

Kenai Peninsula Brown Bear Studies:

Report of the Interagency Brown Bear Study Team, 1985

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KENAI PENINSULA BROWN BEAR STUDIES:

Report of the Interagency Brown Bear Study Team, 1985.

by:

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A report of the Interagency Brown Bear Study Group,
Printed, June, 1986.

SUMMARY

This report summarizes work conducted during the 1985 field season on brown bear (Ursus arctos) from the Kenai Peninsula, Alaska. Ground surveys were conducted to assess brown bear habitats in five areas. Eighteen salmon streams were surveyed to determine the extent of brown bear use of spawning fish. Aerial surveys, bear tagging efforts, and radio-tracking efforts were successful and indicate that intensive bear studies are feasible, but likely will be expensive. A user survey on the Russian River/ Resurrection River/Cooper Lake trail system indicated a 13% increase in use from the 1984 survey. Recommendations for continued work are given.

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Preface

This is the second report of the Kenai Peninsula Interagency Brown Bear Study Team (IBBST). The group was formed in 1984 following joint meetings between the U. S. Forest Service (USFS), U. S. Fish and Wildlife Service (USFWS), and the Alaska Department of Fish and Game (ADF&G). The group was established to coordinate efforts in collection of scientific information relative to brown bears on the Kenai Peninsula. The major goal of the group is to establish a data base that will aid land managers in meeting the primary goal of maintaining a viable brown bear population on the Kenai Peninsula. This report contains some of that data base. It was prepared by the interagency group, as a joint effort. G. L. Risdahl, C. A. Schloeder, and E. E. Bangs prepared the original draft, while I functioned primarily as editor. A field survey to assess habitats and salmon spawning areas was conducted by G. L. Risdahl and C. A. Schloeder. Numerous people assisted with bear surveys, tagging efforts, and radio-tracking surveys. We are especially grateful to the USFWS pilots Bill Larned, Bob Richey, and Bob Delaney for the hours of early morning and late evening surveys. We thank C. Lofsted and M. Hauk for their skill in flying the tagging helicopter. We thank T. Bailey and J. Bevins for assistance with bear tagging, and M. Portner for her assistance in radio-tracking. Al Franzmann and Steve Peterson reviewed the draft, while B. Townsend provided editorial review. Everyone involved helped make this report better, and we appreciate that.

Charles C. Schwartz
Chairman, IBBST

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INTRODUCTION

This report summarizes field efforts conducted by the IBBST on the Kenai Peninsula from May to October, 1985. It updates the 1984 efforts (Bevins et al. 1985) and includes recommendations for future field research and management concerning brown bears. This season's objectives were to:

1. Conduct ground surveys to estimate bear use, on the Kenai Peninsula, of known and suspected brown bear use areas not surveyed in 1984.
2. Update the 1984 information on historic and present brown bear distribution, and salmon abundance and distribution.
3. Continue to conduct aerial surveys on a portion of the Kenai Peninsula in an effort to identify brown bear use areas.
4. Continue to estimate the costs of capturing brown bears by helicopter darting for subsequent radiotelemetry studies.
5. Begin to monitor movements of radio-collared brown bears.
6. Continue to monitor human use and human/bear interaction within the Russian River/Resurrection River/Cooper Lake trail system.
7. Interview biologists and local residents to obtain information relative to the Kenai Peninsula Brown Bear Step-down Plan.

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MATERIALS AND METHODS

Ground Surveys

Ground surveys were conducted on five drainages that agency biologists believed were important brown bear use areas not surveyed during the 1984 field season. These areas included the Funny River and Mystery Creek drainages; the upper portion of the Chickaloon River; the tributaries of Skilak Lake; Deep Creek; and the Snow River Pass/Paradise Valley/North Fork of Snow River area. In addition, three drainages known to have received much use by both humans and brown bears in 1984 were re-examined. These areas included the Cooper Lake/Upper Russian Lake area, the South Fork of Snow River, and the Resurrection River drainage (Fig. 1).

Survey routes were divided into segments based on vegetative and topographic characteristics. Habitats were evaluated on the presence of brown bear sign and the abundance of known and suspected bear foods, using methods described by Herrero et al. (1983). A field form (Appendix I) was used to record relative densities (high, medium, low, and trace) of potential bear foods. Survey routes varied depending on topography, weather, and vegetative conditions. Surveys were limited to priority habitats and suspected use areas, plus probable travel routes. Areas surveyed were accessed by foot, float plane, helicopter, or boat. Each survey lasted approximately 3-5 days. Areas were examined on foot using man-made or game trails, and by cross-country travel. Alpine areas, snow chutes, meadows, and other openings were searched for brown

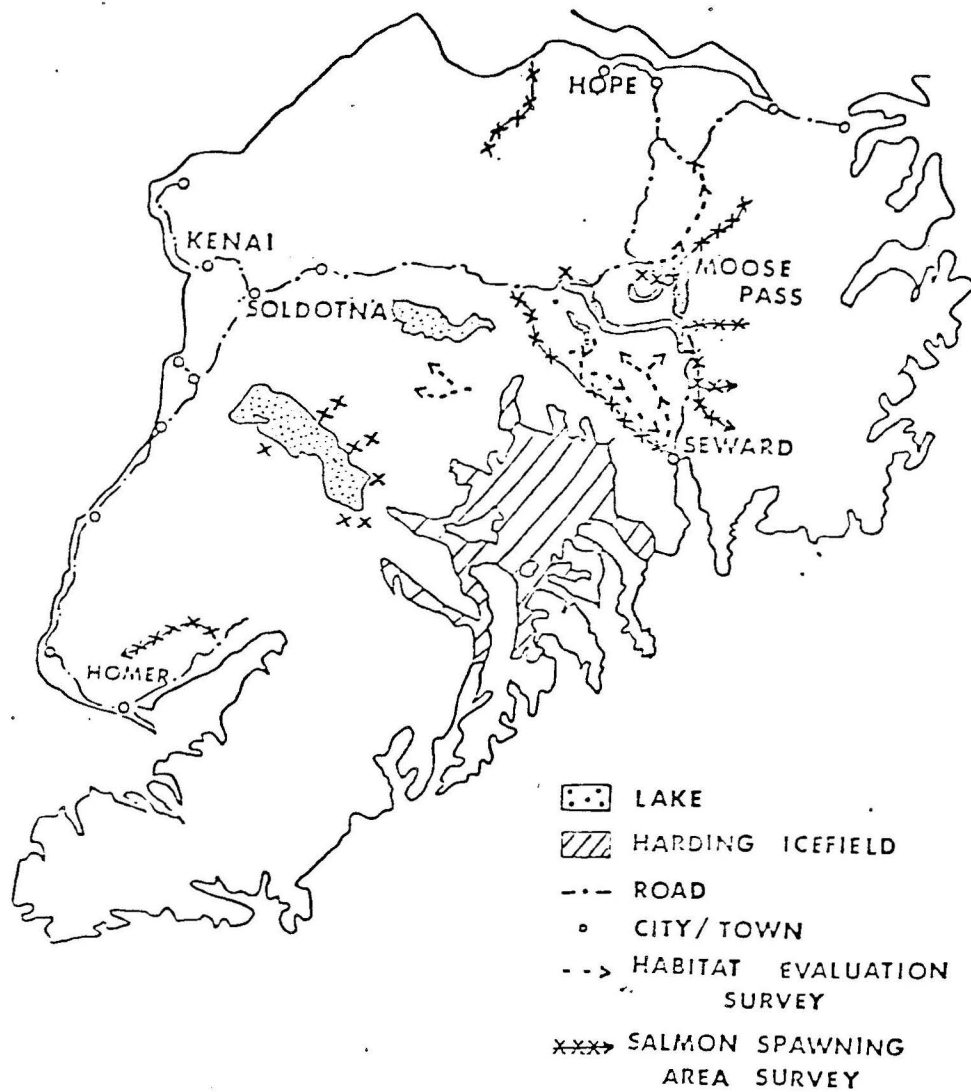


Figure 1. Location of ground survey conducted on the Kenai Peninsula, Alaska, 1985.

bears with 8-10 power binoculars. Survey routes, bear observations, and bear sign locations were plotted on 1:63,360 scale USGS quad maps.

