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# BROWN BEAR HABITAT PREFERENCES AND BROWN BEAR LOGGING AND MINING RELATIONSHIPS IN SOUTHEAST ALASKA

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Progress Report
Federal Aid in Wildlife Restoration
Project W-22-4, Job 4.17R



(Printed March 1986)

PROGRESS REPORT (RESEARCH)

State: Alaska

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Project No.: W-22-4 Project Title: Big Game Investigations

Job No.: 4.17 Job Title: Brown Bear Habitat Preferences and Brown Bear Logging and Mining Relationships in Southeast Alaska

Period Covered: 1 July 1984-30 June 1985

SUMMARY

This report includes telemetry data collected during the 1984 season plus capture, den emergence, and productivity data collected through June 1985. Nineteen brown bears (Ursus arctos) were captured during this period, including 3 from Admiralty Island and 16 from Chichagof Island. Since fall 1981, 74 bears have been captured and 40 bears are currently transmitting. During 1984, we collected 724 relocations (68 percent from Admiralty and 32 percent from Chichagof). To date, over 1,700 relocations have been recorded.

This report summarizes the 1984 seasonal distribution of radio-collared brown bears relative to elevation, slope, aspect, terrain, habitat type, canopy cover, soil drainage, spruce composition, and timber volume. In both study sites, old growth (including riparian forest) was used more than any other type of habitat throughout the year. Alpine and sub-alpine habitats were used seasonally on Admiralty but less so on Chichagof. Avalanche slopes were used extensively in both study areas. On the Chichagof site, which has had extensive logging, clearcuts only yielded 3 out of 233 locations throughout the year, suggesting bear avoidance of clearcuts. During late summer, when bears are associated with anadromous fish streams, high-volume spruce riparian stands received extensive use.

The mean home range size of Admiralty males and females was 92 and 30 km², and for Chichagof males and females was 123 and 15 km², respectively. We observed a high degree of home range

fidelity in most individual bears from 1 year to the next, except in subadult males. For the 3rd year in a row, we have continued to observe an interior distribution of 4 adult radio-collared females on Admiralty. These bears do not use coastal areas or anadromous fish streams at any time of the year. In both study sites this year, we observed displacement of radio-collared bears as a result of human activity within the bears' home ranges.

We continued to fly trend surveys on Admiralty this year. Four surveys were flown; 2 were within our northern study site. Based on a ratio of marked to unmarked individuals determined after we corrected for cubs associated with mothers, we estimated a density of 0.67 bears per $km^2$ within the north Admiralty study site.

Female reproductive data were summarized over the course of this investigation. The mean litter size of cubs-of-the-year on Admiralty was 1.84 and on Chichagof 2.5. On Admiralty Island, mortality from 0-1 year was 40 percent. This was attributable to overwinter mortality and predation by males.

During the winter of 1984-85, we tracked 36 radio-collared bears to their den sites. Den elevations ranged from 6 to 1,037 m. Since the winter of 1981-82, fixed-wing aircraft have been used to locate 83 dens. The mean den elevation on Admiralty was 702 m and on Chichagof 486 m. Old-growth forest was the habitat used most frequently for denning. Most dens were located at higher elevations (>500 m), on steep broken slopes and without regard to slope exposure. On Admiralty, most dens were associated with rock crevices while on Chichagof most dens were associated with large-diameter old-growth trees or snags.

Key words: Admiralty Island, Chichagof Island, brown bear, habitat use, home range, density estimates, reproduction, denning, forestry, mining, Southeast Alaska, *Ursus arctos*.

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## BACKGROUND

Historically, the brown/grizzly bear (Ursus arctos) was widely distributed in North America from central Mexico to northern Canada and Alaska, and from the Mississippi to the Pacific Coast (Hall and Kelson 1959). Today, populations of this species are restricted to northwestern Canada, Alaska, and a few scattered wilderness enclaves in Montana, Idaho, and Wyoming. In the United States outside Alaska, there are estimated to be between 700 and 900 bears (Servheen, in press), which is probably less than 1 percent of their former numbers. The grizzly bear was declared threatened in the lower 48 states in 1974.

Alaska has the largest population of brown/grizzly bears in North America. An understanding of their ecology, including basic life history, population status, movement and home range patterns, and habitat relationships, is essential for sound management. Brown bears are indigenous to southeastern Alaska where they occur throughout the mainland and on islands north of Frederick Sound. Management concerns include hunting, habitat alteration resulting from logging and mining operations, and increased human activities associated with development and recreation.

A general background and literature review for this study has been previously outlined (Schoen 1982). This investigation proposes to determine seasonal habitat preferences and distribution of brown bears in southeastern Alaska, and to evaluate the effects of mining and logging activities on brown bear populations in this region.

## OBJECTIVES

To determine weekly and seasonal movement patterns and habitat utilization by brown bears in southeastern Alaska, particularly in respect to activities associated with mining and/or logging, and to locate and describe denning sites and determine reproductive rates and relate these to habitat and harvest levels.

## STUDY AREA

The study area is located in the Alexander Archipelago of southeastern Alaska. Specific sites have been selected on northern Admiralty Island and eastern Chichagof Island in the northern portion of the archipelago. The Admiralty site has been described by Schoen (1982); the Chichagof site has been described by Schoen and Beier (1983).

## METHODS

Bears were captured in the alpine by shooting them with darts from a helicopter. Along beaches and salmon streams, Aldrich leg-hold snares were used. Etorphine hydrochloride (M99, Lemmon Company, Sellersville, Pa.) and its antagonist diprenorphine hydrochloride (M50-50, Lemmon Company, Sellersville, Pa.) were used to immobilize most bears. Sernylan (phencyclidine hydrochloride, Bioceutic Laboratories, St. Joseph, Mo. [no longer manufactured]) was also used as an immobilizing drug, in combination with a tranquilizer (Acepromazine, Fort Dodge Laboratories, Fort Dodge, Iowa). Movements, home range patterns, and habitat use were determined by relocating instrumented bears through aerial radiotelemetry. A further description of this methodology is provided in Schoen (1982).

## RESULTS AND DISCUSSION

This report presents data collected in 1984, from spring den emergence to fall denning. Also reported are capture, productivity, and den emergence data through June 1985. During this reporting period, 3 bears were captured on Admiralty Island. This number included 2 recaptured bears to which new radio collars were attached. To date, 48 bears have been captured on Admiralty (Table 1). At the completion of this reporting period, 25 radio-collared bears were still transmitting. These included 16 females and 9 males. During this same period, 16 bears were captured and instrumented on Chichagof Island (Table 2). These bears included 13 females and 3 males. Fifteen radio-collared bears were transmitting on Chichagof at the end of this reporting period. To date, 26 bears have been captured on Chichagof Island.

Since fall 1981, 74 brown bears have been captured. Forty bears are currently transmitting, 4 bears are known to have been shot by hunters, 4 bears died during capture, 1 female was killed and eaten by a male bear before she recovered from immobilization, and 25 bears are unaccounted for.

During this report period, we recorded 724 relocations of radio-collared bears. Sixty-eight percent were from Admiralty and 32% were from Chichagof Island. To date, over 1,700 relocations have been collected.

During spring 1985, J. Schoen was asked by the president of The Wildlife Society to participate in a Grizzly Bear Management Ad Hoc Technical Advisory Committee. John joined this committee and attended a meeting in Missoula, Montana, in conjunction with a Grizzly Bear Habitat Symposium. The committee was charged with developing a technical report on the current status of brown/grizzly bears in North America. J. Schoen was assigned the task of preparing brief papers on populations, forest relationships, and predator management. The summary reports are presented in Appendix A.

## Seasonal Distribution and Habitat Use

As in 1983, we divided the year into 4 seasons: spring (den emergence-15 May), early summer (16 May-15 July), late summer (16 July-15 September), and fall (16 September-denning). These were biologically meaningful periods in terms of bear distribution and activities. The distribution of bear relocations in 1984 was as follows:

| Season | Admiralty | Chichagof |
|---|---|---|
| Spring | 64 | 28 |
| Early summer | 175 | 48 |
| Late summer | 76 | 119 |
| Fall | 176 | 38 |

As in 1983, bears on Admiralty used higher elevations than those on Chichagof (Table 3). This was particularly the case in spring and early summer when Admiralty bears made heavy use of high elevation alpine and subalpine habitats. During these same periods, Chichagof bears made greater use of sea level beaches and grass flats. This elevational distribution reflects in large part the higher terrain available in the Admiralty site compared with the Chichagof site. During late summer and fall, bears in both sites made substantial use of elevations below 300 m. This distribution coincided with the time when most bears were fishing for spawning salmon in the coastal fish streams.

For the 3rd consecutive year, we monitored 4 adult Admiralty females that used higher elevations throughout the year. None of these individuals moved to coastal salmon streams to feed on fish as did most of our sample of radio-collared bears.

Radio-collared bears used terrain ranging from flat to over 45 degrees (Table 4). During late summer and fall, over 50 percent of their relocations occurred on slopes of less than 11 degrees. This reflects their use of salmon spawning streams, whereas in spring and early summer, many bears were located on steep avalanche slopes.

In both study sites, bears generally favored southern exposures in spring and early summer but increased their use of northern exposures in late summer and fall (Table 5). Smooth terrain was used more than 70 percent of the time during all seasons (Table 6). Broken terrain was used most in early spring and least in late summer. Broken terrain, however, was generally favored for denning habitat.

Old-growth forest habitat (including riparian old growth) was used in greater proportion than any other habitat throughout the year (Table 7). Upland old growth was used most during spring and least during late summer. In late summer, however, as use of upland old growth declined, bears significantly increased their use of riparian old growth. This change reflects an attraction to anadromous fish streams. Avalanche slopes were heavily used by bears in both study sites in all seasons except late summer. Alpine and subalpine habitats were used substantially by Admiralty bears but not Chichagof bears. On the Chichagof site, lush alpine/subalpine meadows are rare compared with their occurrence on Admiralty. During spring and early summer, while Admiralty bears made substantial use of alpine/subalpine, Chichagof bears made greater use of sea level sedge deltas and tidal flats. Most of the breeding activity we have observed has been associated with alpine areas on Admiralty and sedge deltas on Chichagof.

On Chichagof Island, only 3 of 233 bear relocations (1%) occurred in clearcuts in 1984. In late summer and fall, we observed substantial bear use of the Corner Bay garbage dump on Chichagof Island. This use was attributable primarily to 2 3-year-old sibling female cubs which we captured at the dump in July. Almost all of their movements that summer were associated with the poorly maintained dump site.

For those habitat types on Chichagof where seasonal use exceeded 15 percent (upland and riparian old growth and avalanche slopes), upland old growth was generally used in proportion to availability except in early and late summer (Fig. 1). In late summer riparian old growth was used in much greater proportion than its availability, suggesting preference for this habitat type. This is the season when bears are concentrated on anadromous fish streams. In spring and early summer, avalanche slopes were preferred. Other habitat types received comparatively low use. However, beach/deltas appeared to be preferred in spring and early summer. Clearcuts and alpine/subalpine habitat appeared to be avoided throughout the year.

If we can assume that most individual brown bears utilize a relatively large proportion of the small coastal watersheds they inhabit, and if we can assume they are familiar with the food and cover resources of each watershed (an exception to this generality would be our "interior" bears), then we could logically conclude that all habitat types are equally available to each bear. Thus seasonal use of habitats should be proportional to the suitability (to the bear) of those habitats.

