6	4	2	SF	AK Wilderness Lodge	FP	Beaver	N444EF	Also in at 0935
8/15/2006	7:15		6			SF		P	Beaver		
8/15/2006	7:25					UNK	Newhalen Lodge	FP	Beaver	N700NL	Circled CW went back west
8/15/2006	7:35					UNK	AK Fishing Unlimited	FP	Beaver	N67206	Flew over CW headed W
8/15/2006	7:50					UNK		FP			Takes off from small lake to W
8/15/2006	7:55	8:05	6	4	2	SF/R	AK Sportsman Lodge	FP	Beaver	N910AS	2 rafts on floats, unloaded rafts
8/15/2006	8:22	8:30				UNK	Enchanted Lake Lodge	FP	Beaver	N98EL	Flew over CW heading east; lands JE Lake
8/15/2006	8:25	8:34				UNK	Enchanted Lake Lodge	FP	Beaver	N97EL	Flew over CW heading east; lands JE Lake
8/15/2006	8:27	8:30	7			SF	Branch River Air	FP	Beaver	N24BR	
8/15/2006	8:29	8:35	6			SF	Branch River Air	FP	Beaver	N5217G	
8/15/2006	8:52	8:59				UNK	Royal Wolf Lodge	FP	Helio	N717RW	Fly by CW; lands JE Lake
8/15/2006	9:15	9:30				SF	AK Valhalla Lodge	FP	Helio	N6468V	
8/15/2006	9:22		3	2	1	SF/R	Royal Wolf Lodge	FP	Beaver	N9RW	1 raft
8/15/2006	9:27		6	4	2	SF	AK Rainbow Lodge	FP	Beaver	N43446	
8/15/2006	9:35					SF	AK Wilderness Lodge	FP	Beaver	N444EF	Was also in at 0657
8/15/2006	16:04					PU	Enchanted Lake Lodge	FP	Beaver	N98EL	
8/15/2006	16:08	16:13				PU	AK Valhalla Lodge	FP	Helio	N6468V	
8/15/2006		16:18				PU		FP	Beaver		
8/15/2006	16:28					PU	AK Wilderness Lodge	FP	Beaver	N444EF	
8/15/2006	17:45					OVR	AK Valhalla Lodge	FP	Helio	N6468V	
8/16/2006	8:05		6	4	2	SF	Newhalen Lodge	FP	Beaver	N700NL	
8/16/2006	8:05					UNK	Newhalen Lodge	FP	Beaver	N700NL	
8/16/2006	11:40					PU	Royal Wolf Lodge	FP	Helio	N295BA	OVR to JE Lake
8/16/2006	12:13					PU	Enchanted Lake Lodge	FP	Beaver	N98EL	Lands CW
8/16/2006	12:13					OVR	Branch River Air	FP	Beaver	N24BR	
8/16/2006	12:18					OVR	NoSeeUm Lodge	FP	Beaver		
8/16/2006	14:00					OVR	AK Rainbow Lodge	FP	Beaver	N7283	OVR to NE towards Mirror then circles back down Funnel
8/16/2006	15:55					OVR	AK Fishing Unlimited	FP	C-206	N9610Z	Up Funnel then to N
8/16/2006	17:47					C/BV	Katmai Air	FP			Large camp; French outfitter; 1 large