As in 1984, a major effort was placed on surveying salmon spawning streams. Eighteen streams and rivers were surveyed at least once; the South Fork of Snow River and its tributaries were examined twice. Stream surveys were usually undertaken at or just after the peak of salmon migration when brown bear activity was presumed greatest. Stream survey routes varied according to the physical characteristics of the stream and adjacent topography. During surveys, we either walked in the water or along the bank, depending on water depth and swiftness, steepness of the terrain, and thickness of stream-side vegetation.

Salmon spawning streams were evaluated on the presence and abundance of brown bear sign and the availability of salmon. Visual estimates of the number of live salmon, salmon carcasses fed on by bears (bear kills), and other salmon carcasses, were made. Live salmon counts were estimates of the total fish present in the survey area. Estimates of bear-killed salmon were only partial estimates since many carcasses were missed in the heavy stream-bank cover, and because bears carried some carcasses beyond the survey area immediately adjacent to the stream (i.e. >50m). Unlike salmon streams surveyed in 1984, streams surveyed this year had fewer salmon, thus allowing for complete fish counts.

On both salmon stream and habitat surveys, tracks and scats were used to determine the extent to which brown and black bears used an area. Tracks were measured (length and width) to estimate the number of individual bears using an area. Track quality varied depending upon the substrate. Generally, stream bottoms were best for track identification, while open meadows and bogs were the poorest. In

addition to tracks, bear use was also determined by evidence of bear rubs on trees, bear trails (distinguished from ungulate trails by their characteristic "foot print pattern"), hair, and beds. The age of all sign was estimated. Suspected brown bear scats encountered were collected and visually examined for potential food items.

Aerial Surveys and Bear Tagging Efforts

Aerial surveys were conducted between 19 June and 24 July, 1985, in an effort to locate and tag brown bears. Surveys were flown over suspected high use areas in both alpine habitat and salmon spawning streams on portions of the Kenai National Wildlife Refuge (KNWR) and the Chugach National Forest (CNF). Surveys were flown with either a Piper Super Cub or Cessna 206. To maximize bear sightings, surveys were concentrated on cloudy days during early morning and late evening.

Once a bear was sighted, the pilot and observer estimated the bear's sex and age, and determined the feasibility of capture. We then attempted to capture and process those bears that were in suitable terrain and habitats, using a Bell Jet Ranger and methods previously described by Schwartz et al. (1983). All captured bears were processed (Schwartz et al. 1983) and fitted with radio collars (Telonics, Inc. Mesa, Ariz.) that contained an inverse mortality mode set to change pulse rate after 10 minutes. With this collar, the pulse rate remained at 75 beats/min. as long as the collar was moved at least once every 10 min. if it remained motionless longer than 10 min. the pulse rate dropped to 50 beats/min. Radio-collared bears were located at least weekly (more often if weather permitted), using fixed-wing aircraft.

Brown Bear Observations and Mortality

The composite map first constructed in 1984 (Bevins et al. 1985) was updated to include new brown bear observations; reported hunter harvest and defense of life and property kills (DLP); new information on salmon spawning areas; and areas of high brown bear use. The 1985 survey routes were also marked on a separate acetate overlay.

Biologist's observations of brown bears, verifiable observations made by the public, and observations recorded on bear observation cards (Bevins et al. 1985) that were available to the public at the Russian River/Resurrection River/Cooper Lake trail heads, were plotted on the map following methods used in 1984. All observations were recorded on observation cards and filed.

Russian River/Resurrection River/Cooper Lake Trail Survey

Human use and bear/human encounters in the Russian River, Resurrection River, and Cooper Lake trail system on the Chugach National Forest were monitored using a visitor-counting system and questionnaire (Bevins et al. 1985). Four electric-eye counters were again used to determine visitation levels within the trail system. Counters were placed in the same locations used during the 1984 study.

Counters were installed at the Russian River, Cooper Lake, and Resurrection River trailheads on 1 and 2 July, respectively. The devices were checked at approximately 2 week intervals, with a minimum and maximum time interval of 9 and 20 days, respectively. Data

collection continued until 2 September at the Cooper Lake and Resurrection River trailheads, and until 16 September at the Upper and Lower Russian River trailheads. Formulas for determining the average number of people using the trailhead system daily were those described by Bevins et al (1985).

Visitors using the trail system were asked to complete a questionnaire concerning their trip and any bear sightings. The forms were the same as last year's (Bevins et al. 1985), and were placed in the same locations. Questionnaires were collected from mid-June to early September.

RESULTS AND DISCUSSION

Ground Surveys

Ground surveys were conducted in five new areas in 1985, and in 3 areas previously surveyed in 1984. Detailed field summaries, including habitat evaluation and food abundance reports, are listed in Appendix II. Three brown bears were observed during these surveys, including two lone adults encountered on the Funny River and one on West Cecil Rhodes Mountain. We encountered two brown bears on the Funny River at close range (8 and 30 m) while surveying for spawning king salmon. Both bears responded to our presence by growling and woofing loudly, then fleeing. The third brown bear was feeding in a small subalpine meadow surrounded by alders. We observed it from a distance of a quarter mile and it was unaware of our presence.

Brown bear sign was observed in all areas surveyed. The extent of brown bear use varied considerably among areas; detailed discussions of each survey are listed in Appendix II. Tracks, scats, hair, "rub trees," and "foot-print-trails" were most commonly noted along man-made trails and natural travel routes such as stream or river bottoms, saddles, and low passes. Digs were observed occasionally in open meadows or along salmon spawning streams. Beds were usually located near salmon spawning streams. Bear-stripped trees were found near salmon streams and along bear trails. Evidence of bear activity in the alpine was usually limited to scats, which were numerous. Brown bear hair was occasionally observed in the alpine.

Brown bear scats collected during spring were composed primarily of grass/sedge and/or horsetail (Equisetum spp.). As summer commenced, a greater variety of green vegetation was noted in scats, but a preponderance of horsetail remained. Scats containing vegetation as well as salmon were found from mid-summer through fall. Most fall scats and some late summer scats were composed of berries, the most common being crowberry (Empetrum nigrum), high bush cranberry (Viburnum edule), devil's club berry (Echinopanax horridum), low bush cranberry (Vaccinium vitis-idaea), and blueberry (V. spp.). Fresh vegetation scats were occasionally found in the fall.

A few digs were encountered but it was often difficult to determine their purpose. It appeared that most digs were attempts to excavate some species of tuber or root, underground colonial insect nests, or rodents. Digs along salmon streams were probably day beds in the cool sand or places where bears had dug for decaying salmon carcasses during early spring or late fall.

Updated information was obtained for 18 salmon spawning streams within 6 of the 12 geographic areas described by Bevins et al. (1985); these included areas B, D, E, G, I, and J (Fig. 2).