If these assumptions are reasonable, it follows that upland and riparian old growth, and avalanche slopes are highly suitable and important bear habitats in both study sites, and that alpine/subalpine is suitable and important habitat on the Admiralty site. On the Chichagof site (where we now have availability data), riparian areas and avalanche slopes are in limited supply and perhaps can be considered seasonally critical habitat. From a management standpoint, few land use activities are associated with avalanche slopes. Riparian old growth, however, encompasses a valuable timber resource and is managed for timber harvest. Therefore, we recommend that riparian old-growth receive special consideration in forest planning, as well as an intensified research effort.

Although used relatively little, the spring and early summer preference for beach/delta habitat should not be discounted. Some of these preferred habitats of limited availability may be very important to bears at certain times of the year.

Additional work, including food habits research now in progress, should shed more light on some of these relationships.

Seasonal distribution of radio-collared bears relative to canopy cover, soil drainage, percent spruce composition, and timber volume is presented in Tables 8, 9, 10, and 11. The most significant trend in these data is the shift in late summer toward high-volume riparian stands. These stands are characteristically found along valley bottoms bordering anadromous fish streams where bears concentrate to fish during this time of the year. As discussed earlier, these sites should probably receive increased management and research attention.

The 1984 season was the 1st year we systematically collected scat samples for analysis of seasonal food habits. Tom McCarthy, a graduate student from the University of Alaska, was responsible for preparing reference collections and analyzing scats. A brief summary of this work is presented in Appendix B.

## Home Range and Movements

In 1984, annual home ranges were plotted and their areas calculated for 40 radio-collared bears from Admiralty and Chichagof Islands. Means and standard errors of home range convex polygons follow:

### Admiralty Island

| | Male | Female |
|---|---|---|
| $\bar{x}$ = | 92 $km^2$ (35 $mi^2$) | 30 $km^2$ (12 $mi^2$) |
| SE = | 23 | 6 |
| n = | 9 | 20 |

### Chichagof Island

| | Male | Female |
|---|---|---|
| $\bar{x}$ = | 123 $km^2$ (47 $mi^2$) | 15 $km^2$ (6 $mi^2$) |
| SE = | 93 | 4 |
| n = | 3 | 8 |

The Admiralty means are reasonably comparable to last year's data (males = 112 $km^2$, females = 34 $km^2$). However, the Chichagof means are considerably larger than last year's. This difference is a result of there being a full year's data in 1984, compared with only half a year's data and fewer relocations in 1983.

Composite maps of male and female home ranges for the Admiralty site are presented in Figures 2 and 3. From these figures, we see considerable spatial overlap in home range and substantially larger male vs. female ranges.

We had multiple years' observations of 18 bears and observed substantial overlap of all individual female ranges in consecutive years. Of the males, 3 out of 6 had substantial overlap. The other 3 males had minimal overlap in ranges between years. All 3 of these individuals (Nos. 50, 66, and 72) were young animals just beginning to establish their adult home ranges.

Of particular interest is the high concentration of bears associated with the Greens Creek area located along southeast Hawk Inlet. The Noranda Mining Company is currently involved in exploration of this area and in late 1985 or early 1986 the company may begin major mine development within this watershed, including road building from the Hawk Inlet Cannery site into the upper Greens Creek drainage. Our work has concentrated around this area with the intention of monitoring this bear population before, during, and after development. Fortunately, we have had the opportunity to work with many of the same individual bears throughout the pre-development phase and plan to continue with as many of these individuals as possible through the development phase.

Four female bears had home ranges located in the interior of the Greens Creek study site, with no overlap of coastal areas or anadromous fish streams (Fig. 3). These adult females (Nos. 99, 60, 14, and 6) are what we refer to as "interior" bears (Schoen et al., in press). This is the 3rd consecutive year we have observed this interior distribution for these 4 bears. During 1984, we monitored the movements of 3 radio-collared females in the Pack Creek drainage. All 3 individuals spent nearly all their time within the lower Pack Creek drainage in the vicinity of the beach fringe forest and the tidal wetlands. By the 2nd week of September, these 3 bears began to disperse away from the stream as the fish run declined. However, all 3 were still in the immediate Pack Creek vicinity within 1 to 2 km of the tidal flats. On 24 September we flew a telemetry survey of Pack Creek. None of the bears were found in the Pack Creek drainage or within 3 to 4 km of it. The only one we could locate was bear No. 8, which was nearly 5 km south and across Windfall Harbor. In 3 years of monitoring, we did not locate this bear farther than 2.5 km from Pack Creek and had never located this individual in the Windfall Harbor area. Measured distance, by land, from Pack Creek to her location across Windfall Harbor, is about 11 km.

We suggest this unusual dispersal out of the Pack Creek area was likely a result of human disturbance. The USFS had a trail-building crew on the ground at Pack Creek from 14 September to 16 November 1984. These crews regularly ran chainsaws and had fires going every day to keep the bears away. It is our experience that most brown bears are very sensitive to human presence and will move out of an area that has significant human activity. We have been snaring bears along salmon streams over the past 5 years. During that time, we have noticed after several days of hiking up a fish stream being used extensively by bears, that most of the bears move out of the area, presumably in response to our presence. Many professional bear guides also point out the importance of minimizing their activity in hunt areas to avoid displacing bears.

A composite map of the home ranges of 3 male and 11 female radio-collared bears on Chichagof Island is presented in Figure 4. As on Admiralty, a high density of home ranges exists, with considerable overlap. Eight home ranges overlap the Kadashan drainage. The marked bears in this drainage, plus associated cubs and identifiable unmarked bears, accounted for 30 different individuals associated with the Kadashan River Basin during 1984. This watershed encompasses 13,600 ha.

We were particularly interested in Kadashan because of construction activity associated with development of a major logging road during 1984. This road bisected the home ranges of 7 radio-collared bears. Road construction began in early spring, 1984, from the Corner Bay logging camp. By the middle of July, the road was adjacent to the head of the Kadashan Flats. By 1 August, it had reached an area adjacent to the lower portion of the east fork of the Kadashan about 0.5 km from the river. This is a portion of the river which receives extensive fishing activity by bears. Throughout the month of August, major road construction with associated blasting, timber harvest, and dump truck and bulldozer activity continued adjacent to this area which receives high bear use. On 16 August, 3 bears (Nos. 30, 53, and 82) were located on the Kadashan River for the last time. By the next week, bears No. 53 and No. 82 (both females) had moved approximately 12 km east to Trap Mountain and Trap Bay where they remained for the rest of the year. Bear No. 30 (a 4-year-old male) moved 30 km west across Hoonah Sound to Fick Cove. He remained on that side of Hoonah Sound for the remainder of the year. During this same time period, 2 additional females moved downstream away from the road development while 2 others remained in the general vicinity of the development. We had a prior year of data only on bear No. 30. In 1983, he was always located within the Kadashan drainage where he denned. These data suggest to us that road-building activities may have resulted in a number of bears moving away from this disturbance and in some cases actually leaving the watershed.

On 19 July, 2 3-year-old female bears were captured and radio-collared at the Corner Bay dump where they regularly fed on garbage. These 2 bears and 1 male (all sibling offspring of No. 24) had frequented the dump throughout the summer as well as during the previous year. Following capture, all 3 individuals remained together, seldom venturing more than 2 km away from the dump. These bears visited the Corner Bay Camp fairly frequently and were becoming a nuisance. In October, both females were located denned together on the ridge above Corner Bay. The location of the male was undetermined.

## Alpine Trend Counts and Density Estimates

As in 1983, many Admiralty bears inhabited upper elevation alpine/subalpine habitats where they were highly visible during the latter half of June and early July. During this period, we conducted 4 alpine survey flights lasting approximately 1 hour each; 2 flights were located in our study site on north Admiralty, 1 took place in the Swan Cove-Windfall Harbor area, and 1 was flown in the southern portion of Admiralty Island. The results of these surveys are presented in Table 12. The number of bears observed per hour of survey time ranged from 27 to 31. Cubs per 100 adults varied from 26 to 42. Within our north Admiralty study site we could account for 24 marked adult bears. Using an index of marked versus unmarked bears and correcting for cubs, we estimated the total number of bears in this area to be 94 and 122, respectively, from our 2 surveys. This number converts to a density of from 0.24 to 0.31 bears per $km^2$ for a mean of 0.28 per $km^2$ (0.73 bears per $mi^2$). Although lower than last year's estimate of 0.67 per $km^2$, this estimate still represents a very high-density population.

Two days following our 1st survey flight, we located all of the radio-collared bears in the study site. The mean elevation of these relocations was 659 m. Forty-six percent of the relocations were in alpine/subalpine habitat, 27 percent in old-growth, and 27 percent on avalanche slopes. On the day after our 2nd survey, we again monitored all the bears. Their mean elevation was 729 m and their habitat distribution was 64 percent alpine/subalpine, 27 percent avalanche slopes, and 9 percent old growth. During 1984, 96 percent of marked bears used alpine or subalpine habitat at least sometime during the summer. From these data, we feel confident that we have a high likelihood of seeing any individual on an early summer survey flight. Thus, at least on northern Admiralty, early summer alpine surveys appear to be a reasonable technique for monitoring trends in the bear populations. We plan to continue these annual alpine surveys as a routine monitoring activity associated with our assessment of bear/mining relationships.

## Reproduction

A summary of the reproductive history of radio-collared bears on Admiralty Island from 1981 through 1985 is presented in Table 13. Since 1981, we have observed 19 litters of cubs-of-the-year from 18 radio-collared females. The mean litter size for cubs-of-the-year was 1.84 (SE = 0.09). During the same period the mean litter size of 23 litters (from 13 radio-collared females) of yearlings and older was 1.65 (SE = 0.10).

We believe we know the age of 1st breeding for 4 radio-collared females. For 2 coastal females (No. 95 and No. 4) it was 6 years. However, for 2 interior females (No. 6 and No. 14) 1st breeding occurred at 9 years; neither of these bears has yet to successfully raise cubs to the yearling age class. In 1985 bear No. 6 was 12 years old and bear No. 14 was 11 years old.

We have consecutive years' data on 11 litters (representing 20 cubs) from cub to yearling class. Eight mortalities were observed, representing 40 percent of the cubs and 36 percent of the litters. Mortality of cubs from yearling class and older was 10 percent ($n$ = 10). This represented 1 out of 6 litters. All these mortalities occurred over winter except for 3 animals representing 2 litters. One litter composed of 2 cubs-of-the-year was presumed killed by a male in early summer of 1983. In another litter of 3 yearlings, 1 cub disappeared over the summer. Of 6 winter mortalities, 5 were cubs born the previous winter and the other was born 2 winters previously.

Winter 1984-85 was a heavy snowfall winter with an unusually late spring. Many bears emerged from dens later than usual that spring. We documented 2 cases of overwinter mortality that winter. In both cases, the radio-collared females entered their dens in the fall with 2 cubs-of-the-year. Both bears emerged in spring without their cubs. We visited bear No. 14's den during the summer of 1985 and found scat composed of cub hair and bone fragments at the entrance to her den. We also found bone chips, small bear claws, and teeth in the nest material within the den. This bear entered the den sometime in October and did not emerge until the 2nd half of June. We captured this 11-year old female in July 1985 and she was in extremely poor condition with an actual weight of under 75 kg.

We speculate that due to the long denning period of nearly 8 months, the physical condition of both mother and cubs declined severely; the cubs died, and the mother ate them. This is the first documented case, to our knowledge, of a female bear eating her cubs over winter.

