

AERIAL SURVEY OF BROWN BEAR DENNING IN THE  
KATMAI AREA OF ALASKA

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ABSTRACT

In May 1974 an aerial survey of brown bear denning habitat was conducted in the Katmai region of Alaska. A total of 232 dens were located. The majority (70%) were found on hillsides between 500 feet (152 meters) and 1,500 feet (457 meters) in elevation. Most dens were situated in or near alder-willow patches indicating proximity to such vegetation may be a factor in den site selection. The gradient of slopes upon which dens were located varied from less than 25 degrees to 45 degrees, but slopes between 25 and 35 degrees appeared to be preferred. Most dens were situated on south facing slopes, but eastern exposures were also common. A total of 20 sites were checked on foot to determine the validity of aerial identification of brown bear dens. In three instances sites were mis-identified as to active or false dens from the air. Spring thawing conditions had caused partial collapse of the dens visited precluding accurate measurements.

\* Troyer was an employee of U.S. Fish and Wildlife Service at the time of the survey.

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INTRODUCTION

In May 1974 an aerial brown bear (Ursus arctos) denning survey was conducted in the Katmai region of the Alaska Peninsula. The objective of the survey was to determine the density and distribution of bear dens within the northern portion of the Aleutian Mountain Range.

The study was a cooperative effort between the National Park Service, Alaska Department of Fish and Game and the U. S. Fish and Wildlife Service. Funding was provided by the National Park Service, and the authors, who performed the field work were employees of the other agencies. Both authors had previous experience in brown bear research including some denning studies.

The study area encompassed all potential denning habitat between McNeil River and Nonvianuk Lake on the north and Becharof Lake on the south. This included the existing Katmai National Monument and areas proposed for inclusion into the National Park system under terms of the Alaska Native Land Claims Settlement Act (NPS, 1973).

\* Troyer was an employee of U. S. Fish and Wildlife Service at the time of the survey.

## DESCRIPTION OF THE STUDY AREA

The study area is located in southwestern Alaska at the base of the Alaska Peninsula. This area contains four physiographic regions--the coastline along the Shelikof Strait, the Aleutian Mountain Range, the lake region surrounding Naknek Lake, and the western tundra plains (Fig. 1).

The coastline is characterized by rugged mountains, prominent headlands, steep rocky cliffs, many offshore rocks and pinnacles. The watersheds of the sixteen major bays along the coastline are utilized by salmon for spawning. Typical hillside vegetation consist of dense alder-willow patches and tall grasses while the valley bottoms harbor balsam poplar, birch and some Sitka spruce.

The Aleutian Mountain Range separates the coast from the lake region. These mountains rise to over 7,000 feet (2,134 meters) and high peaks and valleys are covered with glaciers and snowfields. Because of volcanic activity much of this region is rocky and barren, providing little bear habitat except at the lower elevations. Vegetation is sparse and restricted to alpine plants. Streams have steep gradients and usually do not support salmon populations.

The lake region primarily encompasses the area draining into Naknek Lake. It is characterized by many lakes, rivers, streams, marshes and ponds. Mountains within this area rarely rise over 3,000 feet (914 meters) and, except for high peaks, are vegetated by alder-willow patches and grasses. Much of the lower elevations are covered by boreal forests of white spruce, birch, willow and balsam poplar. The numerous river systems are extensively used by salmon.