Chickaloon River - Area B:

Area B encompasses the entire Chickaloon River water shed (Fig 3.). Portions of Mystery Creek and the Upper Chickaloon River were surveyed in July. Estimates by the USFWS of the number of king salmon (1000) and sockeye salmon (5-6000) spawning in Mystery Creek were unchanged (Jack Dean pers. commun.). Evidence during our survey suggested that brown bear use of the area was minimal. Only one set of brown bear tracks and four bear-killed salmon were seen on the 22.6 km stretch of stream we surveyed. In addition, USFWS fisheries biologist Jack Dean reported no evidence of brown bear use on Mystery Creek all season.

Brown bear use of the upper Chickaloon River was moderate to heavy. Jack Dean reported that last year, the use was even greater. This decreased use was attributed to the absence of pink salmon in 1985, plus unusually clear, shallow waters. The 1984 survey on the lower Chickaloon in August (Bevins et al 1984), confirmed intensive use by brown bears. Estimates of salmon numbers in the Chickaloon River were 2730 King Salmon , 5600 Sockeye, 5000 Coho, and 100,000 Pink (even-year runs only) salmon.

Lower Kenai River - Area D:

Area D encompasses the tributary rivers and streams of the Kenai River, below and including the Russian River (Fig. 4). Three tributary

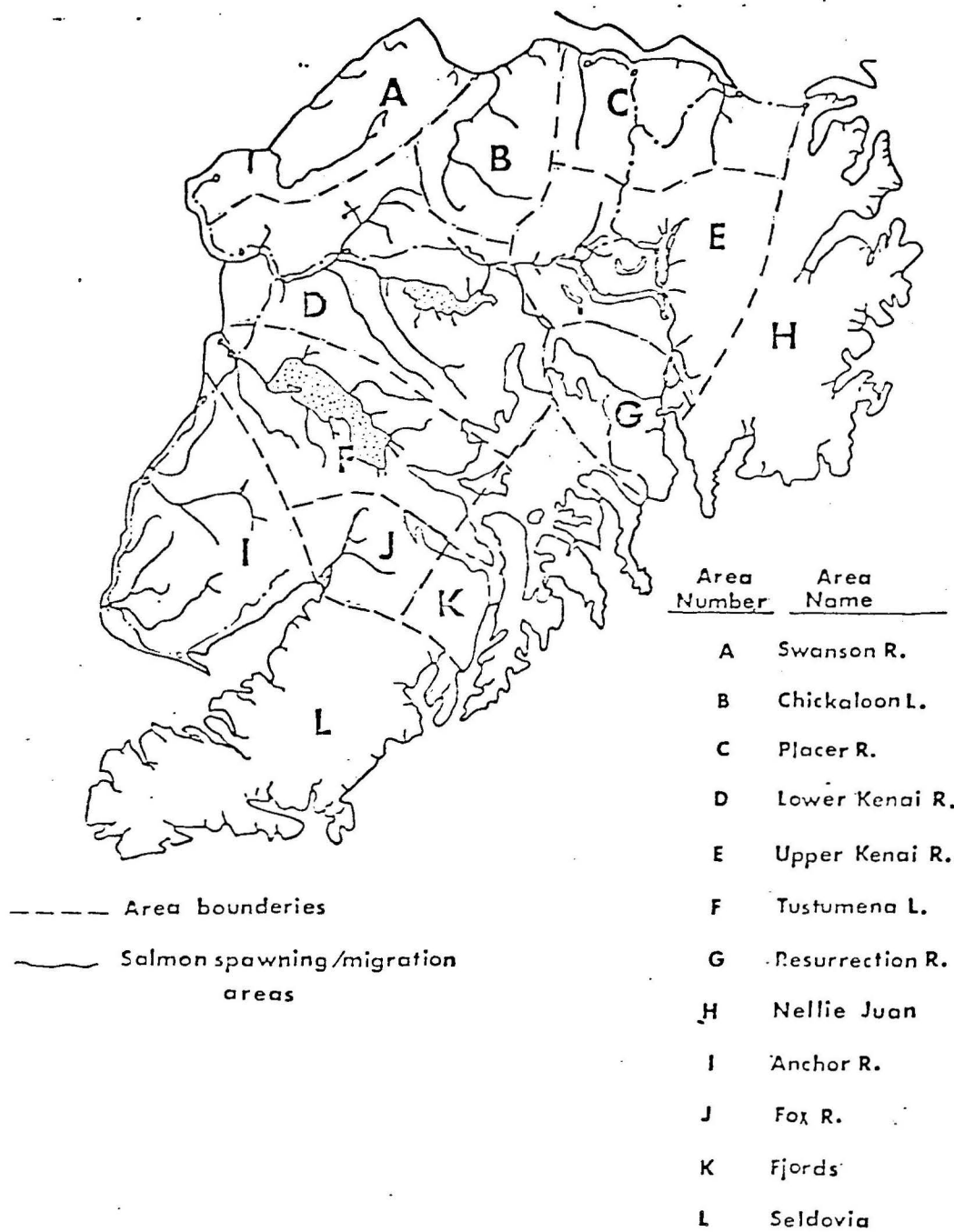


Figure 2. Geographic areas on the Kenai Peninsula, Alaska.