Reproductive history of radio-collared females from Chichagof Island is summarized in Table 14. The mean litter size of cubs of the year from 4 litters was 2.5 (SE = 0.29). Bear No. 44 which produced 3 cubs-of-the-year, was found dead on the upper Kadashan River in late summer 1984. We presume the cubs also perished. Data are too limited for further analysis at this time.

Denning

During winter 1984-85, 36 radio-collared bears (26 on Admiralty, 10 on Chichagof) were located in their winter dens (Tables 15 and 16). The mean den elevation on Admiralty Island was 671 m (SE = 44). Den elevation varied from 6 m, where a young male spent the winter in a surface nest at the base of a tree along the coast, to 1037 m near the top of Eagle Peak. Forty-two percent of the Admiralty dens were in old-growth forest habitat, 23 percent were in alpine/ subalpine, 19 percent in rock, and 15 percent on avalanche slopes. On Chichagof Island, bears denned more in lower, forested habitat. The mean den elevation on Chichagof Island was 500 m (SE = 57) with 60 percent of the dens occurring in old growth, 30 percent in alpine/subalpine, and 10 percent on avalanche slopes. In both study areas, dens were generally on steep slopes (>20 degrees) with no apparent pattern in slope exposure. Spring den emergence in 1985 was about 2 weeks later than usual following a late spring with heavy winter snow accumulations at higher elevations.

Since winter 1981-82, 83 different dens (65 from Admiralty and 18 from Chichagof) have been located from fixed-wing aircraft and their general site characteristics described. Twenty-seven of these dens have been visited and measured on the ground. Den types included shallow earthen excavations and excavations under the roots of large old-growth trees, cavities within large diameter snags, crevices in boulder fields, natural rock caves, and an uncovered nest at the base of a tree. Mean elevation and range of Admiralty dens was 702 m (6-1,189 m) and that of Chichagof dens was 486 m (247-762 m). Most dens occurred on broken slopes of greater than 25 degrees. There appears to be no relationship between den location and slope exposure. On Admiralty Island, 41 percent of the bears denned in old-growth forest habitat, 32 percent in rock, 17 percent in alpine/subalpine, and 10 percent on avalanche slopes. Sixty-eight percent of the bears on Chichagof Island denned in old-growth forest habitat, 16 percent in alpine/subalpine, 11 percent in rock, and 5 percent on avalanche slopes. Most bears entered their winter dens during the 1st half of October and all bears were denned by the end of December. Den emergence began in late March and most bears had left their dens by the 3rd week of May except in 1985. Although many dens which occurred in natural rock cavities appeared to have been used in prior years, we observed little reuse of the same dens by individual bears through consecutive years. On Chichagof Island, many dens appear to be associated with large, old-growth trees or snags while on Admiralty many are associated with natural rock cavities.

## ACKNOWLEDGMENTS

D. Barril, L. Bennett, R. Bressette, S. Buchanan, S. Eide, B. Englebrecht, R. Flynn, K. Hart, K. Hundertmark, L. Johnson, M. Kirchhoff, J. Matthews, T. McCarthy, D. McKnight, S. Peterson, B. Townsend, G. Reifenstein, M. Schoen, and M. Thomas offered valuable assistance with this project and we wish to acknowledge their contribution.

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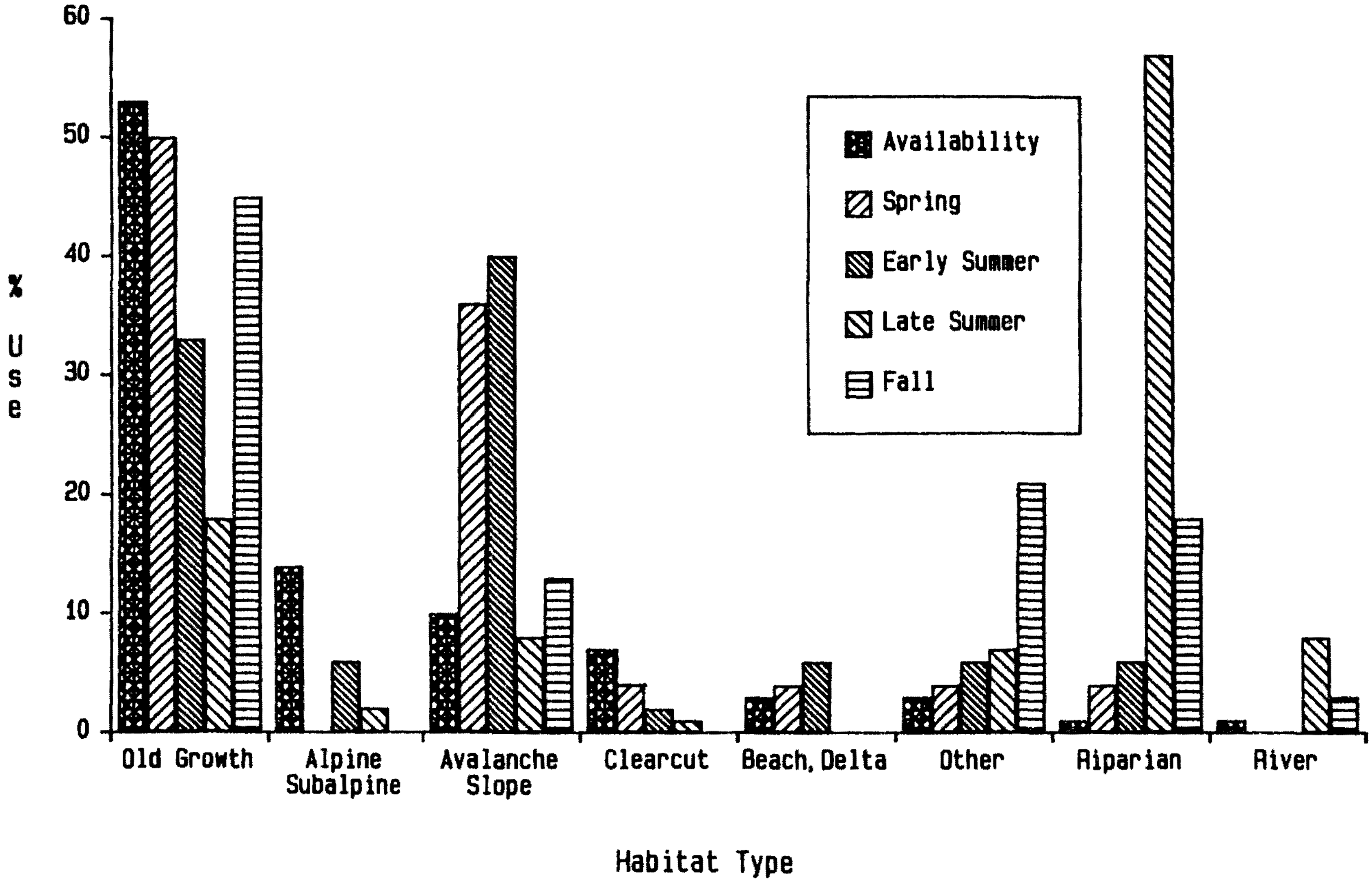


Fig. 1. Seasonal preference for use of habitat types, compared with habitat availability, for radio-collared brown bears on Chichagof Island, 1984.

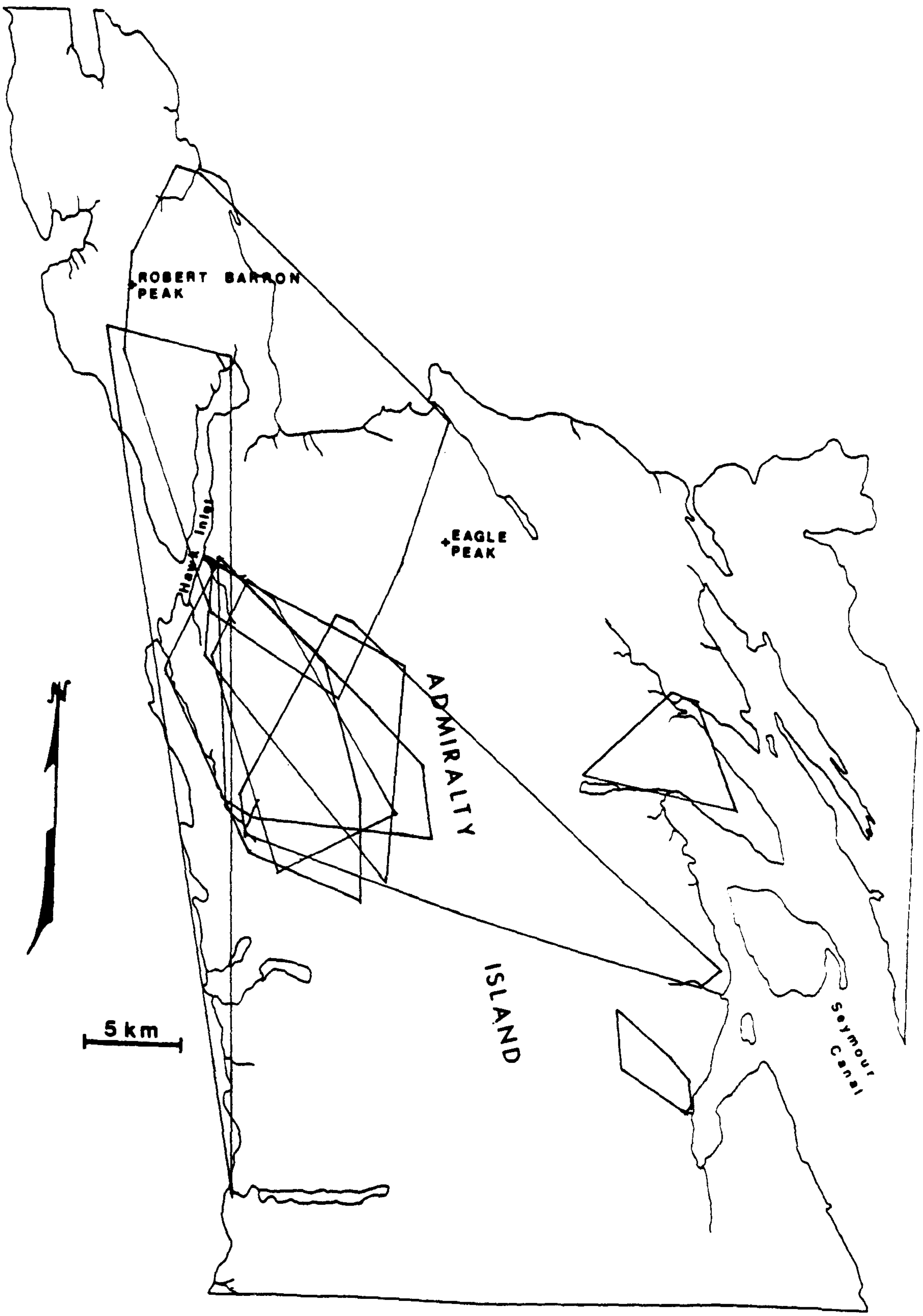


Fig. 2. Composite home range map of radio-collared male brown bears on Admiralty Island, 1984.