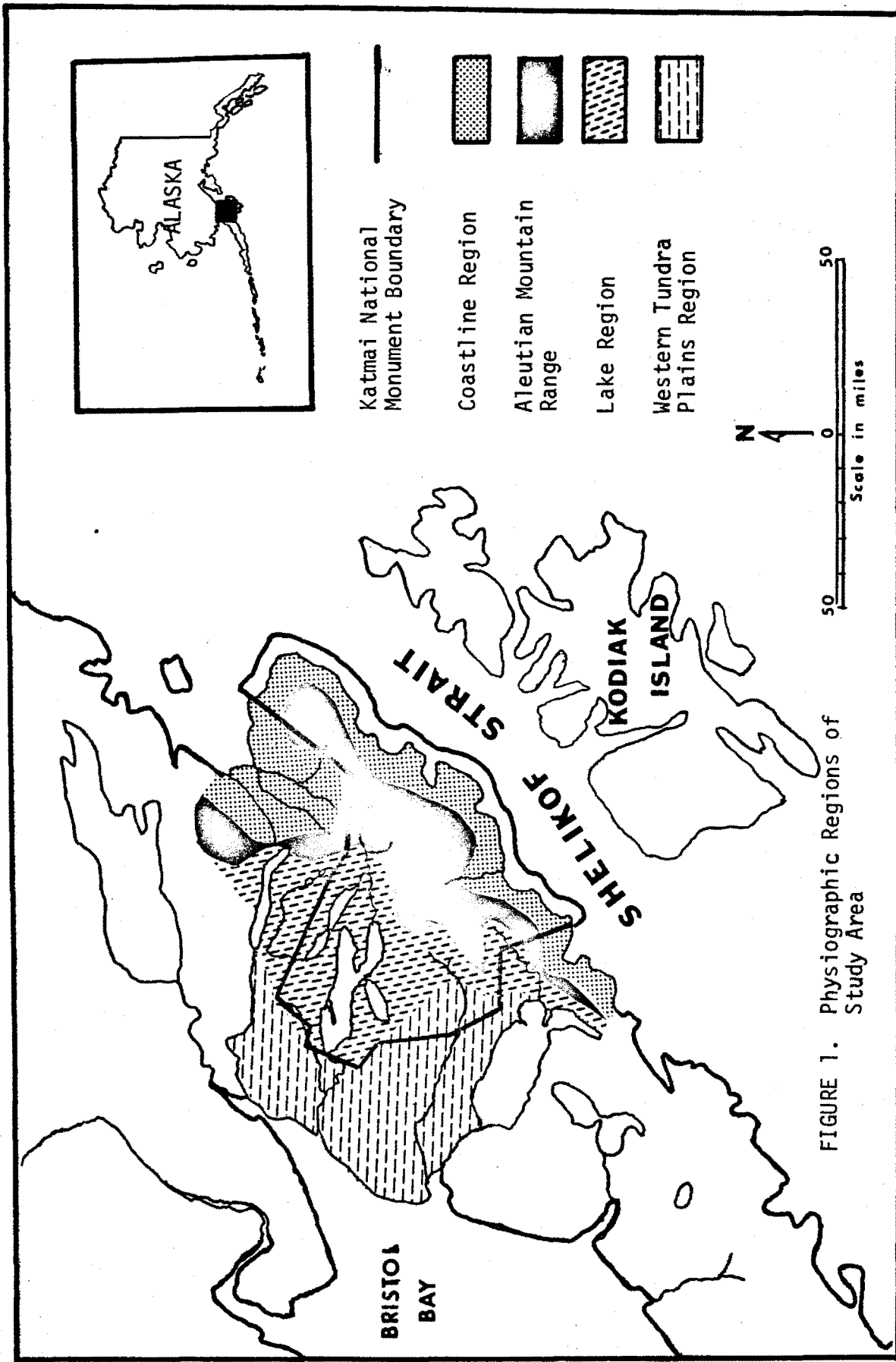


FIGURE 1. Physiographic Regions of Study Area

The western tundra plains consist of relatively flat terrain with numerous, poorly-drained lakes and long meandering rivers that are utilized by salmon. Low ridges break the uniformity of the terrain. Much of this region is covered by scattered black spruce and extremely low shrubs and sedges.

At the time of the survey, snow had melted from most of the denning habitat of the lake region and the western tundra plains, but was still present at the higher elevations in the coastline and the mountain regions.

#### METHODS

Aerial surveys were conducted using Piper Supercub (PA-18) and Super Cruiser (PA-12) aircraft equipped with 150 H.P. engines. These planes have the capability of slow flight, maneuverability, and provide excellent visibility. Surveys were flown on clear days during periods of no turbulence. All denning habitat was covered systematically by making one or more flights, depending upon terrain and elevation.