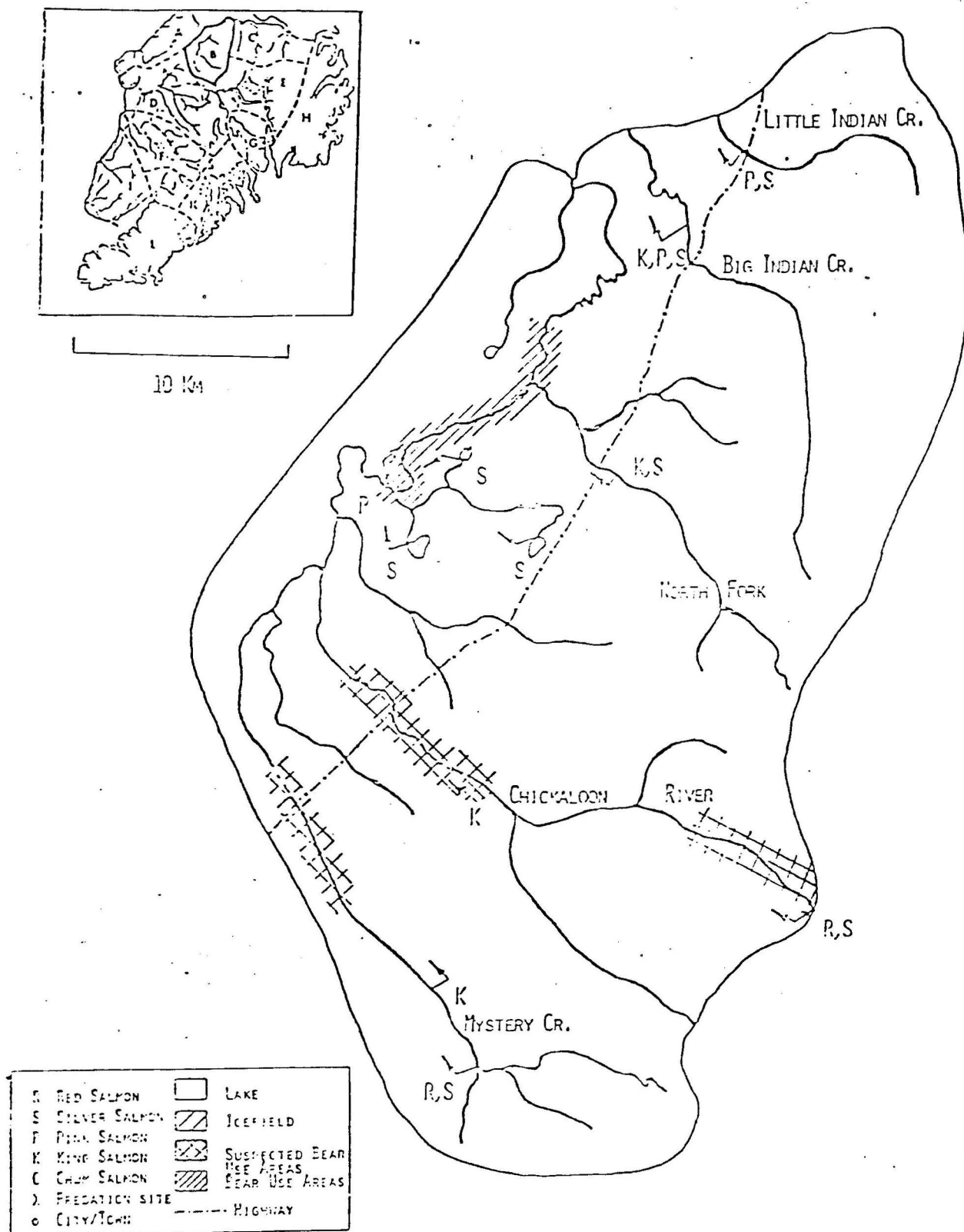


Figure 3. Salmon distribution and brown bear use of spawning Area B of figure 2, Kenai Peninsula, Alaska 1935.

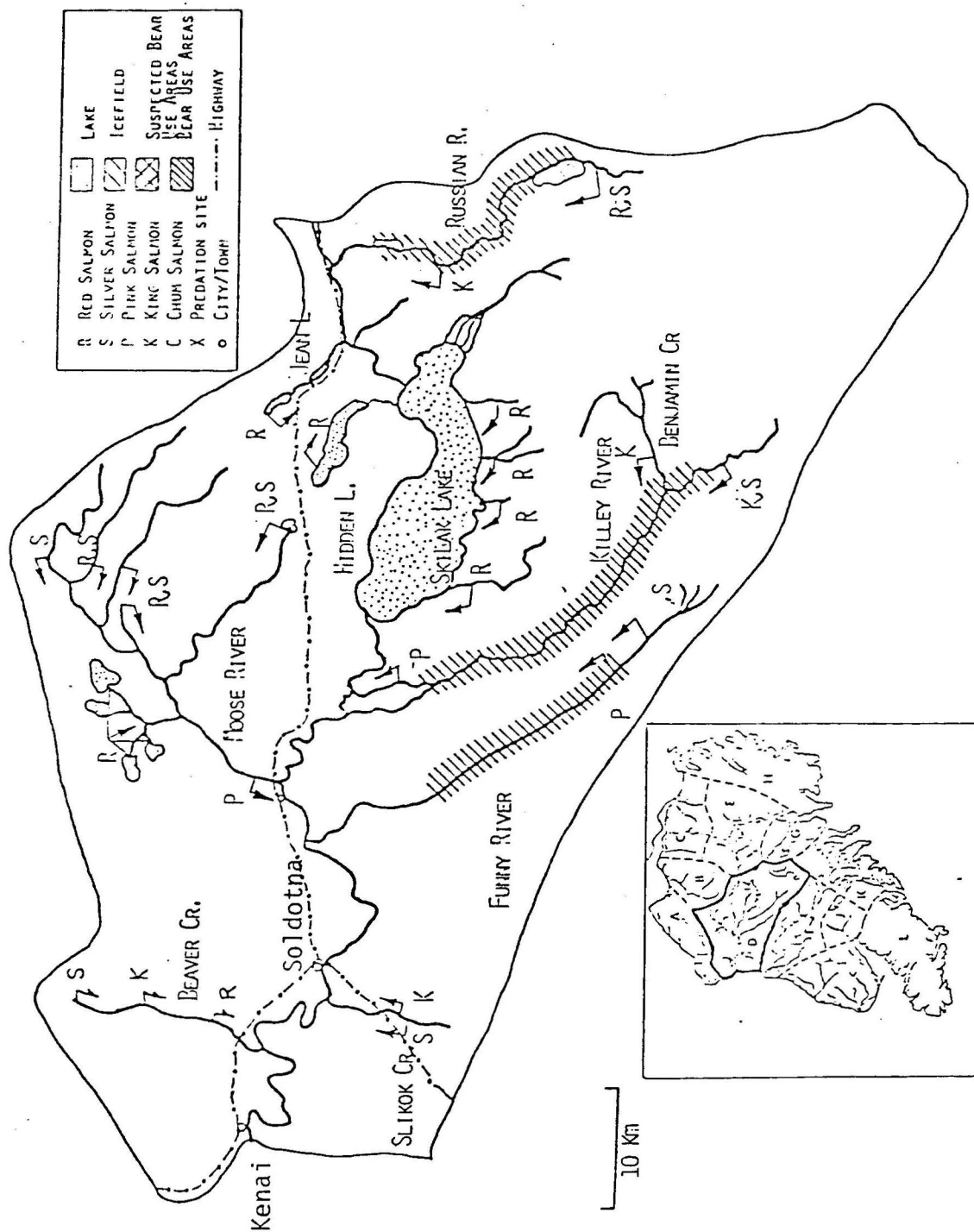


Figure 4. Salmon distribution and brown bear use of salmon spawning Area D (Lower Kenai River) of figure 2, Kenai Peninsula, Alaska, 1935.

streams on the south side of Skilak Lake were surveyed in July. These streams include Cottonwood Creek, Pipe Creek, and King County Creek. We observed no use of these streams by brown bears. Both Pipe Creek and Cottonwood Creek had steep stream gradients, lacked suitable spawning gravel, and contained no salmon when surveyed. Salmon have been reported to spawn at the mouths of these streams (Bevins et al. 1984);

King County Creek appeared to be suitable for salmon spawning, however, no evidence of past or present spawning activity was observed. Sam Ward, a long-term, full-time resident of nearby Caribou Island, annually fishes for silver salmon at the mouth of this creek.

The Moose River was surveyed by USFWS personnel this year. They estimated that 3000 Sockeye, 600 Coho and a few Pink and King salmon use this system (Dean, pers. commun.). Brown bear use was observed to be low. One brown bear was sighted along the stream during a USFWS flight.

We surveyed a 16.1 km stretch of the Funny River. Only 19 live king salmon were observed, but brown bear use of the stream was considered to be intense. Two brown bears were encountered during this survey and two additional radio-collared bears were located two and five miles downstream the same day. Brown bears have been observed to use the Funny River on a regular basis. It appeared that during our survey, brown bears had moved into the area and were waiting for the salmon to arrive. Five of six radio-collared bears utilized the Funny River. The salmon migration was approximately 1 to 2 weeks late this year because of the cold spring weather. The tracks of nine different brown bears were documented during this survey.

Upper Kenai River - Area E:

Area E includes all of the Kenai River watershed east of the Russian River (Fig. 5). Trail Creek was not surveyed this year, but brown bear use of the area was documented. Two separate USFS fisheries crews encountered brown bears feeding on salmon at the mouth of Trail Creek near Johnson and Railroad Creeks. Two other USFS parties observed brown bears while hiking along the railroad tracks near the outlet of Trail Creek into Upper Trail Lake. As the salmon run progressed, 2 subadult brown bears were repeatedly sighted fishing at the mouth of Trail, Railroad, and Johnson Creeks.