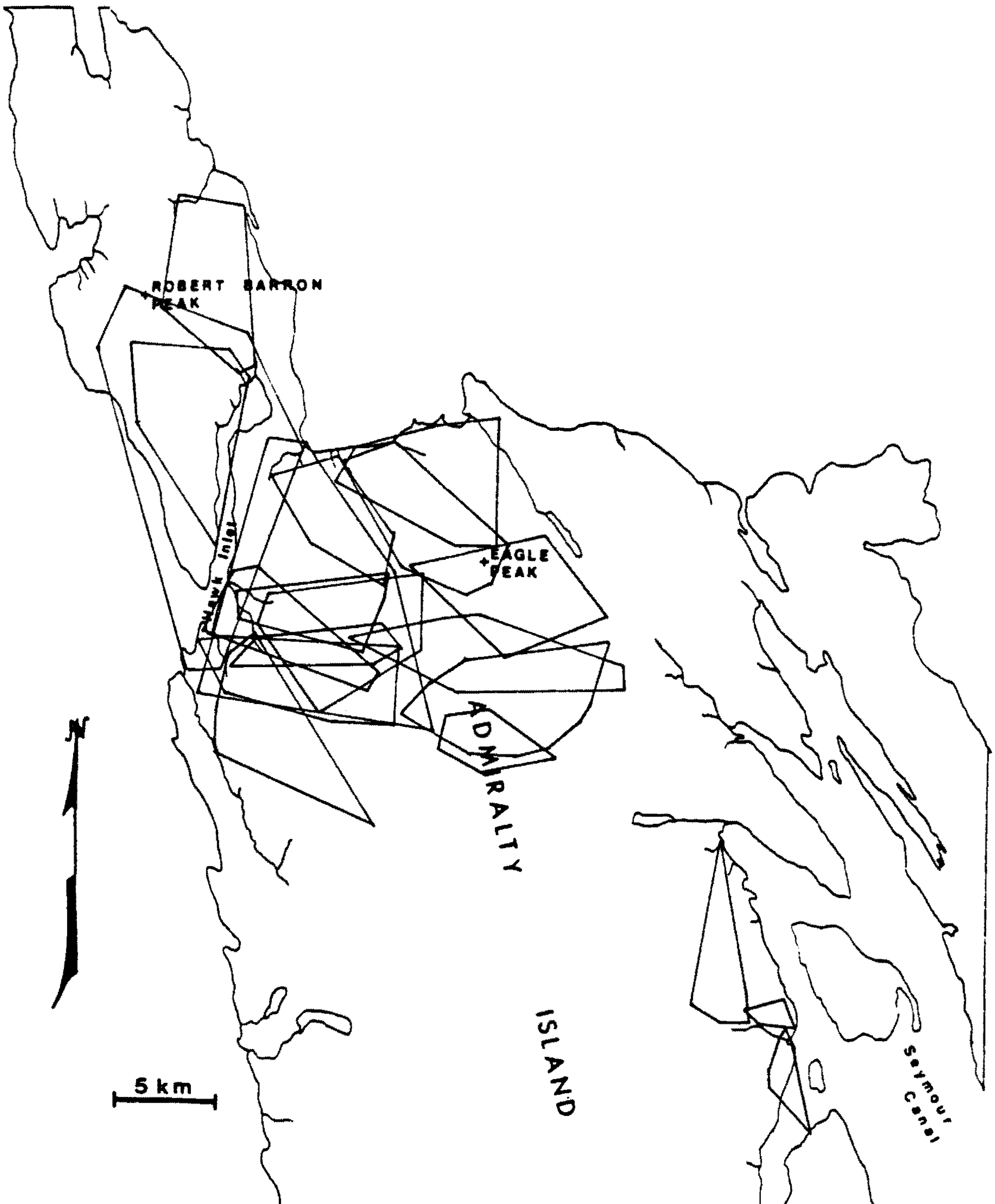


Fig. 3. Composite home range map of radio-collared female brown bears on Admiralty Island, 1984.

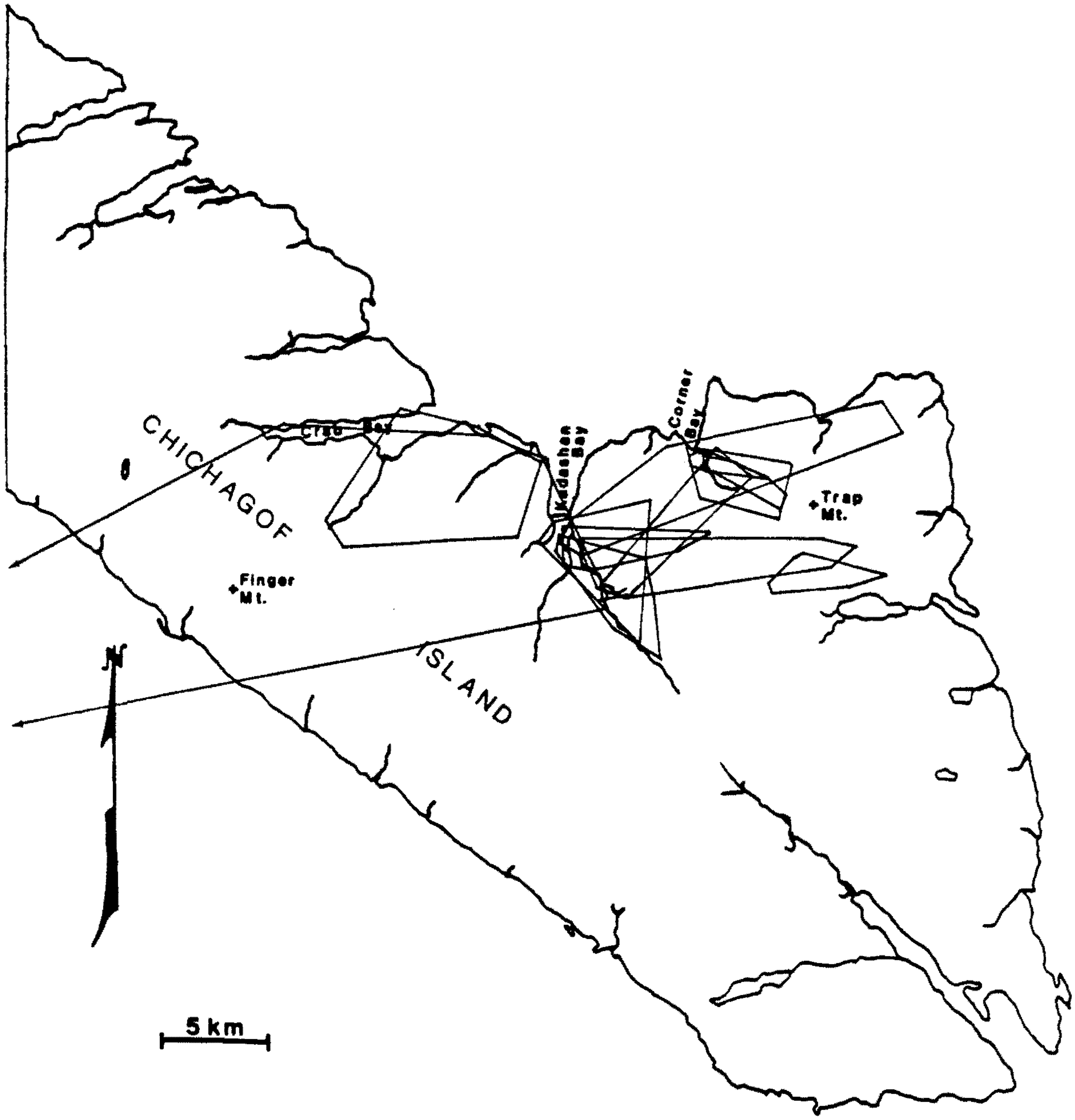


Fig. 4. Composite home range map of radio-collared brown bears on Chichagof Island, 1984.

Table 1. Status of brown bears captured on Admiralty Island, Alaska, fall 1981 through 30 June 1984.

| Bear No. | Location | Sex | Capture (recapture) Age[a] | Weight kg[b] | Date | Capture techniques[d] | Current status |
|---|---|---|---|---|---|---|---|
| 51 | Greens Cr. | M | 1 | 60 | 8-28-81 | s | Radio lost 9-81 |
| 60 | Greens Cr. | F | 20 | 160 | 9-21-81(7-2-82) | h | Transmitting |
| 59 | Greens Cr. | M | 3 | 80(113)[c] | 9-21-81(8-8-82) | h | Mortality (5-1-83) |
| 58 | Eagle Peak | M | 4 | 180(194) | 9-21-81(8-8-82) | h | Last located 9-84 Hood Bay |
| 36 | Mansfield Pen. | F | 14 | 230 | 9-26-81 | h | Radio lost 5-82 |
| 50 | Greens Cr. | M | 3 | 120(146) | 9-26-81(6-17-83) | h | Transmitting |
| 14 | Greens Cr. | F | 7 | 120(90) | 9-26-81(7-2-82) | h | Transmitting |
| 43 | King Salmon | F | 15 | 250 | 9-27-81 | h | Radio lost 5-82 |
| 6 | King Salmon | F | 8 | 150(153) | 9-27-81(6-14-83) | h | Transmitting |
| 62 | Admiralty Cove | F | 14 | 150 | 6-16-82 | s | Transmitting |
| B-14 | King Salmon | F | 2 | 100 | 9-26-81 | h | Mortality |
| 10 | Greens Cr. | M | 11 | 280[c](288)[c] | 7-2-82(7-6-84) | h | Radio lost 6-85 |
| 38 | Greens Cr. | F | 23 | 280 | 7-2-82 | h | Transmitting |
| 99 | Greens Cr. | F | 17 | 200(158) | 7-8-82(6-21-84) | h | Transmitting |
| 95 | Mansfield Pen. | F | 8 | 170 | 7-8-82 | h | Transmitting |
| 72 | Eagle Peak | M | 6 | 200 | 7-8-82 | h | Transmitting |
| 34 | Mansfield Pen. | F | 2 | 70 | 7-8-82 | h | Hunter kill 9-83 |
| 63 | Greens Cr. | F | 17 | 160 | 7-8-82 | h | Radio stationary 10-84 |
| 20 | Greens Cr. | M | 5 | 100(135) | 7-30-82(5-1-83) | s/h | Mortality 5-1-83 |
| 56 | Greens Cr. | F | 13 | 170 | 7-30-82 | s | Transmitting |
| 48 | Greens Cr. | M | Adult | 300 | 8-3-82 | s | Radio lost 6-83 |
| 39 | Mansfield Pen. | F | 9 | 270 | 8-7-82 | s | Transmitting |
| 37 | Mansfield Pen. | F | 10 | 270 | 8-3-82 | s | Hunter kill 10-83 |
| 67 | Greens Cr. | F | 2 | 60 | 8-2-82 | s | No radio sighted 9-82 Lake Florence, 6-85 Pack Cr. |
| 7 | Pack Cr. | F | 11 | 150 | 8-26-82 | d | No radio: sighted 6-85 Pack Cr. |
| 11 | Pack Cr. | M | 4 | 120 | 8-28-82 | t | Hunter kill 5-83 |
| 8 | Pack Cr. | F | 10 | 150 | 8-26-82 | t | Transmitting |
| 9 | Pack Cr. | F | 1 | 54 | 8-26-82 | d | No radio sighted 6-85 Pack Cr. |
| 91 | Pack Cr. | F | 19 | 162[c] | 6-21-83 | h | ? |

Table 1. Continued.