In snow free areas, dens were usually located by sighting mounds of excavated material. In snow, dens were located by dirt stains caused by the departing bears or tracks leading from dens. In a few cases, bears were at den entrances and attracted the observer's attention. When a potential den was sighted, low passes were often made to determine if the sighting was a valid den, a false den (partially excavated sites never used as dens) or merely small excavations made by bears in search of food. No attempt was made to distinguish between current dens and past years' dens where the dirt mounds remained non-vegetated.

Locations of each den were plotted on a U. S. Geological Survey map, scale 1:250,000. The elevation, estimated degree of slope, slope exposure direction and surrounding vegetation were also recorded for each. Dens checked on foot were measured and diagrammed.

Reconnaissance flights were conducted on April 25 and May 1 and 2, to determine the degree to which bears were emerging from dens. Little activity was noted on April 25, but by May 1 and 2 fresh bear trails were evident and nine dens were located. Aerial surveys were then conducted on May 5, 6, 7, 13 and 14 using two aircraft each day. Between May 7 and 13 the weather was exceedingly turbulent and no surveys were flown. On May 19, 21 and 23 the Kamishak, Little Kamishak, McNeil, Strike, American and Kulik drainages were re-flown as den emergence was delayed on these northernmost drainages. On May 30 dens were checked on foot at Becharof Lake.

### RESULTS

A total of 232 dens were found in approximately 94 hours of flying. The largest concentrations were in the Naknek Lake area; specifically on Mount Dumpling, Mount LaGorce, along the Savonoski River and along the mountain foothills north of Lake Colville and Lake Grosvenor. Additional areas of dense concentration were the upper Kamishak drainage, Contact Creek, Puale Bay, Douglas River and on the islands of Becharof Lake (Fig. 2).

One hundred and seven dens were located within the present boundaries of Katmai National Monument; with an additional 58 inside the proposed northern extension boundaries; 27 inside the proposed southern extension