We surveyed the South Fork of Snow River in May and again in September. Brown bear use was noted both times, but was much heavier during September, 2-3 weeks after the estimated peak of the sockeye salmon run. Brown bear use was most intense along the clearwater tributary creeks used by spawning salmon. Four brown bears were estimated to have been using the area during our May survey and six in September. Two USFS fisheries technicians encountered a large brown bear on the first tributary creek on 6 August. (See Salmon Survey on the South Fork of Snow River, 9/4 -6/85, App. II.) This bear charged the two technicians and knocked one of them to the ground, stepped on her and tore her shirt. On 2 September, a hunter shot and killed a charging brown bear further upstream. Physical and behavioral descriptions by both parties suggest that the same bear may have been involved in both incidents.

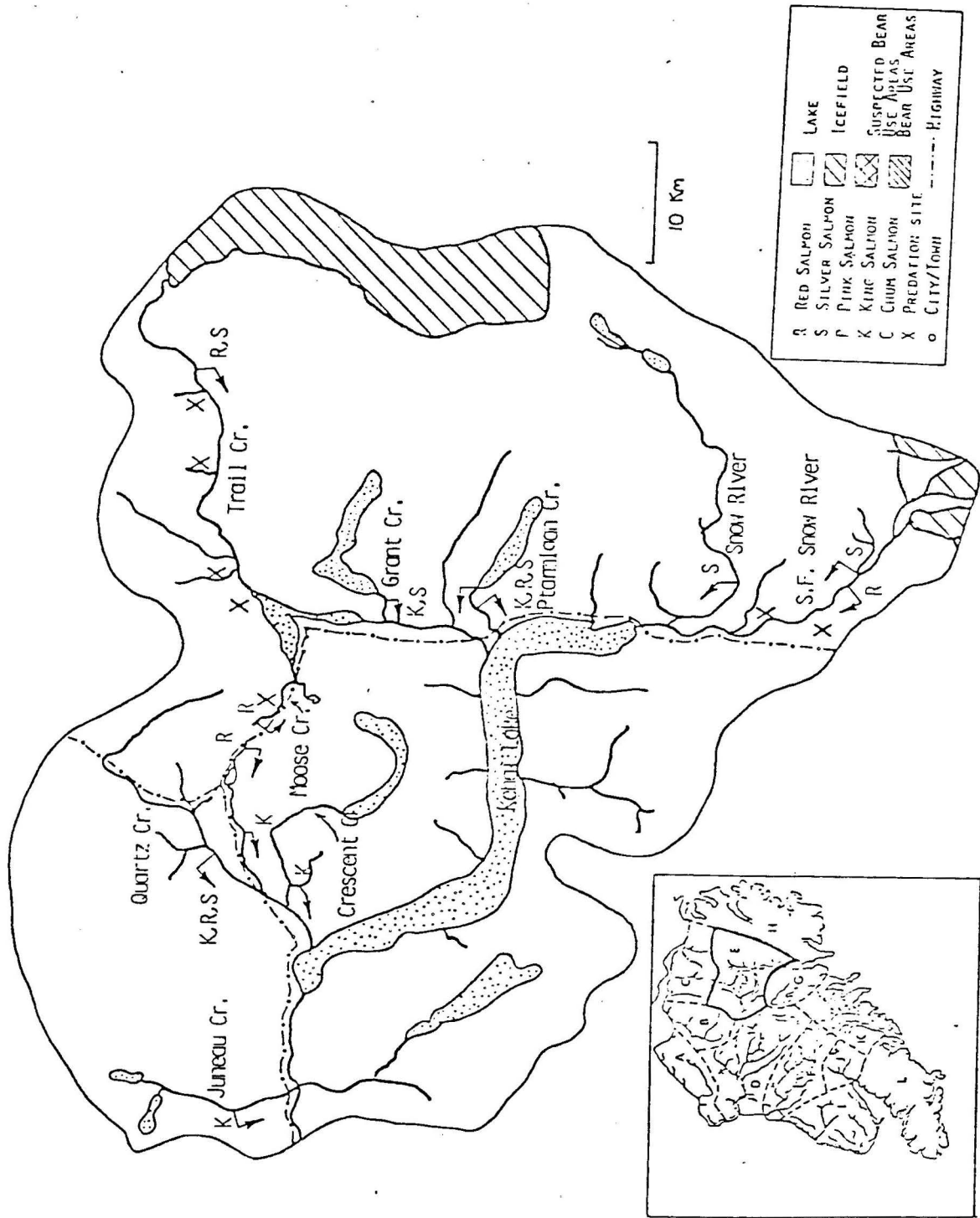


Figure 5. Salmon distribution and brown bear use of salmon spawning Area E (Upper Kenai River) of figure 2, Kenai Peninsula, Alaska, 1935.

Resurrection River - Area G:

The Resurrection River and its tributaries make up the region encompassed by Area G (Fig. 6). In 1984, USFS wildlife technicians surveyed the tributary creeks of Resurrection River upstream of Martin Creek, including Martin Creek on the northeast side of the river (Bevins et al. 1985). This season, we attempted to document brown bear use of the clearwater tributaries on the southwest side of Resurrection River. We examined Placer Creek, Moose Creek, and an unnamed creek a short distance upstream of Moose Creek. No evidence of spawning salmon was found in any of these creeks. Tracks of only two brown bears were seen in the areas surveyed.

Anchor River - Area I:

Area I encompasses the Ninilchik River, Deep Creek, Stariski Creek and the Anchor River systems (Fig. 7). We surveyed portions of the middle fork and north fork of Deep Creek from 9-12 August. Our survey was conducted at least one to two weeks past the peak of the king salmon run; consequently, there were few live kings left in the system. We found brown bear use especially heavy on the middle fork of Deep Creek and around the junction of the two forks. Our survey up the north fork was less extensive (3.2 km verses 12.9 km), but it appeared that brown bear activity was less on the north fork. We estimated that at least 11 different brown bears had been using the middle fork during the peak of the salmon run, and at least two browns had used the lower three kilometers of the north fork. Activity below the two forks was minimal, because the stream was deep and turbid.