| Bear No. | Location | Sex | Capture (recapture) Age[a] | Weight kg[b] | Date | Capture techniques[d] | Current status |
|---|---|---|---|---|---|---|---|
| 92 | Pack Cr. | F | 16 | 158[c] | 6-21-83 | h | Transmitting |
| 93 | Pack Cr. | M | 5 | 158[c] | 6-21-83 | h | Transmitting |
| 94 | Pack Cr. | F | 10 | 156[c] | 7-13-83 | t | Transmitting |
| 40 | Greens Cr. | M | 10 | 180 | 6-21-83 | h | Transmitting |
| 45 | Greens Cr. | M | 15+ | 284[c](270)[c] | 6-14-83(7-6-84) | h | Transmitting |
| 55 | Greens Cr. | F | 7 | 124 | 6-21-83 | h | ? last located 10-83 |
| 35 | Wheeler Cr. | F | 8 | 135[c] | 6-17-83 | h | Mortality |
| 18 | Greens Cr. | M | 6 | 214[c] | 6-17-83 | h | Transmitting |
| 16 | Greens Cr. | F | 4 | 90[c] | 6-17-83 | h | ? last located 9-84 |
| 66 | Greens Cr. | M | 4 | 180[c] | 6-22-83 | h | Transmitting |
| 64 | Eagle Peak | F | 14 | 190[c] | 6-24-83 | h | Transmitting |
| 57 | Greens Cr. | F | 11 | 203[c] | 9-28-83 | h | Transmitting |
| 68 | Greens Cr. | F | 5 | 146[c] | 9-28-83 | h | Transmitting |
| 4 | Greens Cr. | F | 6 | 214[c] | 9-29-83 | h | Transmitting |
| 19 | King Salmon | F | 13 | 191 | 9-29-83 | h | Mortality |
| 41 | Mansfield Pen. | M | adult | 135 | 6-21-84 | h | Transmitting |
| 49 | Mansfield Pen. | M | 3 | 100 | 6-16-84 | h | No radio ? |
| 81 | Mansfield Pen. | F | adult | 200 | 6-21-84 | h | Transitting |
| 29 | Wheeler Cr. | F | adult | 158 | 7-5-84 | h | ? last located 11-84 |

[a] Age determined by tooth sectioning.

[b] Weight estimated.

[c] Actual weight.

[d] h = helicopter
s = snare
t = trap
d = darted, free ranging

Table 2. Status of brown bears captured on Chichagof Island, Alaska, summer 1983 through 30 June 1985.

| Bear No. | Location | Sex | Capture (recapture) Age[a] | Weight kg[b] | Date | Capture techniques[d] | Current status |
|---|---|---|---|---|---|---|---|
| 23 | Kadashan | M | 5[a] | 158[c] | 6-23-83 | h | Last located 10-83 |
| 21 | Corner Bay | F | Adult | 169[c] | 6-23-83 | h | Transmitting |
| 88 | Kadashan | M | 5[a] | 167[c] | 6-23-83 | h | Radio lost 7-84 |
| 24 | Corner Bay | F | 16[a] | 225[c] | 6-23-83 | h | Radio lost 9-84 |
| 12 | Kook Lake | F | 3 | 100 | 6-24-83 | h | Radio lost 8-84 |
| 30 | Kadashan | M | 3[a] | 126[c](136) | 6-24-83(9-16-83) | h/s | Transmitting |
| 2 | Crab Bay | M | 6[a] | 216[c] | 6-24-83 | h | Last located 7-84 |
| 73 | Kadashan | F | 11[a] | 158(181)[c] | 8-8-83(7-12-84) | s | Transmitting |
| 18 | Kadashan | M | 19[a] | 215 | 9-16-83 | s | Hunter kill 5-84 |
| 44 | Kadashan | F | 12 | 270 | 9-17-83 | s | Found dead 9-84 |
| 90 | Corner Bay | M | 4 | 135 | 9-22-83 | d | Radio lost sighted 5-84 Portage |
| 32 | Kadashan | F | 4 | 135 | 7-10-84 | s | Transmitting |
| 11 | Kadashan | F | 3 | 118(100)[c] | 7-10-84(6-20-85) | s/h | Radio lost 10-84 (transmitting) |
| 82 | Kadashan | F | 4 | 145[c] | 7-11-84 | s | Transmitting |
| 53 | Kadashan | F | 12 | 215 | 7-12-84 | s | Transmitting |
| 65 | Corner Bay | F | 3 | 80 | 7-19-84 | s | Radio lost, last sighted 6-85 Corner Bay |
| 33 | Corner Bay | F | 3 | 80 | 7-19-84 | s | Not transmitting sighted 7-85 Kadashan trap |
| 26 | Kadashan | F | 9 | 200[c] | 7-21-84 | s | Transmitting |
| 9 | Kadashan | F | 5 | 154[c] | 7-21-84 | s | Radio lost 8-84 sighted 7-85 Kadashan |
| 3 | Kook Lake | M | 4 | 136[c] | 10-2-84 | s | Transmitting |
| 22 | Kook Lake | F | 3 | 90 | 10-8-84 | s | Transmitting |
| 17 | Crab Bay | M | 10 | 200[c] | 6-18-85 | h | Transmitting |
| 5 | Crab Bay | F | 4 | 118[c] | 6-18-85 | h | Transmitting |
| 70 | Kadashan | M | 6 | 163[c] | 6-18-85 | h | Transmitting |

Table 2. Continued.

| Bear No. | Location | Sex | Capture (recapture) | | | Capture techniques[d] | Current status |
|---|---|---|---|---|---|---|---|
| | | | Age[a] | Weight kg[b] | Date | | |
| 15 | Corner Bay | F | 4 | 113[c] | 6-18-85 | h | Transmitting |
| 25 | Crab Bay | F | 11 | 159[c] | 6-20-85 | h | Transmitting |

[a] Age determined by tooth sectioning.

[b] Weight estimated.

[c] Actual Weight.

[d] h = helicopter,
s = snare
t = trap
d = darted, free ranging.

Table 3. Percent seasonal distribution of radio-collared brown bears, relative to elevation, Admiralty and Chichagof Islands, Alaska, 1984.

| Elevation (m) | Spring A[a] | Spring C[b] | Early summer A | Early summer C | Late summer A | Late summer C | Fall A | Fall C |
|---|---|---|---|---|---|---|---|---|
| <300 | 45 | 54 | 27 | 50 | 59 | 93 | 61 | 68 |
| 300-600 | 19 | 36 | 33 | 42 | 7 | 6 | 18 | 18 |
| 600-900 | 28 | 7 | 27 | 8 | 33 | 1 | 16 | 13 |
| >900 | 8 | 4 | 13 | 0 | 1 | 0 | 6 | 0 |
| n[c] | 64 | 28 | 175 | 48 | 76 | 119 | 176 | 38 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 4. Percent seasonal distribution of radio-collared brown bears, relative to slope, Admiralty and Chichagof Islands, Alaska, 1984.

| Slope (degrees) | Spring A[a] | Spring C[b] | Early summer A | Early summer C | Late summer A | Late summer C | Fall A | Fall C |
|---|---|---|---|---|---|---|---|---|
| <11 | 35 | 16 | 24 | 40 | 62 | 87 | 57 | 50 |
| 11-25 | 20 | 12 | 30 | 18 | 23 | 5 | 17 | 25 |
| 26-45 | 42 | 72 | 45 | 38 | 15 | 9 | 27 | 25 |
| >45 | 4 | 0 | 1 | 4 | 0 | 0 | 0 | 0 |
| n[c] | 55 | 25 | 159 | 45 | 66 | 112 | 154 | 36 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 5. Percent seasonal distribution of radio-collared brown bears, relative to aspect, Admiralty and Chichagof Islands, Alaska, 1984.

| | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| Aspect | A[a] | C[b] | A | C | A | C | A | C |
| N | 11 | 14 | 10 | 18 | 22 | 30 | 18 | 8 |
| NE | 13 | 7 | 10 | 9 | 11 | 28 | 9 | 29 |
| E | 11 | 0 | 16 | 5 | 11 | 3 | 13 | 5 |
| SE | 14 | 4 | 5 | 7 | 7 | 2 | 6 | 13 |
| S | 17 | 7 | 22 | 16 | 20 | 9 | 13 | 18 |
| SW | 8 | 43 | 16 | 30 | 13 | 3 | 13 | 8 |
| W | 14 | 18 | 12 | 14 | 10 | 7 | 17 | 5 |
| NW | 13 | 7 | 9 | 2 | 7 | 20 | 12 | 13 |
| *n*[c] | 64 | 28 | 174 | 44 | 76 | 118 | 165 | 38 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 6. Percent seasonal distribution of radio-collared brown bears, relative to terrain, Admiralty and Chichagof Islands, Alaska, 1984.

| | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| Terrain | A[a] | C[b] | A | C | A | C | A | C |
| Smooth | 66 | 79 | 74 | 79 | 87 | 97 | 83 | 71 |
| Broken | 34 | 21 | 26 | 21 | 13 | 3 | 17 | 29 |
| *n*[c] | 64 | 28 | 170 | 48 | 76 | 119 | 166 | 38 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 7. Percent seasonal distribution of radio-collared brown bears, relative to habitats on Admiralty and Chichagof Islands, Alaska, 1984.

| Habitat type | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| | A[a] | C[b] | A | C | A | C | A | C |
| Beach/ tidal flat | 2 | 4 | 1 | 6 | 3 | 0 | 1 | 0 |
| Old-growth forest | 45 | 50 | 35 | 33 | 22 | 18 | 30 | 45 |
| Riparian old-growth | 13 | 4 | 4 | 6 | 32 | 57 | 31 | 18 |
| Avalanche slope | 23 | 36 | 23 | 40 | 7 | 8 | 15 | 13 |
| Subalpine | 2 | 0 | 12 | 6 | 16 | 1 | 4 | 0 |
| Alpine | 9 | 0 | 18 | 0 | 17 | 1 | 9 | 0 |
| Rock | 6 | 0 | 5 | 2 | 0 | 0 | 5 | 5 |
| Clearcut | 0 | 4 | 0 | 2 | 0 | 1 | 0 | 0 |
| Second-growth | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Stream | 0 | 0 | 1 | 0 | 4 | 8 | 4 | 3 |
| Garbage dump | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 16 |
| Road | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| *n*[c] | 64 | 28 | 175 | 48 | 76 | 119 | 166 | 38 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 8. Percent seasonal distribution of radio-collared brown bears, relative to canopy, Admiralty and Chichagof Islands, Alaska, 1984.

| Canopy % | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| | A[a] | C[b] | A | C | A | C | A | C |
| <26 | 41 | 43 | 57 | 54 | 38 | 26 | 36 | 45 |
| 26-50 | 14 | 14 | 15 | 19 | 26 | 26 | 12 | 11 |
| 51-75 | 45 | 43 | 28 | 25 | 36 | 48 | 51 | 45 |
| >75 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |
| $n$[c] | 64 | 28 | 175 | 48 | 76 | 119 | 166 | 38 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 9. Percent seasonal distribution of radio-collared brown bears, relative to soil drainage, Admiralty and Chichagof Islands, Alaska, 1984.

| Drainage | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| | A[a] | C[b] | A | C | A | C | A | C |
| Poor | 19 | 42 | 26 | 18 | 16 | 21 | 19 | 8 |
| Good | 81 | 58 | 74 | 82 | 84 | 79 | 81 | 92 |
| $n$[c] | 42 | 26 | 82 | 22 | 49 | 91 | 110 | 24 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 10. Percent seasonal distribution of radio-collared brown bears, relative to spruce composition, Admiralty and Chichagof Islands, Alaska, 1984.

| Spruce | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| % | A[a] | C[b] | A | C | A | C | A | C |
| <26 | 49 | 69 | 56 | 60 | 24 | 28 | 32 | 32 |
| 26-50 | 42 | 25 | 35 | 13 | 22 | 34 | 48 | 50 |
| >50 | 9 | 6 | 8 | 27 | 54 | 39 | 20 | 18 |
| _n_[c] | 33 | 16 | 48 | 15 | 37 | 80 | 96 | 22 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 11. Percent seasonal distribution of radio-collared brown bears, relative to timber volume, Admiralty and Chichagof Islands, Alaska, 1984.

| Volume | Spring | | Early summer | | Late summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| (mbf) | A[a] | C[b] | A | C | A | C | A | C |
| <8 | 21 | 39 | 25 | 29 | 17 | 6 | 13 | 8 |
| 8-20 | 17 | 12 | 24 | 29 | 19 | 27 | 15 | 13 |
| 20-30 | 36 | 35 | 30 | 19 | 29 | 35 | 48 | 50 |
| >30 | 26 | 15 | 20 | 24 | 35 | 32 | 25 | 29 |
| n[c] | 42 | 26 | 79 | 21 | 48 | 88 | 109 | 22 |

[a] Admiralty site.