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
											dining tent, 4 large sleeping tents; no fence, 2 barrels seen, also cooler
8/16/2006	17:56					PU	Royal Wolf Lodge	FP	Helio		
8/17/2006	6:45		6	4	2	SF	AK Wilderness Lodge	FP	Beaver	N1455Z	
8/17/2006	6:35	7:10				UNK		P			Plane flew headed west, possibly to small lake W of CW
8/17/2006	7:20	7:32				UNK	Royal Wolf Lodge	FP	Helio	N295BA	
8/17/2006	7:27	7:27				UNK		FP			Takes off from small lake to W of CW
8/17/2006	7:29	7:29				UNK		FP	Beaver		White/blue beaver headed toward Small lake to W of CW from N
8/17/2006	7:35	7:35	6	4	2	SF	Enchanted Lake Lodge	FP	Beaver	N97EL	
8/17/2006	7:40					OVR		FP	Beaver		Flew over high to south; fish on tail
8/17/2006	8:24	8:35	3	2	1	SF	Enchanted Lake Lodge	FP	Beaver	N97EL	Lands CW
8/17/2006	8:48					UNK	NoSeeUm Lodge	FP	Beaver		Flew over headed N poss to JE Lake
8/17/2006	8:51					UNK		FP			Plane takes off from small lake to W
8/17/2006	12:24					PU	AK Valhalla Lodge	FP	Beaver	N67112	Lands CW; pick-up
8/17/2006	13:48					OVR	Iliamna Air Taxi	FP	Beaver	N765U?	OVR from CW to N
8/17/2006	14:10					OVR	Lake Clark Air	FP	C-206	N733KD	OVR to N
8/17/2006	15:19					PU	Royal Wolf Lodge	FP	Helio		Lands JE Lake
8/17/2006	17:13					PU	AK Valhalla Lodge	FP	Beaver	N67112	Takes off from CW to N
8/17/2006	18:58					PU	Katmai Lodge	FP	Otter		Lands CW; pick-up
8/18/2006	7:35	7:45	6	4	2	SF	Enchanted Lake Lodge	FP	Beaver	N97EL	
8/18/2006	7:40	7:50	6	4	2	SF	Enchanted Lake Lodge	FP	Beaver	N98EL	
8/18/2006	7:50	8:02	3	2	1	SF/R	AK Sportsman's Lodge	FP	Beaver	N910AS	
8/19/2006	7:15	7:30	3	2	1	SF/R	AK Sportsman's Lodge	FP	Beaver	N910AS	
8/19/2006	7:50					OVR		FP	Otter		White and blue with red stripe # on tail
8/19/2006	7:56	8:08	6	4	2	SF	AK Sportsman's Lodge	FP	Beaver	N5154G	
8/19/2006	8:15	8:26	6	4	2	SF	Branch River Air	FP	Beaver	N5217G	
8/19/2006	8:23	8:32				UNK	Royal Wolf Lodge	FP	Helio	N717RW	
8/19/2006	8:25	8:33	4	4		SF	Branch River Air	FP	Beaver	N24BR	
8/19/2006	8:35	8:45				UNK	Royal Wolf Lodge	FP	Helio	N295BA	
8/19/2006	8:58	9:04	6	4	2	SF	Sky Trekking	FP	Beaver	N102TE	
8/19/2006	9:02	9:06				UNK	NoSeeUm Lodge	FP	Beaver	N99NL	
8/19/2006	9:15		5	3	2	SF	Mission Creek Lodge	FP	Beaver	N460DB	
8/19/2006	9:40		6	4	2	SF	Sky Trekking	FP	Beaver	N102TE	