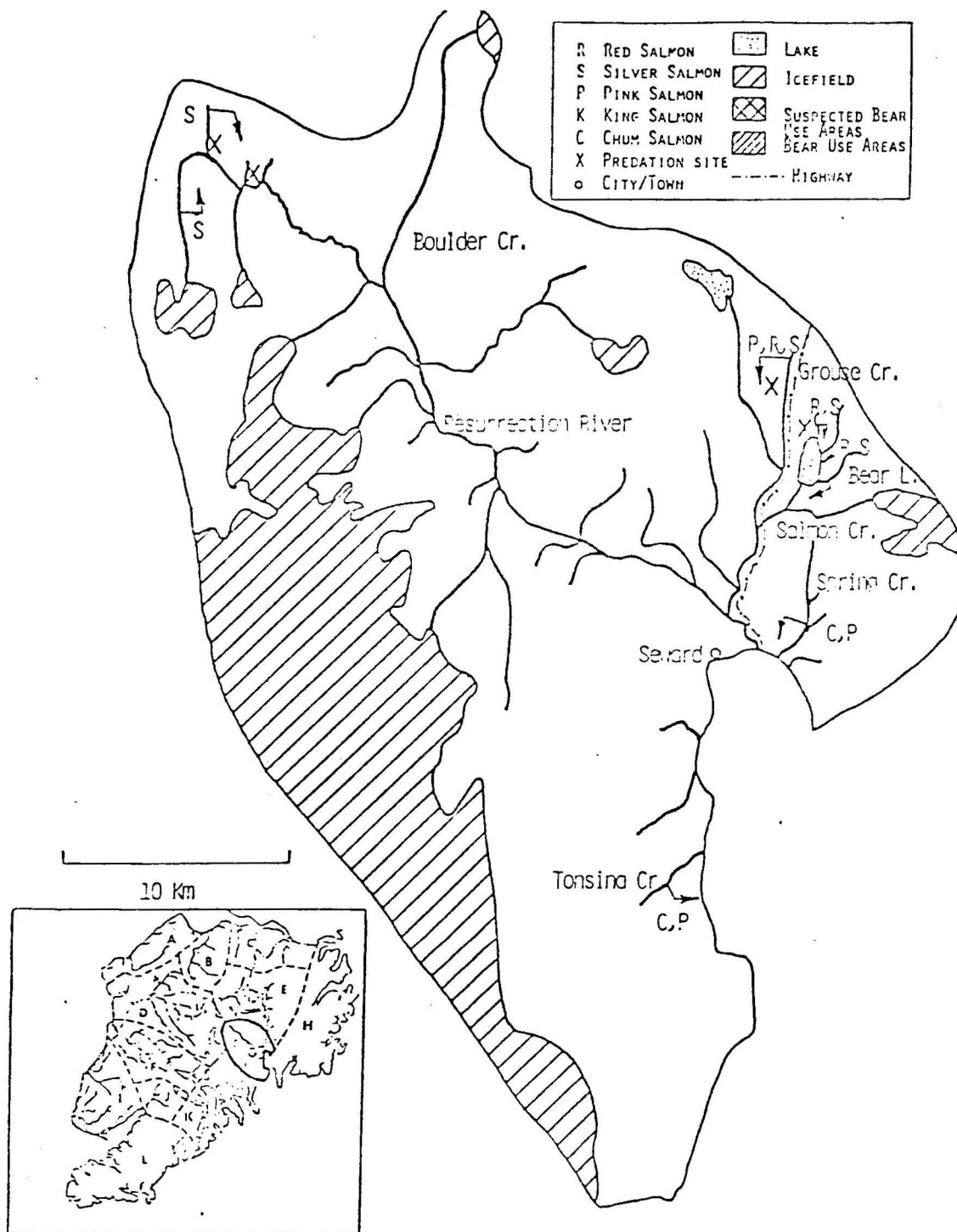


Figure 6. Salmon distribution and brown bear use of salmon spawning Area G (Resurrection River), of figure 2, Kenai Peninsula, Alaska, 1985.

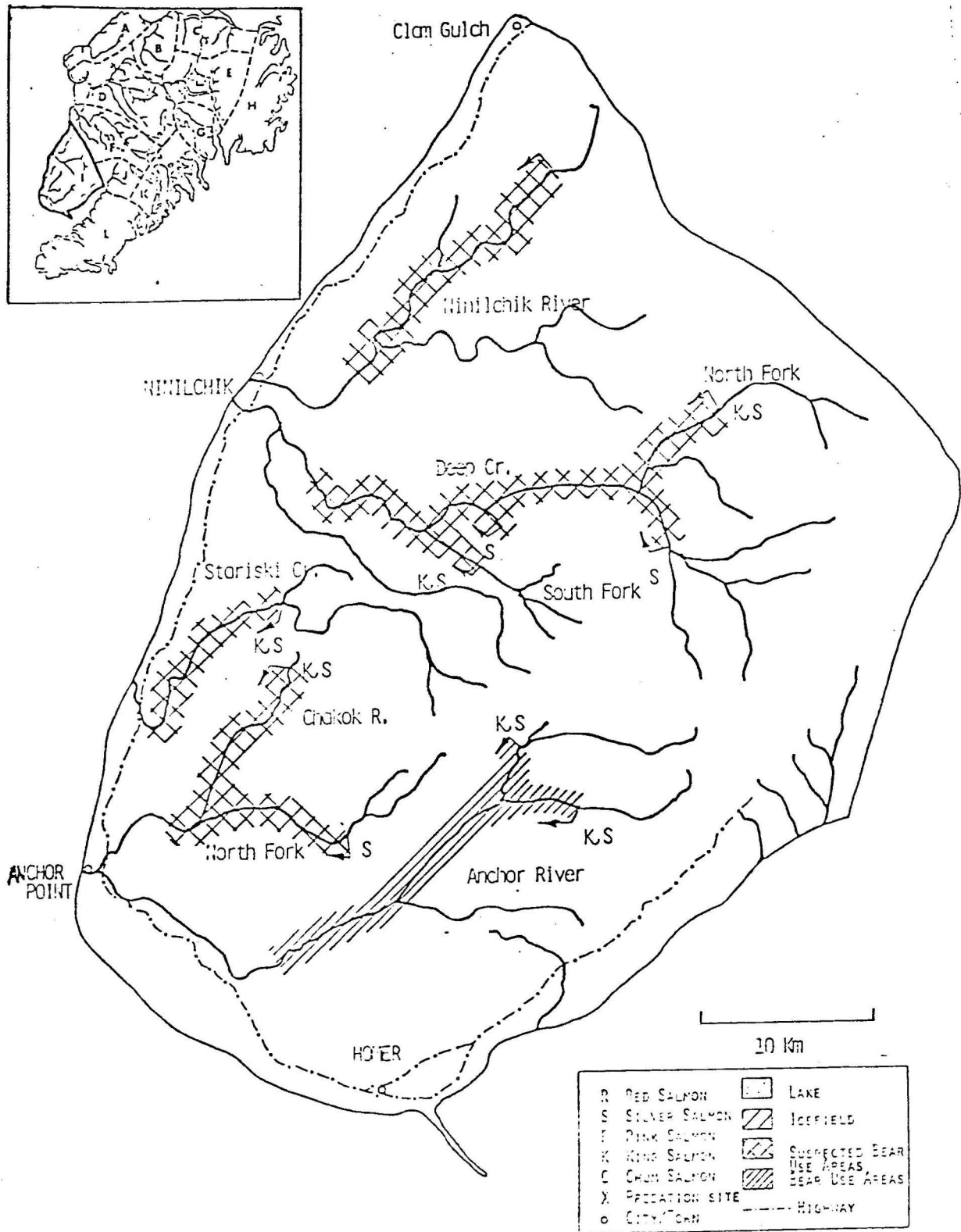


Figure 7. Salmon distribution and brown bear use of salmon spawning Area I (Anchor River) of figure 2, Kenai Peninsula, Alaska, 1985.

Fox River - Area J:

Fox River and Sheep Creek and their tributaries make up Area G (Fig. 8). The Fox River and Clearwater Slough were surveyed this summer by USFWS biologists. Their actual escapement counts for sockeye and silver salmon were not yet available, but earlier estimates made by fisheries biologist Jack Dean (Bevins et al. 1985) were still considered fairly accurate. Fox River contains an annual run of about 900 red salmon and between 700 and 1300 silver salmon. Both species migrate and spawn in tributaries beyond and including Clearwater Slough. Brown bear use of the area was considered by biologists to be low to moderate. Brown bear activity increased upstream of Clearwater Slough; the increase was attributable to less human activity (Dean, pers, commun.). Seven brown bears were observed by USFWS crews on three separate occasions while the crews surveyed these streams. Two adult females (one with one cub and one with two cubs), and two subadults were observed. In each encounter, the bears ran from the observers. A young brown bear was also found dead on the bank of Clearwater Slough, but the cause of death was not discernible.