[b] Chichagof site.

[c] Number of relocations.

Table 12. Summary of alpine bear surveys conducted on Admiralty Island, Alaska, 1984.

| | North Admiralty | | Swan/ Windfall | South Admiralty |
|---|---|---|---|---|
| | 25 Jun | 4 Jul | 4 Jul | 5 Jul |
| Survey time (hr) | 0.9 | 1.1 | 0.7 | 0.7 |
| Bears observed: | | | | |
| adults | 18 | 18 | 14 | 14 |
| cubs of year | 2 | 3 | 3 | 3 |
| total cubs | 8 | 13 | 8 | 5 |
| cubs:100 adults | 30.4 | 41.9 | 36.4 | 26.3 |
| Total | 26 | 31 | 22 | 19 |
| Bears:hour | 29.0 | 28.2 | 31.4 | 27.1 |
| Total marked bears observed | 6 | 5 | | |
| Total marked bears in area | 24 | 24 | | |
| Approximate size of area | 390 $km^2$ (150 $mi^2$) | | 195 $km^2$ (75 $mi^2$) | 455 $km^2$ (175 $mi^2$) |

Table 13. Reproductive history of radio-collared female brown bears on Admiralty Island, Alaska, 1981-85.

| Bear No. | Age at capture (yrs) | Offspring[a] by year | | | | |
|---|---|---|---|---|---|---|
| | | 1981 | 1982 | 1983 | 1984 | 1985 |
| 60 | 20 | 1/2 yr | 0 | 2 COY[b] | 1 COY | 1/1 yr |
| 14 | 7 | 0 | 0 | 0 | 2 COY | 0[c] |
| 36 | 14 | 2 COY | | | | |
| 6 | 8 | 0 | 0 | 1 COY | 0[e] | 0 |
| 43 | 15 | 0 | 2 COY | 2/1 yr | | |
| 99 | 17 | | 2/3 yr | 2 COY | 2/1 yr | 1/2 yr |
| 56 | 13 | | 2/2 yr | 2/3 yr | 2 COY | 2/1 yr |
| 63 | 17 | | 2 cubs | 0 | | |
| 95 | 8 | | 2/1 yr | 2/2 yr | 0 | 2 COY |
| 39 | 9 | | 0 | 0 | 2 COY | 0[e] |
| 38 | 23 | | 0 | 0 | 0 | 0 |
| 37 | 10 | | 0 | 1 COY | | |
| 62 | 14 | | 0 | 0 | 0 | 2 COY |
| 34 | 2 | | 0 | 0 | | |
| 67 | 2 | | 0 | | | |
| 55 | 7 | | | 0 | | |
| 64 | 14 | | | 1/1 yr | 1/2 yr | 2 COY |
| 16 | 4 | | | 0 | 0 | |
| 35 | 8 | | | 0 | | |
| 57 | 11 | | | 2/2 yr | 2/3 yr | Unk |
| 68 | 5 | | | 0 | | |
| 4 | 6 | | | 0 | 2 COY | 2/1 yr |
| 19 | 13 | | | 1/2 yr | | |
| 8 | 10 | | 1/1 yr | 1/2 yr | 2 COY | 2/1 yr |
| 91 | 19 | | | 0 | | |
| 92 | 16 | | | 0 | 2 COY | Unk |
| 94 | 10 | | | 0 | 2 COY | 2/1 yr |
| 29 | 10 | | | | 3/1 yr[d] | |
| 81 | 13 | | | | 0 | Unk |

[a] COY = cub of year
1 yr = yearling
2 yr = 2 year-old
cub = cub older than COY
0 = no cubs observed

[b] Male killed cubs in June.

[c] Female ate cubs in den.

[d] 1 cub disappeared over summer.

[e] Cubs disappeared over winter.

Table 14. Reproductive history of radio-collared female brown bears on Chichagof Island, 1983-85.

| Bear No. | Age at capture (yrs) | Offspring[a] by year | | |
|---|---|---|---|---|
| | | 1983 | 1984 | 1985 |
| 21 | Adult | 0 | 3 COY | 3/1 yr |
| 24 | 16 | 0 | 2 COY | |
| 12 | 3 | 0 | 0 | |
| 73 | 11 | 0 | 2/2 yr | 0 |
| 44 | 12 | 0 | 3 COY[b] | |
| 32 | 4 | | 0 | 0 |
| 11 | 3 | | 0[c] | 0 |
| 82 | 4 | | 0 | 0 |
| 53 | 12 | | 0 | 2 COY |
| 65 | 3 | | 0 | 0 |
| 33 | 3 | | 0 | 0 |
| 26 | 9 | | 2 cubs[d] | 1/2 yr[e] |
| 9 | 5 | | 0 | 0 |
| 22 | 3 | | 0 | 0 |
| 5 | 4 | | | 0 |
| 15 | 4 | | | 0 |
| 25 | 11 | | | 0 |

[a] COY = cub of year
1 yr = yearling
2 yr = 2 year-old
cub = cub older than COY
0 = no cubs observed

[b] Female found dead by midsummer.

[c] Offspring of #73.

[d] Cubs different sizes.

[e] Cub gone by 7-85.

Table 15. Summary of denning of radio-collared brown bears on Admiralty Island, southeastern Alaska, 1984-85.

| Bear No. | Sex | Reproductive status[a] | Den | | | | Approx. date of den entrance and emergence | |
|---|---|---|---|---|---|---|---|---|
| | | | Slope | Elev.[b] | Aspect | Habitat | Fall 1984 | Spring 1985 |
| 14 | F | 0[c] | 35 | 945 | SE | alpine | before 10-31 | after 6-19 |
| 60 | F | 1/1 yr | 45 | 732 | N | rock | before 10-31 | before 5-21 |
| 06 | F | 0 | 55 | 1067 | W | rock | before 10-31 | 5-21 |
| 99 | F | 2/2 yr | 45 | 732 | N | rock | before 10-31 | 5-31 |
| 40 | M | | 45 | 732 | W | avalanche | after 10-31 | before 4-15 |
| 10 | M | | 40 | 701 | NE | subalpine | before 11-06 | before 4-15 |
| 18 | M | | 25 | 311 | S | old growth | after 11-06 | before 5-04 |
| 50 | M | | 30 | 732 | E | subalpine | after 10-31 | before 4-15 |
| 57 | F | 0 | 25 | 762 | S | subalpine | after 10-10 | before 5-21 |
| 66 | M | | 35 | 579 | SE | avalanche | after 10-31 | before 5-04 |
| 04 | F | 2/1 yr | 40 | 762 | N | avalanche | before 10-10 | 6-03 |
| 41 | M | | 5 | 6 | W | old growth | before 11-06 | 4-15 |
| 81 | F | 0 | 35 | 457 | SE | old growth | before 11-06 | before 4-15 |
| 68 | F | 0 | 45 | 915 | N | rock | after 10-10 | before 6-03 |
| 92 | F | Unk | 35 | 579 | S | old growth | Unk | before 5-16 |
| 94 | F | 2/1 yr | 35 | 579 | S | old growth | Unk | before 5-22 |
| 93 | M | | 25 | 610 | N | subalpine | Unk | before 5-16 |
| 8 | F | 2/1 yr | 35 | 549 | SW | avalanche | 9-24 | before 6-08 |
| 72 | M | | 45 | 610 | S | old growth | before 10-31 | before 5-04 |
| 39 | F | 0[c] | 30 | 579 | E | old growth | before 10-31 | 5-21 |
| 62 | F | 2 COY | 45 | 1037 | NW | rock | before 10-10 | before 5-16 |
| 64 | F | 2 COY | 35 | 762 | E | old growth | before 11-06 | before 5-21 |
| 38 | F | 0 | 40 | 610 | NE | old growth | after 10-31 | 5-21 |
| 95 | F | 2 COY | 10 | 457 | NE | old growth | before 11-06 | 5-16 |
| 56 | F | 2/1 yr | 35 | 671 | W | old growth | before 10-10 | 5-02 |
| 29 | F | Unk | 45 | 976 | SE | alpine | before 11-06 | Unk |
| 45 | M | | -- | -- | -- | -- | Unk | before 4-10 |

[a] At den emergence.
[b] Meters.
[c] Over-winter mortality, 2 COY.

Table 16. Summary of denning of radio-collared brown bears on Chichagof Island, southeastern Alaska, 1984-85.

| Bear No. | Sex | Reproductive status[a] | Den | | | | Approx. date of den entrance and emergence | |
|---|---|---|---|---|---|---|---|---|
| | | | Slope | Elev.[b] | Aspect | Habitat | Fall 1984 | Spring 1985 |
| 82 | F | 0 | 35 | 366 | N | old growth | before 11-27 | before 5-17 |
| 53 | F | 2 COY | 35 | 459 | S | old growth | 10-19 | after 6-10 |
| 22 | F | 0 | 25 | 640 | S | subalpine | before 11-27 | before 5-17 |
| 3 | M | | 20 | 274 | S | old growth | before 11-27 | 5-17 |
| 65[c] | F | 0 | 40 | 762 | W | alpine | before 11-27 | Unk |
| 33[c] | F | 0 | 40 | 762 | W | alpine | before 11-27 | Unk |
| 21 | F | 3/1 yr | 40 | 610 | NE | avalanche | before 11-27 | before 5-17 |
| 26 | F | 1/2 yr | 20 | 305 | SW | old growth | before 11-27 | before 5-17 |
| 32 | F | 0 | 15 | 366 | W | old growth | before 11-27 | 4-23 |
| 73 | F | 0 | 20 | 457 | W | old growth | before 11-27 | 4-23 |

[a] At den emergence.
[b] Meters.

Appendix A.

# REVIEW OF POPULATION STATUS, FORESTRY RELATIONSHIPS, AND PREDATOR MANAGEMENT OF BROWN/GRIZZLY BEARS IN NORTH AMERICA.

by John Schoen

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## Status of Brown/Grizzly Bear Populations in North America

The grizzly, or brown bear (*Ursus arctos*), is the most widely distributed species of bear in the world. It once ranged throughout Europe, Asia, North Africa, and North America. This species has been greatly reduced in numbers throughout most of the world. In North America, the grizzly bear was historically widely distributed from central Mexico to northern Canada and Alaska, and from the Mississippi River to the Pacific Ocean (Hall and Kelson 1959). The distribution of the grizzly bear today is greatly reduced, with populations restricted to western Canada, Alaska, and a few wilderness enclaves in Montana, Idaho, Wyoming, and with perhaps a few individuals occurring in Washington. In the United States south of Canada, where grizzly and brown bears once roamed over 20 states, these bears are now found in only 4 states. Grizzly bears probably exist at 1 percent of their former range and numbers in these states (Servheen, in press).