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
8/19/2006	9:45					UNK	Rapids Camp Lodge	FP	Beaver	N95RC	
8/19/2006		12:21				UNK	Sky Trekking	FP	Beaver	N102TE	
8/19/2006	12:23		11	9	2	BV	Emerald Air	FP	Otter	N1018B	
8/19/2006	13:04					OVR	Rust Air	FP	Cessna	N489Z?	
8/19/2006	14:30					OVR	Lake Clark Air	FP	C-206		
8/19/2006	17:17					OVR	Emerald Air	FP	Otter	N1018B	
8/20/2006	7:15	7:27				UNK	Royal Wolf Lodge	FP	Helio	N717RW	Landed on lake east of CW
8/20/2006	7:23	7:33				UNK	Royal Wolf Lodge	FP	Helio	N295BA	Landed on JE Lake
8/20/2006	7:00		6	4	2	SF	Mission Creek Lodge	FP	Beaver	N460DB	
8/20/2006	7:40	7:48	5	3	2	SF	Katmai Air	FP			Hot landing and take off
8/20/2006	7:41	7:52	3	2	1	SF/R	AK Sportsman's Lodge	FP	Beaver	N910AS	Raft on floats
8/20/2006	7:55	8:03	6	4	2	SF	AK Sportsman's Lodge	FP	Beaver	N5154G	
8/20/2006	8:07	8:14	3	2	1	SF	Katmai Lodge	FP	Otter	N17589	
8/20/2006	8:16	8:19	5			SF	Branch River Air	FP	Beaver	N24BR	
8/20/2006	9:19	9:30	6	4	2	SF	Mission Creek Lodge	FP	Beaver	N733N	
8/20/2006	13:15					OVR	Katmai Air	FP	C-206	N498K	Fly over
8/20/2006	11:30	17:22	11	9	2	BV	Emerald Air	FP	Otter	N1018B	
8/20/2006	13:24	17:27				PU	Katmai Air	FP	Otter	N491K	Picking up large camp, French outfitter
8/20/2006	13:31	14:37				PU	AK Sportsman's Lodge	FP	Beaver	N910AS	
8/20/2006	13:37	16:49				PU	NoSeeUm Lodge	FP	Beaver	N99NL	Lands CW for pick-up
8/20/2006	14:09					OVR	Branch River Air	FP	Beaver	N5217G	OVR to W
8/20/2006	14:59					OVR	Trail Ridge Air	FP	Cessna	N6469U	OVR to N circling CW
8/20/2006	15:28					PU	AK Wilderness Lodge	FP	Beaver	N444EF	Takes off from CW
8/20/2006	15:28					OVR	Newhalen Lodge	FP	Beaver	N700NL	OVR to N
8/20/2006	15:38					OVR	Royal Wolf Lodge	FP	Helio	N295BA	OVR to N
8/20/2006	16:29					PU		FP			Takes off from CW
8/20/2006	17:48					PU		FP	Cessna		Takes off from CW
8/21/2006	6:30		4	3	1	SF	Iliamna Air Taxi	FP	Beaver	N121AK	
8/21/2006	6:40	6:47	3	3		SF	Katmai Air	FP	C-206	N496K	
8/21/2006	7:28		6	4	2	SF	Enchanted Lake Lodge	FP	Beaver	N98EL	
8/21/2006	7:43	7:52				UNK	Royal Wolf	FP	Helio	N295BA	
8/21/2006	7:48	7:54				SF	Royal Wolf Lodge	FP	Helio	N717RW	
8/21/2006	8:17	8:30	5	3	2	SF	Iliamna Air Taxi	FP	Beaver	N62230	
8/21/2006	8:18	8:41	2	1	1	SF/R	AK Sportsman Lodge	FP	Beaver	N5154G	Raft

Date	Time In	Time Out	Tot	V	G	Purp	Commercial Operator	Veh	Make	Plane #	Comments
8/21/2006						SF/R	AK Wilderness Lodge	FP	Beaver	444EF	Unsure of time and of # of people
8/21/2006			3	2	1	C	AK Valhalla Lodge	FP	Beaver	6468V	ADF&G camp
8/21/2006	8:32		2	2		UNK		FP	Super Cub		Mustard super cub
8/21/2006	8:40					UNK		FP	Beaver		Lands on side of CW

Appendix G.

Moraine Creek Field Camp, Suggested Supplies and Equipment

Suggested Supplies and Equipment Based on 2006 Field Experience

This list is intended as a starting point for identifying supply and equipment needs for field work at Moraine Creek. However, this list may also be useful for planning other short-term backcountry projects as well. The supplies and equipment listed supported 2 people camping for 2 weeks. Personal gear and supplies are not included.