Summary of Brown Bear Use of Salmon Spawning Areas:

A summary of documented brown bear use in salmon spawning areas appears in Table 1. Additional information collected for all 12 major watershed areas on the Kenai Peninsula can be found in Bevins et al. (1985). Unlike the "bear use" rating in the 1984 report, we felt it was easy to distinguish between brown and black bear use of an area based solely on tracks, and excluding bear-killed salmon and scats, since few black bear tracks were observed on the salmon streams surveyed this

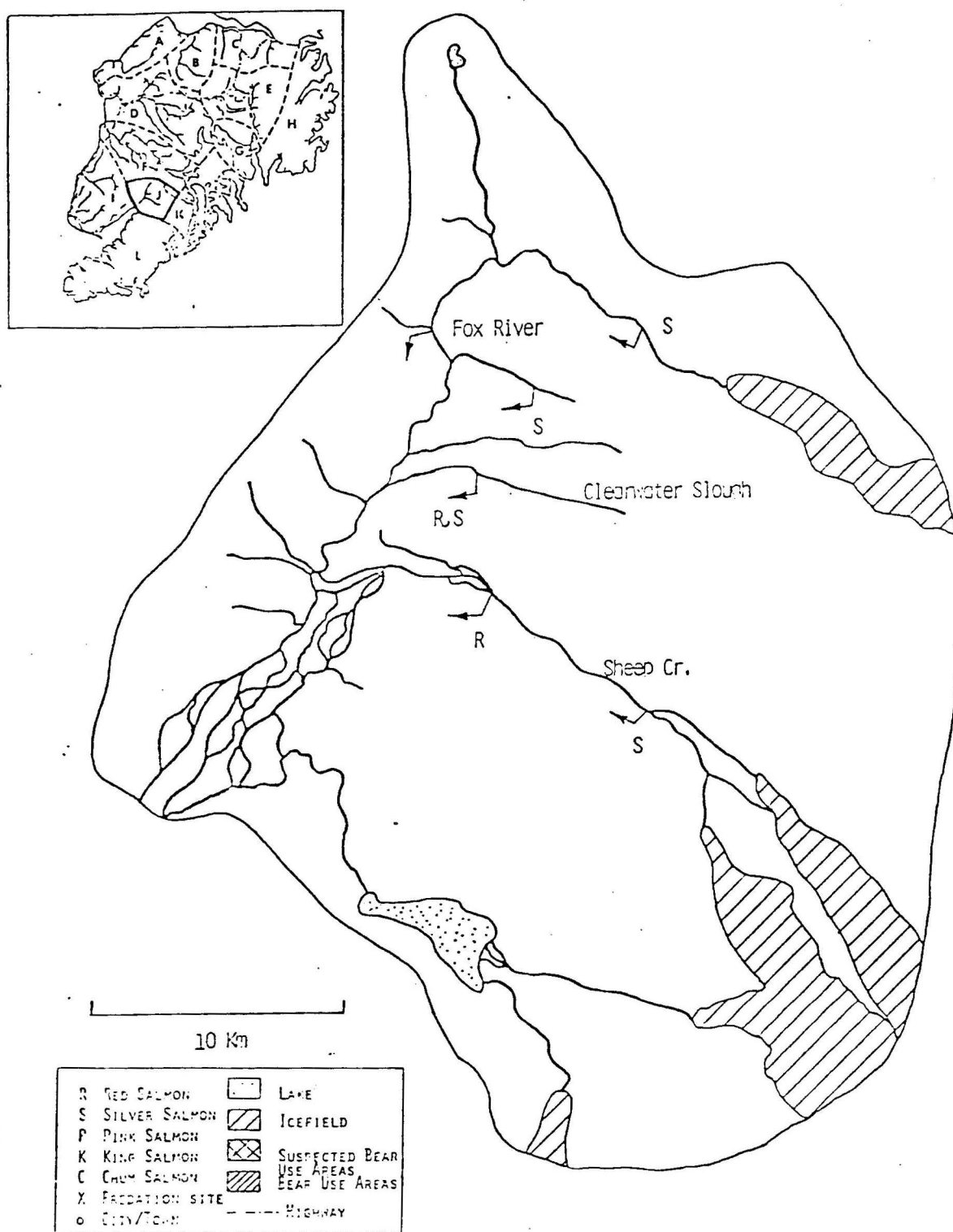


Figure 3. Salmon distribution and brown bear use of salmon spawning Area J (Fox River) of figure 2, Kenai Peninsula, Alaska, 1935.

Table 1. RESULTS OF "BEAR USE" SURVEYS CONDUCTED ON SALMON SPAWNING AREAS ON THE KENAI PENINSULA, 1985.

DATE OF SURVEY	DRAINAGE	SPAWNING AREA	LENGTH OF AREA SURVEYED KM	STAGE OF RUN	SALMON COUNTS (LIVE/DEAD/BEAR KILL) ²	BROWN BEAR USE ³ OF	ESTIMATED NUMBER OF BROWN BEAR
6/4-7	SF Snow R.	E	21.8	Too early	0/0/0	Low	4
7/8-12	Funny R.	D	16.1	Beginning	48/0/2 (K)	* Intense	9
7/17	Mystery Cr.	B	22.6	Rising to peak	174/0/4 (K)	Low	1
7/23	U Chikcaloon R.	B	11.3	Peak	1109/76/55 (K)	* Heavy	6
7/23	U Chikcaloon R.	B	11.3	Past Peak	100/154/54 (S)	* Heavy	6
7/23	M Chikcaloon R.	B	11.3	Peak	900/81/--- (K)	* Heavy	-
7/23	M Chikcaloon R.	B	11.3	Past Peak	138/250/--- (S)	* Heavy	-
7/24-26	Skilak Lake Pipe Cr. Cottonwood Cr. King County Cr.	D D D	0.8 0.8 1.6	None None None	0/0/0 0/0/0 0/0/0	None None None	0 0 0
8/9-12	Deep Cr. Middle Fk. North Fk.	I I I	12.9 3.2	Past Peak Past Peak	101/15/24 (K) 14/3/13 (K)	* Heavy Moderate	11 2
9/4-6	SF Snow R. 1st Stream 2nd Stream 3rd Stream	E E E	4.8 1.6	Past Peak Past Peak	1/462/216 (S) 2/30/88 (S)	* Intense * Intense	6 6
	1st Seep 2nd Seep 3rd Seep	E E E	Dried-Up 0.4 0.4	None Past Peak Past Peak	0/0/0 4/12/60 (S) 0/0/67 (S)	None * Heavy/Intense * Heavy/Intense	- 6 6
9/9-11	Resurrection R. Tributaries	G	6.5	Beginning	12/0/1 (C)	Low	2

¹ Salmon spawning areas according to Fig. 2.

² Many of the bear kills are low estimates. (S=Socketeye, K=King, C=Coho)

³ This is a subjective rating influenced by many variables (timing, ease of locating sign, differences in bear behavior, yearly differences in salmon numbers and bear use). *Based on our findings, these appear to be major brown bear feeding areas.

⁴ Estimates are made from track measurements.

year. We therefore felt the majority of the bear use on the salmon streams examined this year was from brown bears.

Aerial Surveys and Bear Tagging Efforts

USFWS, ADF&G, and USFS biologists conducted 11 intensive aerial searches for brown bears between 19 June and 24 July, 1985; six searches were conducted during June and five during July. Over 21 hours were spent searching for brown bears in June and 16 hours in July (Table 2). A maximum total of 66 brown bear sightings were made during the 37 hours of flight time; because the same areas were searched repeatedly, some of these observations are duplicates.