In 1970, Cowan (1972) estimated the population of brown/grizzly bears in North America to be in the range of 26,000 to 31,000. Earlier, Calahane (1964) estimated the Canadian and Alaskan populations of grizzly bears to be between 12,000 and 16,000, and between 8,000 and 18,000, respectively.

Current population estimates and status of grizzly bears by state, province, and territory follow.

### United States South of Canada:

Grizzly bears are believed to occur in 6 isolated ecosystems within 4 states. The population of grizzly bears in the United States today is estimated to number between 700 and 900 individuals (Servheen, in press).

The Yellowstone ecosystem encompasses portions of Wyoming, Montana, and Idaho. This area surrounding Yellowstone National Park is estimated to have at least 200 bears (Servheen, in press). The Yellowstone population has been studied extensively over the last 2 decades (see Craighead et al. 1974, and Knight and Eberhardt 1985). The status of this population is considered precarious because it is isolated, has a low number of breeding females, and is considered to be declining at an annual rate of 1.8% (Knight and Eberhardt 1985).

The northern Continental Divide ecosystem in Montana is estimated to have from 440 to 680 bears, including approximately 200 bears that inhabit Glacier National Park (Servheen, in press). A limited quota of bears is harvested annually under a sport season managed by the State of Montana. Currently that state is preparing an Environmental Impact Statement on its bear management program.

The northern Continental Divide population is the largest single population of grizzly bears occurring south of Canada. Major concerns are: resource development including mining, logging, and oil and gas development; livestock grazing; and human/bear conflicts. This population is contiguous with the Canadian border; thus interchange of bears from Canada provides an important reserve.

The Cabinet/Yak ecosystem lies in northwestern Montana and is adjacent to Idaho and British Columbia. There is little information on this population although grizzly bears are known to occur here. Kasworm (1984) described a minimum of 3 grizzlies during 1983 field studies. Servheen (in press) estimated a population of 12 bears. Management concerns are similar to those described above.

Surveys began in 1984 in the Selway/Bitteroot ecosystem in eastcentral Idaho. This region is considered good grizzly habitat but no data or estimates of grizzly numbers are available. This area, like Yellowstone, is completely isolated from other populations, including those to the north in Canada. Therefore grizzly populations in this area may be particularly vulnerable to extinction.

The Selkirk ecosystem occurs in northwest Idaho and a small portion of northeastern Washington. Zager (1983) reviewed 59 accounts of bear sightings or observations of bear sign in the Selkirks since 1975. Almack and Rohlman (1984) worked in this area and captured 2 adult females. One female and her 2 cubs were transplanted to British Columbia while the other was monitored during a radio-tracking study. A few grizzly bears occur in this area but no population estimate has been prepared. The potential for interchange with British Columbia is probably very important to the continued existence of grizzly bears in this area.

There are few data on grizzly bears in the North Cascades of Washington. If any bears exist here, they may be those whose movements carry them over the border from British Columbia.

<u>Canada</u>:

A recent estimate of the Canadian population of grizzly bears is about 20,000 with the highest numbers in the Yukon and British Columbia (Macey 1979). This is reasonably close to Cowan's (1972) estimate of 18,600 with 90 percent in the Yukon and British Columbia.

In the Northwest Territories, Cowan (1972) presented an estimate of 500 to 1,000 bears. We currently have little additional information on the status of grizzly bears from this area.

The current estimate of grizzly bears in Alberta, outside the national parks, is 500 to 1,000 animals (Alberta Fish & Wildlife 1984). Cowan (1972) provided an estimate of 800+ grizzlies for the Province of Alberta. Alberta Fish & Wildlife (1984) states that the population goal for grizzly bears in Alberta is to retain a minimum of 1,000 bears, including those populations that seasonally inhabit both Alberta and adjacent national parks. We do not have an estimate of numbers of bears in the national parks of Alberta. The density of grizzly bears in the Canadian Rockies is relatively low (Hamer and Herrero 1983, Russell et al. 1979). In southern Alberta, grizzly populations have been reduced to an area at the extreme western edge of the province, where they have become dissected, and individuals mix with the population in British Columbia (B. Horejsi, pers. commun.). According to Horejsi, much of southern Alberta is being grazed and oil and gas development is widespread. Consequently, access has increased substantially and the range of the grizzly bear has been reduced substantially. Major concerns include: roading associated with oil and gas exploration; recreational developments; grazing conflicts; and the associated increase in bear harvest, both legal and illegal, confounded by the difficulty of monitoring bear population changes (B. Horejsi pers. commun.).

In British Columbia, the provincial estimate of the total grizzly population is 6,000 to 7,000 animals (British Columbia Ministry of Environment 1979). Cowan (1972) estimated 6,800 grizzly bears for British Columbia. Bears have declined or have been extirpated from the southern coast and parts of the interior as a result of increased human-caused mortality and the loss of habitat to urban and rural development. It is expected that this decline will continue in the next few years (British Columbia Ministry of Environment 1979). Considerable concern has been expressed in regard to intensive forestry and its effect on grizzly bears throughout their range in coastal British Columbia (see review in Archibald 1983). Recently, Tompa (1984) suggested the provincial population of grizzly bears is overharvested and that this means a declining trend of varying intensity in some areas, as well as a reduction in the range of the species in other areas.

The largest population of grizzly bears in Canada likely occurs in Yukon Territory. Cowan (1972) presented an estimate of 10,000 bears for the Yukon. However, the current estimate of grizzly bear numbers in the Yukon is approximately 6,500 animals (B. Smith, pers. commun.).

Alaska:

Alaska has the largest number of brown/grizzly bears in North America and some of the highest density populations in the world. The Alaska Department of Fish and Game (1978) estimated the population of brown/grizzly bears to be between 32,000 and 43,000. Estimates of bear habitat, density, population size, and harvest are presented for geographical regions of Alaska in Table 1. These estimates are considerably higher than those of Cowan (1972) who presented a population estimate of 12,000. Estimates by Alaska Department of Fish and Game (1978) reflect more recent survey work and are probably more representative of actual population levels.

Currently there are 5 major brown/grizzly bear research programs going on in Alaska (Barnes 1985, Miller 1984, Reynolds and Hechtel 1984, Schoen and Beier 1985, Smith and Van Daele 1984). Miller and Ballard (1982) estimated brown bear densities of 1 bear/41 $km^2$ for an interior bear population in southcentral Alaska following an intensive mark-recapture program. R. Smith (pers. commun.) estimated a population of 3,000 bears on Kodiak Island and 250 to 500 bears on the adjacent islands of the Kodiak Archipelago. This is higher than the 2,408 bears estimated for the archipelago by Troyer and Hensel (unpubl. data) and reflects results of recent research. In Southeast Alaska, J. Schoen, L. Beier, and L. Johnson (pers. commun.) estimated the population of brown bears to range from 3,750 to 8,500 animals, with the highest density of bears (2,000 to 5,000) occurring on Admiralty, Baranof, and Chichagof Islands. Admiralty Island has one of the highest populations of brown bears in the world with an estimated density of over 1 bear/2.5 $km^2$ in an intensive study site on the northern portion of the island (Schoen and Beier 1985). In contrast, the density of bears on the North Slope has been estimated at 1/42 $km^2$ (Reynolds 1980). In Alaska, the highest density populations occur on the Alaska Peninsula, Kodiak Archipelago, and Admiralty, Baranof, and Chichagof Islands in Southeast Alaska. Throughout most of the state, the population trend is either stable or increasing with the exception of localized situations around site-specific resource developments or growing population centers.

The most serious threats to brown/grizzly bear populations in Alaska are the transfer of public lands to private ownership, road developments increasing human access into formerly undeveloped lands, industrial scale forestry, subsistence game regulations which increase the difficulty of enforcing seasons and bag limits, and an increasing public perception of the bear as a predator and competitor for ungulate species. Other problems include a variety of resource developments such as mining, hydroelectric development, oil and gas development, etc. Livestock grazing in localized areas (e.g., cattle ranches on Kodiak) also poses traditional problems associated with ranchers protecting their stock from depredation. Intensive back-country recreation is growing in Alaska and brings more people into wilderness areas with dense bear populations. All these activities increase the opportunity for bear/human contact--which traditionally has resulted in reductions of bear populations. Although legal sport hunting can be effectively managed, illegal kills and kills in defense of life or property are very difficult to control in the large, remote areas that are typical of grizzly bear range in Alaska.

## Brown/Grizzly Bear - Forestry Relationships

The decline in the range and numbers of grizzly bears over the past century has increased management concern for the future of this species in North America and resulted in the declaration in 1975 of grizzlies as a threatened species in the United States outside of Alaska. This situation has prompted an increase in grizzly bear research, particularly habitat-related studies throughout remaining ranges. In the northern Rockies, timber management has affected wildlife habitat more than any other activity (Zager and Jonkel 1983). Consequently, a better understanding of the effects of forestry practices on grizzly bears is essential for sound management of the species. Most of the significant research on bear/forest relationships has been conducted within the last decade and a number of investigations are currently underway.

In Montana, Mace and Jonkel (1980) reported grizzly bears avoided or moved out of recently logged areas. Radio-collared bears in northwestern Montana avoided cutting units and habitat affected by open, traveled roads (Zager et al. 1983). The cutting units used by bears in that study were generally isolated from human disturbance factors. Craighead (1977) and Jonkel (1977) suggested that human-induced mortality associated with logging may be the major contribution to grizzly declines. In British Columbia, Russell (1974) indicated that coastal brown bear populations are incompatible with intensive forestry. Smith (1978) suggested that other factors, in addition to habitat alteration, may be contributing to declines in brown bear populations in this area. Archibald (1983) suggested that development in coastal mainland forests in British Columbia appears to result in declining brown bear populations. Johnson (1980) stated, "Development of an extensive logging industry has perhaps the greatest impact on bear management in Southeast Alaska...one known impact which is primarily a management problem but at the same time contributes significantly to the kill, is the rather large number of bears destroyed in logging and support camps. This kill may approach 10 percent of the reported legal kill."

Currently, our understanding of grizzly bear/forestry relationships is inadequate for developing rigorous management guidelines with broad continent-wide application. The following generalities, however, may be useful when considering forest management activities within the range of the grizzly bear.

Brown/grizzly bears are long-lived and highly adaptable animals. Their adaptability is apparent from the size of their original range and from their ability to inhabit diverse ecosystems from the high arctic to dense coastal rain forests. Clearcut logging generally results in the production of an abundance of bear forage plants during early stages of forest succession (Mealy et al. 1977, Zager et al. 1983, Lindzey and Meslow 1977). These sites should provide good or adequate habitat for a generalist species like the grizzly. However, it is imperative that resource managers consider the long-term cumulative effects of forest management over entire rotations.