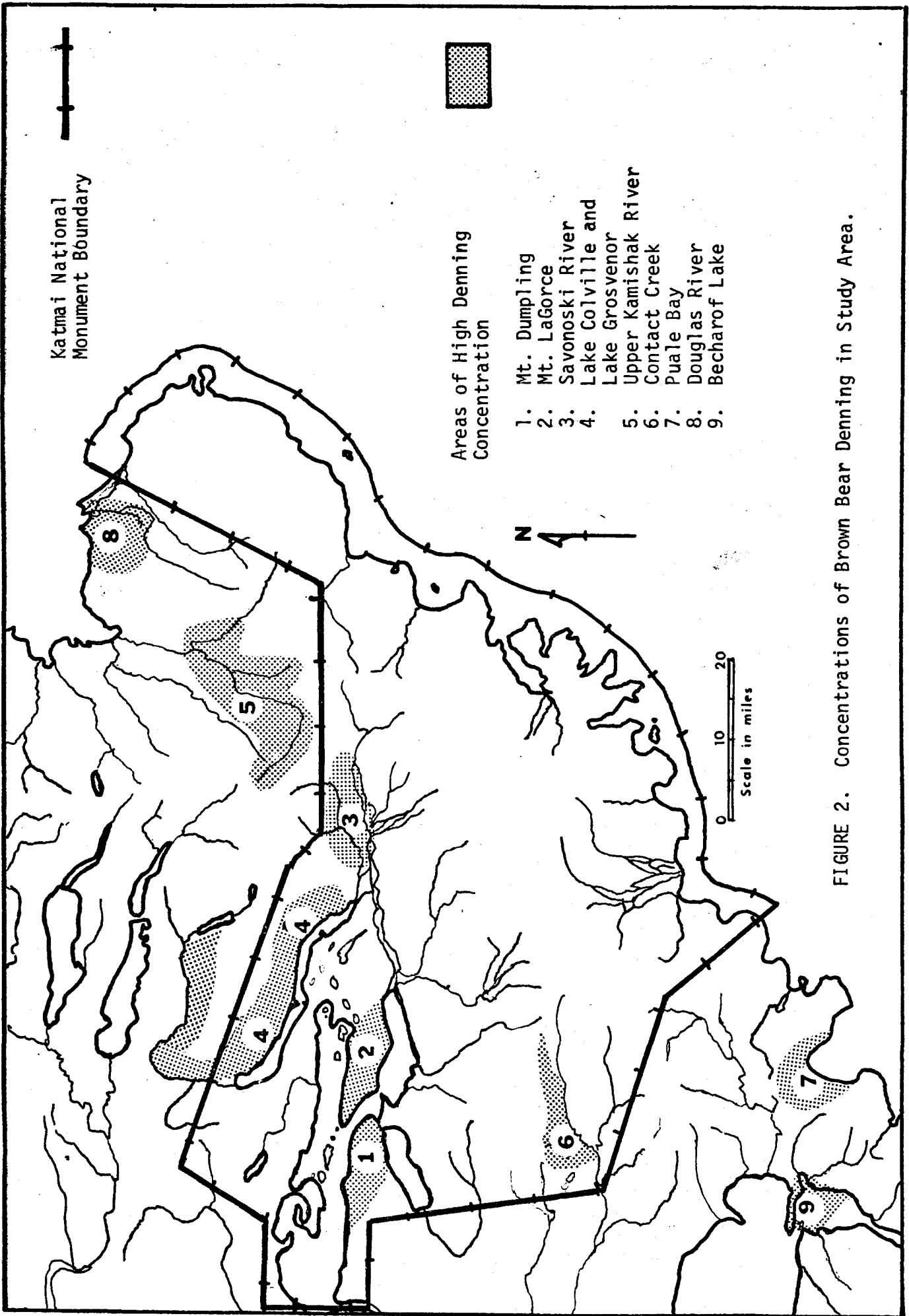


FIGURE 2. Concentrations of Brown Bear Denning in Study Area.

boundaries; 20 outside the northern extension; and 20 outside of the southern extension. Areas nearly devoid of dens included the high mountain regions and the lowland tundra west of the monument boundary.

Most of the dens (70%) were located in terrain ranging between 500 (152 meters) and 1,500 feet (457 meters) in elevation, with the majority lying between 700 (213 meters) and 1200 feet (366 meters) (Table 1).

Nine percent of the dens were situated below 500 feet (152 meters). Nearly all of these (14 dens) were on the islands of Becharof Lake. Becharof Lake is 14 feet above sea level and few of the islands rise more than 50 feet (15 meters) above the lake level. Several of these dens were located within a few feet of the lakeshore.

The mean elevation of dens (1,300 feet or 396 meters) was similar to that reported by Lentfer et al, 1970 for the lower Alaska Peninsula. This contrasts with 1,800 foot (548 meters) average elevation reported for dens on Kodiak Island (Lentfer et al 1970). Terrain slope of less than 25 degrees was observed for 62 dens, while 152 dens (65.5%) were located on slopes of 25 to 35 degrees. Only 18 dens were recorded from slopes greater than 35 degrees, and none were recorded from slopes in excess of 45 degrees. Sparse vegetation and potential snowslides may be factors that discourage den sites on steep slopes.

South-facing slopes were most commonly selected by denning bears, with east-facing slopes second in importance (Table 2). This contrasts with the findings of Lentfer et al (1970) who reported north and east facing slopes to be the most commonly used.