Camping

- ❑ 3 tents (2 sleep tents and 1 tent for gear shelter—make sure they have a good seam sealing layer)
- ❑ Ground cloths
- ❑ Duct tape
- ❑ 2 sleeping bags and 2 sleeping pads
- ❑ 2 large (20–30 gal) metal bear barrels
- ❑ 3 small plastic ABS plastic bear resistant food containers (2 for personal use, one 1 to loan out if needed)
- ❑ 1 large water container (5–6 gal)
- ❑ 2 or 3 backpacker cooking stoves (2 to cook with, 1 for back up) and any necessary fuel canisters
- ❑ 1gal stove fuel
- ❑ 2 cook sets; pans, silverware, bowls, and cups
- ❑ Fire starters
- ❑ 2 water filter/purifiers
- ❑ First aid kits (include waterproof tape)
- ❑ Trash bags
- ❑ 2 backpacker latrine trowels
- ❑ Toilet paper
- ❑ 3 flashlights/headlamps (1 backup)
- ❑ 1 brick of batteries for flashlights, GPS, and digital camera
- ❑ Electric fence equipment (detailed below)

Bear Management

- ❑ 2 bear pepper spray cans
- ❑ 1 air horn
- ❑ Shotgun and deterrent and lethal rounds
- ❑ Gun cleaning kit and oil
- ❑ Bird-scare pistol, 0.22 cal blanks, bird banger and screamer cartridges (you may want to triple-bag or vacuum-seal the cartridges)
- ❑ Backcountry BMRFs and instructions photocopied on waterproof paper

General Field Equipment

- ❑ 1 radio per person
- ❑ SkyProbe antenna if available
- ❑ 2 fully charged radio batteries per person (you might also want to bring a “clamshell” and a brick of batteries for it)
- ❑ GPS
- ❑ 1 Satellite phone with fully charged battery, spare battery, and emergency phone list
- ❑ Maps (1 large-scale topographic map of the area; photocopies of local area topographic map on waterproof paper; photocopies of any aerial photos that are available)
- ❑ Bird and plant field guides and species checklists
- ❑ 1 compass
- ❑ 2 pairs binoculars
- ❑ Spotting scope and tripod

- ❑ Digital camera and accessories
- ❑ 2 metal clipboards
- ❑ Data sheets photocopied on waterproof paper; 3 field notebooks
- ❑ Current aircraft tail number cross-reference list for Commercial Use Authorizations (on waterproof paper)
- ❑ Pencils and extra leads
- ❑ 2 pairs chest waders
- ❑ 2 pairs hip waders
- ❑ 2 bug net jackets
- ❑ Flight survival belt packets
- ❑ Repair kit (sealant for waders, etc.)

Electric Fence

Note: It is useful to set up the fence in advance of the field work to (1) learn how the fence parts fit together, (2) determine whether any additional parts or tools are needed, and (3) verify that the fence energizer is working properly. This exercise can be done using just the fence corner posts and a few line posts to surround a small area. Refer to the fence installation documentation for safety guidelines. The following list is for a 3-wire (all wires positive) fence.

- ❑ Solar battery and solar fence energizer unit (note: the battery must be fully charged prior to field use)
- ❑ 10–18 step-in plastic fencepost
- ❑ Spool of 9-strand polywire (you won't know how much you need until you get there and have your tents set up)
- ❑ Fencing pliers
- ❑ Small sledgehammer (to drive in ground rods)
- ❑ 3 ground rods
- ❑ 3 ground clamps (to attach the wire to the grounding rods)
- ❑ 100 ft of parachute cord (to tie support lines to the corner fence posts)
- ❑ 18 large tent stakes (to stake out support lines from corner fence posts)
- ❑ 3-4 fence gate handles
- ❑ Electric fence volt meter

For optimal grounding of the fence: (1) if the area where the grounding rods are placed becomes dry, water the ground where the ground rods are inserted regularly; (2) make sure that no vegetation is touching the fence; and (3) when unhooked, do not allow gate pieces to touch the ground while the fence energizer is powered on.