Even-aged, second-growth conifer stands with minimal understory forage production provide poor habitat for most wildlife species (Schoen et al. 1981) including bears (Lindzey and Meslow 1977). For example, in southeastern Alaska, although the forage production of clearcuts is higher than that of the old-growth forest, second-growth stands dominate about 75 percent of the rotation period and produce minimal forage for wildlife. The net effect of logging such forests is a reduction in carrying capacity for herbivorous wildlife species (Wallmo and Schoen 1980, Alaback 1982). Changes in carrying capacity vary regionally depending on differences in succession, rotation lengths, and forest management plans. Nevertheless it is necessary to consider forest management plans over the long term (entire rotations, e.g., 100 years) to evaluate all the cumulative effects on wildlife.

The effects of forest management on brown/grizzly bears, however, must also be evaluated in terms of human/bear interactions. Intensive forest development in grizzly country (generally wilderness areas) significantly improves human access and consequently increases disturbance as well as direct man-caused mortality on bears. In general, roads are detrimental to bears and other wildlife (Elgmork 1978, Lyon and Jensen 1980, Zager 1980).

Another major byproduct of development is garbage. Human garbage has been implicated as one of the major contributors to bear attacks on humans and ultimately the reason that many garbage habituated "problem" bears must be destroyed (Herrero 1985). The impact of development and human encroachment on the grizzly bear is part of our historical record; this impact must be recognized and avoided where possible if we are to provide adequate protection for the few remaining populations of grizzlies and brown bears on this continent.

Where timber management is planned for areas within or adjacent to grizzly bear habitat, special consideration must be given to avoidance of impacts on bears and their habitat. Zager and Jonkel (1983) provided a set of recommendations for managing grizzly bear habitat in the northern Rocky Mountains. Their list is not all-inclusive but provides general guidelines which should be considered in forest management plans. Some of their recommendations are summarized as follows:

Timber harvest activities, including roading, should be coordinated with seasonal bear use to minimize disturbance.

All-aged or uneven-aged silvicultural systems should be considered where feasible.

Escape cover and some isolation of sites should be maintained.

Timber harvest schedules should be coordinated among landowners to ensure enough time for cover, food, and trees to grow before additional activities are undertaken.

Timbered strips should be left around feeding sites such as wet meadows, riparian areas, snow chutes, and cutting units.

Important bear travel routes, feeding areas, and denning areas should be avoided.

Old roads should be closed when possible, and new roads minimized, to provide isolation and reduce human disturbance.

Roads should avoid areas that are important feeding or travel areas for bears.

Road alignment should be used to reduce observability of bears.

Unessential traffic should be restricted and secondary roads closed following completion of management activities.

Permanent road closure or alteration is more effective than merely posting the road as closed or installing gates.

These recommendations were developed for the northern Rockies; however, they provide general guidelines worth considering on a broader geographic scale. In addition to these recommendations, rigorous care and handling of garbage should be added, including isolating dump sites with electrified chain link fencing and incinerating all organic materials to eliminate odors. In the future, additional guidelines should be forthcoming from coastal British Columbia, Alaska, and elsewhere.

Finally, forest/wildlife managers must acknowledge that the brown/grizzly bear is in large part a species of the wilderness and that man has eliminated this bear from many areas through development and extraction of resources across the continent. As Craighead et al. (1982) stated, "Space and solitude are essential for maintaining grizzly bears in perpetuity.... Research and management efforts throughout North America should focus on the largest wilderness areas of prime bear habitat." The challenge facing forest managers interested in maintaining grizzly populations is immense. Necessary elements for the accomplishment of this task are an increased understanding of bear habitat relationships and people/bear relationships, a commitment to identifying and maintaining adequate grizzly bear habitat in wilderness status, and a willingness among managers to develop and implement new, innovative approaches toward multiple-use management, giving special consideration to the unique requirements of brown/grizzly bears.

## Predator Bears

Since statehood began in 1959, management of brown/grizzly bears has been relatively conservative, with the following requirements: 1 bear may be taken every 4 regulatory years; registered guides are required for nonresidents; the taking of cubs, or sows with cubs, is prohibited; and all bears reduced to possession must be sealed by a Department representative. Bears taken in the defense of life or property must be turned over to the State and a review of the circumstances of the case is required.

Prior to 1980, the brown/grizzly bear was not considered a serious predator on other game species in Alaska (Erickson 1965). However, as a result of low moose calf recruitment in interior Alaska, research was undertaken which revealed that brown bears were responsible for 79% of the mortality of radio-collared moose calves in the Nelchina and upper Susitna River Basins of south central Alaska (Ballard et al. 1981). Following the experimental reduction of bear numbers in the study area by transplanting, calf moose survival increased substantially. As a result of these studies, deliberate attempts to increase the bear harvests, starting in 1980 and continuing to the present, were made in Game Management Units 11 and 13. These efforts have doubled the reported harvest levels compared with those that occurred prior to 1980. The public's perception of this issue is summarized in the ADF&G 1983 spring report to the Alaska Board of Game:

> "The public's perception of the results of Unit 13 research is that brown bears are responsible for low moose numbers, not only in GMU 13 but also in many other areas of the State where, in many cases, no problems had been previously reported. The public's response has culminated in numerous regulation proposals to the Board of Game for liberalization of bear hunting season lengths, bag limits, and methods and means of harvest. In GMU 13 for example, all of the advisory committees were unanimous in their desire to see Unit 13 bear densities reduced. All of the committees justified their proposals by suggesting that increased bear harvests would result in a larger moose population."

Thus the State of Alaska has moved from a period of 25 years of relatively conservative management of brown/grizzly bear populations with generally stable or increasing populations throughout the state to a time of intense pressure by many sport hunters to substantially liberalize bear management and reduce local bear populations to increase ungulate numbers in some parts of the state. This is a difficult management issue. In other areas of the state such as the Alaska Peninsula, Kodiak Archipelago, and Southeast Alaska, brown bears continue to be managed conservatively.

Responsible predator-prey management requires the identification of specific management objectives and the ability to census and monitor changes in population densities of both predator and prey. Generally it has been much easier to track changes in ungulate populations than in bear populations. This difficulty in monitoring bear populations is compounded by the low reproductive rate of brown/grizzly bears which increases the risk of overharvesting them. Consequently, it is important to manage bears conservatively; especially in the absence of reliable census techniques. Additional research on predator-prey relationships of bears and ungulates is currently underway in both Alaska and the Yukon Territory. These studies should provide valuable insights for wildlife managers.

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Table 1. Habitat, population estimates, and kill of brown bears in Alaska (Alaska Department of Fish and Game, 1978).

| Geographical region | Estimate of bear habitat ($mi^2$) | Estimate of density of bears (no./100$mi^2$) | Extrapolated estimate of population size | Percent of minimum population killed (no. killed)[a] |
|---|---|---|---|---|
| Arctic | 89,000 | 1-2[b] | 893-1,786 | 2 (20) |
| Northwestern | 47,250 | 2-3 | 946-1,419 | 3 (30) |
| Western | 99,800 | 5-7 | 4,990-6,986 | 1 (54) |
| Interior | 131,250 | 3-5 | 3,939-6,565 | 2 (75) |
| Southcentral | 63,000 | 7-9 | 4,410-5,670 | 3 (144) |
| Southeastern | 31,500 | 12-15 | 3,780-4,725 | 3 (128) |
| Southwestern | 63,000 | 20-25[b] | 12,600-15,750 | 3 (380) |
| Total | 525,100[c] | | 31,558-42,901 | 2.6(831) |

[a] Values for number killed represent the mean annual kill for 6 years, 1972-77.

[b] Values based on field studies; all other values estimated and/or extrapolated from these figures.

[c] Total land area of Alaska is approximately 580,000 $mi^2$, of which less than 55,000 $mi^2$ are not presently used by brown bears.

Appendix B.

## SUMMARY OF 1984 BROWN BEAR FOOD HABITS.

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In early June of 1984, research was initiated to investigate the food habits of brown bears in the Hawk Inlet area of Admiralty Island. The goals of this project were: 1) to determine, through scat analysis and direct observation, the food habits of both the "interior" and "coastal" brown bear populations that have been identified, 2) to determine, through chemical analysis, the nutritional values of food items found to make up these diets, and 3) to estimate digestibility of several important food items by conducting feeding trials utilizing captive brown bears at the Washington Park Zoo in Portland, Oregon.

The study site lies on the northern portion of Admiralty Island in the vicinity of Hawk Inlet. Six anadromous fish streams supporting runs of both pink and chum salmon are located within the study area. Alpine/subalpine, avalanche slope, old-growth spruce-hemlock forest, riparian old growth, and tidal wetland habitat types were also represented.

Collection of fecal and plant samples began in early June of 1984. All collecting was conducted out of a base camp established near the head of Hawk Inlet. Tidal flats, beach fringe forest, and low-elevation riparian forest and fish streams were reached by boat, while avalanche slopes and alpine/subalpine areas were accessed most frequently by helicopter. Fecal samples were sent by air to Juneau for freezing, pending analyses. Simple field analysis of scats by hand lens and by dissecting scope allowed for identification of many of the major food items. Forage samples were collected at known feeding sites to ensure representation of various stages of phenology. These samples were either air dried or sent to the Forest Sciences Laboratory in Juneau for oven drying. One hundred forty scats were collected throughout the course of the season.

Direct observation of bear feeding activity was possible while bears were on tidal flats, at fish streams, and on limited occasions, in the alpine. No observations were made of bear feeding activity on avalanche slopes or in forested areas. The field portion of the study was completed in early October.

Analysis of scats was completed during the winter of 1984-85. A combination of macro-occular estimation and microhystological techniques was employed. Voucher slides for plant fragment identification were prepared for most plants found in the study area. Hair and bone samples were used to identify animal remains. Forage samples were dried, ground, and sent to the Wildlife Habitat Management Laboratory at Washington State University, Pullman, Wa. Crude protein, fat and carbohydrate content, caloric value, and ADF-NDF percentages were determined.

Food habits data will be presented on a seasonal and spatial basis with 3 season classes (May-June, July-August, September-October) and 2 elevation classes (low-sea level to 1,399 ft, high-1,400 ft, and above). Food item importance was ranked on the basis of percent frequency of occurrence.

Twenty-eight food items occurred in scats during 1984. Carex spp. was the most important food item for both elevation classes in the May-June sample. In the low elevation class Equisetum spp. and skunk cabbage (Lysichitum americanum) also occurred frequently, while unidentified graminoids and Sitka black-tail deer (Odocoileus hemionus sitkensis) were found to be important in high elevation scats. In the July-August scats Carex spp. was again the most frequently occurring food item in both elevation classes. Salmon (Onchorhyncus spp.) was the second most prevalent food item in low elevation scats from mid-July until late August. Bears showed a marked preference for chum salmon over pink salmon when both fishes were present in the streams. Bears left the streams for higher elevation food sources at the conclusion of the chum run even though pinks were readily available. Equisetum spp. and skunk cabbage were still commonly found in these lower elevation scats as were berries of devil's club (Oplopanax horridus), blueberries (Vaccinium alaskensis), and salmonberry (Rubus spectabilis). Devil's club berries and skunk cabbage were important in high elevation samples of this season class. Very few scats (3) were collected in low elevations during September-October as most bears had moved up to avalanche slopes to feed on berries. Carex spp. and devil's club berries were joined by currants (Ribes spp.) as the most important high elevation food items for this season class.

During the winter of 1984-85 arrangements were made to run in vivo digestibility trials utilizing 2 brown bears maintained at the Washington Park Zoo. Trials began in June 1985. Results of these trials and chemical analysis of forage items will be used to interpret temporal and spatial dietary differences of brown bears.