Table 1. Frequency Elevation of Bear Dens in the Katmai Area, Alaska Peninsula

Feet Above Sea Level	Number	Percent
Below 500 (152 meters)	20	9
500-1000 (152-305 meters)	98	42
1001-1500 (305-457 meters)	65	28
1501-2000 (458-610 meters)	43	18
2001-2500 (610-762 meters)	4	2
Above 2600 (792 meters)	<u>2</u>	<u>1</u>
	232	100

Table 2. Slope Orientation of Bear Dens in Katmai Area, Alaska Peninsula

Slope Face Direction	Number	Percent
N	23	10
NE	23	10
E	34	15
SE	16	6
S	83	36
SW	24	11
W	25	11
NW	<u>4</u>	<u>1</u>
	232	100

Dens were most commonly situated within or at the base of willow or alder patches (124 dens). Sixty-four dens were surrounded by grass but were often close to alder patches. In some instances the dens were in alpine vegetation and at the higher elevations with deep snow cover the surrounding vegetation could not be determined.

#### DISCUSSION

It was often difficult to distinguish valid dens from those partially excavated and not used. The size of the excavated mound at the den entrance and the diameter of the entrance were useful criteria in judging the validity of a den. No doubt errors occurred, however, questionable dens were not counted and other valid dens were missed so the number of dens located is considered conservative.

In an attempt to assess the accuracy of den identification from the air, 14 valid dens and six false dens were checked on foot. Two of the false dens (partially excavated) were previously judged to be valid dens. One den, considered to be false, was proven to be a recently used den.

Den measurements were attempted for those checked on the ground, however, all were partly collapsed and measurements could not be considered accurate. This was particularly true of the depth since the ceiling was usually partially caved in. The length from the entrance to the rear of the denning chamber varied from six (1.8 meters) to twelve feet (3.7 meters), but averaged about eight feet (2.4 meters). The chamber itself was usually four to five feet wide (1.2 to 1.5 meters) and three to four feet (.9 to 1.2 meters) in depth. All dens had a single entrance, however, two or more dens were frequently located within a few hundred feet of each

other. The den entrance and chamber were often supported by alder roots and possibly this may be a factor in den site selection. This habit is similar to that reported by Craighead and Craighead (1972) for grizzlies in Yellowstone Park where often the den entrance was under a spruce or fir tree. Occasionally, however, dens appeared to be nothing more than shallow depressions in areas that would be drifted closed by snow.

Dens normally occurred on vegetated slopes containing soil while hard rocky non-vegetated slopes rarely contained dens. It is not known whether old dens are reused but since most collapsed during the period of spring thaw, it is doubtful that reuse is extensive.

Denning in the low islands of Becharof Lake was considered atypical since denning generally occurs at higher elevations. Deep, well used bear trails crossing these islands indicated extensive use had occurred for many decades.

Two dens located by one of the pilots near Lower Talarik Creek on the north side of Lake Iliamna were also checked. Neither den was more than 150 feet (46 meters) above the lake level and both were far removed from the usual mountain habitat. All dens observed were on well drained slopes. This appears to be an important factor in den selection.

During the first survey of Strike Creek, McNeil River, Kamishak River and Little Kamishak River (May 6), the areas were still covered with deep snow and only five dens were located. When reflowed on May 19, twenty additional dens were located on Kamishak River. Nine additional dens were located during a survey of Little Kamishak River and McNeil River on May 21. Obviously bear emergence was just beginning on May 6. Deep snow may have been a factor in the delay of emergence.

Several drainages which harbor high bear populations during summer months had few dens and apparently possess poor denning habitat. This was true of Hallo Bay, and the McNeil River State Game Sanctuary. It is not known whether the bears that utilize these areas in the summer move into other drainages for denning or if local den locations were not apparent from the air.

During the course of the survey, six dens still occupied by bears were located. Three of these dens apparently contained single bears, two of the dens had sows with yearling cubs, and one den had a sow with two cubs-of-the-year.

A reconnaissance flight was conducted with a Cessna 185 immediately south of Becharof Lake on June 2. A number of additional dens were located on Pulik Mountain, an area that has been noted as denning habitat in Alaska's Wildlife and Habitat (1973). This entire area appears to be excellent bear habitat with many trails crisscrossing the valley floors.

From previous experience it appears that some of the drainages covered in this survey compare favorably with the better habitat on Kodiak Island. Additional work, however, will be necessary during the summer months to get an index and estimate of bear population numbers in the Katmai region.

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