We made 27 bear sightings during June flights. Of these observations, nine bears were females with a total of 15 offspring of various ages. Most surveys were centered in alpine and subalpine habitats on the benchlands between Tustumena Lake and Skilak Lake and their tributaries, and the Lower and Upper Russian Lakes area. Brown bears were seen near several of the tributaries of Tustumena Lake, including Moose Creek and the Glacier Flats Creek/Seepage Creek area; on the mountains surrounding the Russian Lakes area; on the Killey River; between Skilak River and Russian River; and on the shore of Tustumena Lake.

Thirty-nine brown bear sightings were made during 15.75 hours of survey time flown during July. Seven of these bears were identified as females with a total of 19 offspring (Table 2). Surveys were concentrated on streams with spawning salmon. Specific streams surveyed include the Fox River, the tributaries of Tustumena and Skilak Lakes,

TABLE 2. AERIAL SURVEYS AND EFFORTS TO CAPTURE BROWN BEAR ON THE KENAI PENINSULA, ALASKA, 1985.

Date	Fixwing (hrs)	Helicopter (hrs)	Bear Seen(#)	Bear Types	Area
4/18/85	2.0 cub ^a	1.3	1	1- Ad. male ^b	Bay Lake
6/19/85	3.9 cub	2.4	2	2- Ad. male ^c	Bear Cr.
6/19/85	2.8 c-206	---	3	1-sow/2 yearling ^c	Russian R.
6/21/85	3.3 c-206	3.8	9	2-sow/2 cubs, 1- single; 1-sow/1 cub	Russian R.
6/21/85	3.0 cub	---	4	1-sow/3-2 yr. olds ^b	Tustumena Lk.
6/22/85	4.0 cub	3.2	4	1-sow/3 yearlings	Russian R.
6/22/85	4.2 cub	---	5	1-sow/cub ^c , 1-sow/ cub ^b , 1-single	Russian R.
7/18/85	3.5 cub	2.3	9	1-single male ^b , 1- sow/3 yearlings, 1- sow/3-2 yr. olds	Funny R.
7/18/85	3.5 cub	---	6	1-sow/2 yr olds, 1 single	Benjamin Cr.
7/19/85	2.0 cub	---	5	1-sow/3-2 yr. olds, 1-single	Funny R.
7/22/85	3.8 cub	3.0	13	1-adult male ^c , 6- singles ^c , 1-sow/3 yearlings ^b , 1-sow/ 2-2 yr. olds	Funny R.
7/24/85	3.0 cub	1.6	6	1-male, 1 male ^b , 1-sow/3 cubs	Funny R.
Total	39 hrs.	17.6 hrs.	67		

^a Seen during lynx-tracking flight

^b Successful captures 6 (4 radiocollared & 2 eartagged)

^c Unsuccessful captures 6 (5 & 1 mortality)

cub= Super Cub (PA187)

c-206= Cessna 206

and the Russian River, with additional efforts directed at the Funny River, Killey River, and Benjamin Creek. Brown bears were sighted on Russian River, Benjamin Creek, and Funny River. On several survey flights, radio-collared bears were known to be within the search area, but were not observed. Vegetation along these streams was dense, thus limiting our ability to sight bears. Black bears were seen frequently in all habitat types. The difference in sightability was especially apparent in alpine habitats, where brown bears were rarely observed, while black bear sightings were common. All brown bears observed in July were on salmon spawning streams.

During these aerial surveys 12 attempts were made to capture brown bears. During June, we successfully immobilized and radio-collared two brown bears; we made three unsuccessful attempts to immobilization bears; and one female with a single cub died as a result of capture. Both bears successfully collared were adult females. One female was accompanied by one cub; the other female had three two-year-olds. During July, three bears were successfully captured: a female with 3 yearlings, and 2 subadult males deemed too young to radio-collar. Three unsuccessful attempts were also made.

A total of 17.6 hours of helicopter time was used during 1985 to successfully capture 6 bears (2.9 hours/success). The cost of capturing a brown bear in 1985 was estimated at \$2,230. This value was derived as follows: We flew an estimated 39 hrs of fixed wing-time at a commercial charter rate of \$140/hr = \$5,460 and 17.6 hrs helicopter time at \$450/hr = \$7,920 which equals a total capture cost for aircraft support of \$13,380. Therefore, it cost \$1,115 per capture attempt (12 attempts made) or \$2,230 per success. In 1984, cost was estimated to include

48.3 hrs fixed wing-time (\$6,762) and 7.2 hrs of helicopter time (\$3,240) for an aircraft support cost of \$10,002. Estimated cost per capture attempt was \$2,500 (4 attempts) and \$3,334 per success capture (3 successes). Actual fixed-wing costs were lower since Refuge aircraft were used for bear spotting.

Even though we were able to reduce the cost per capture in 1985, the cost was still high. Dense vegetation along most streams, plus precipitous terrain in the mountains, reduced the number of areas where bears could be darted. Spring darting appeared to have more potential prior to leafout in some mountainous areas. Bears, primarily females with offspring, were easily spotted in alpine and subalpine areas. Darting along salmon streams was difficult as many bears disappeared into stream-side vegetation almost immediately after detecting the helicopter. Also, along the Funny River, it appeared that bears left the area after 3 days of tagging efforts.

We radio-tracked the marked brown bears during the 1985 field season. Three of the four bears tagged in 1985 remained on the air until the denning period. The following is a brief summary of their activities.

Bear 004, an adult male, was captured on 18 April 1985 at Bay Lake. This bear was feeding on a wolf-killed moose and was located incidental to routine lynx (Lynx canadensis) surveys. Thirty-one locations of Bear 004 were made before he denned, near the point of capture on 29 November 1985. Bear 004 frequently used the small creeks near Fox and Bay Lakes through mid-June. He moved to the Funny River in July, where he presumably fed on salmon, and was also located on the

Killey River, Benjamin Creek, and Bear Creek until early November when he returned to the Fox Lake area for denning (Fig 9).

Bear 005 was an adult female with 3 2-year-old offspring when she was tagged on 21 June 1985 on the Tustumena Glacier Flats. This bear was located 13 times before she denned at Truuli Creek on 18 November 1985. Bear 005 spent the majority of her time on the Tustumena Glacier Flats and nearby salmon streams. We were only able to locate her once on 9 August 1985 between 10 July and 30 August 1985 even though we made numerous tracking flights between those dates. We presume the animal moved out of range of the tracking aircraft, or moved into steep terrain which blocked the signal. Consequently, we were unable to delineate the entire home range of bear 005 (Fig 10).

Bear 007 was an adult female with one cub of the year. She was captured on 22 June 1985 in the head waters of the Russian River. This bear was located 15 times before she denned near Skilak Glacier on 12 November 1985. She was located on both the Funny and Russian Rivers most of the summer, where she presumably fed on salmon, until she moved to the outwash area of Skilak Glacier in late October before denning (Fig 11).

Bear 009, an adult female with three yearling cubs, was captured on 22 July 1985 along the Funny River. This bear and her offspring were located throughout the summer on both the Funny River and Bear Creek, until September when she moved north to the Kenai River. She remained in the area of the Kenai River until late September, when she moved through the Sterling area north to Sucker Creek. Coincidental to her move, there was an unconfirmed report of a horse being killed by a brown bear just north of where we located her. Bear 008 was located on Sucker

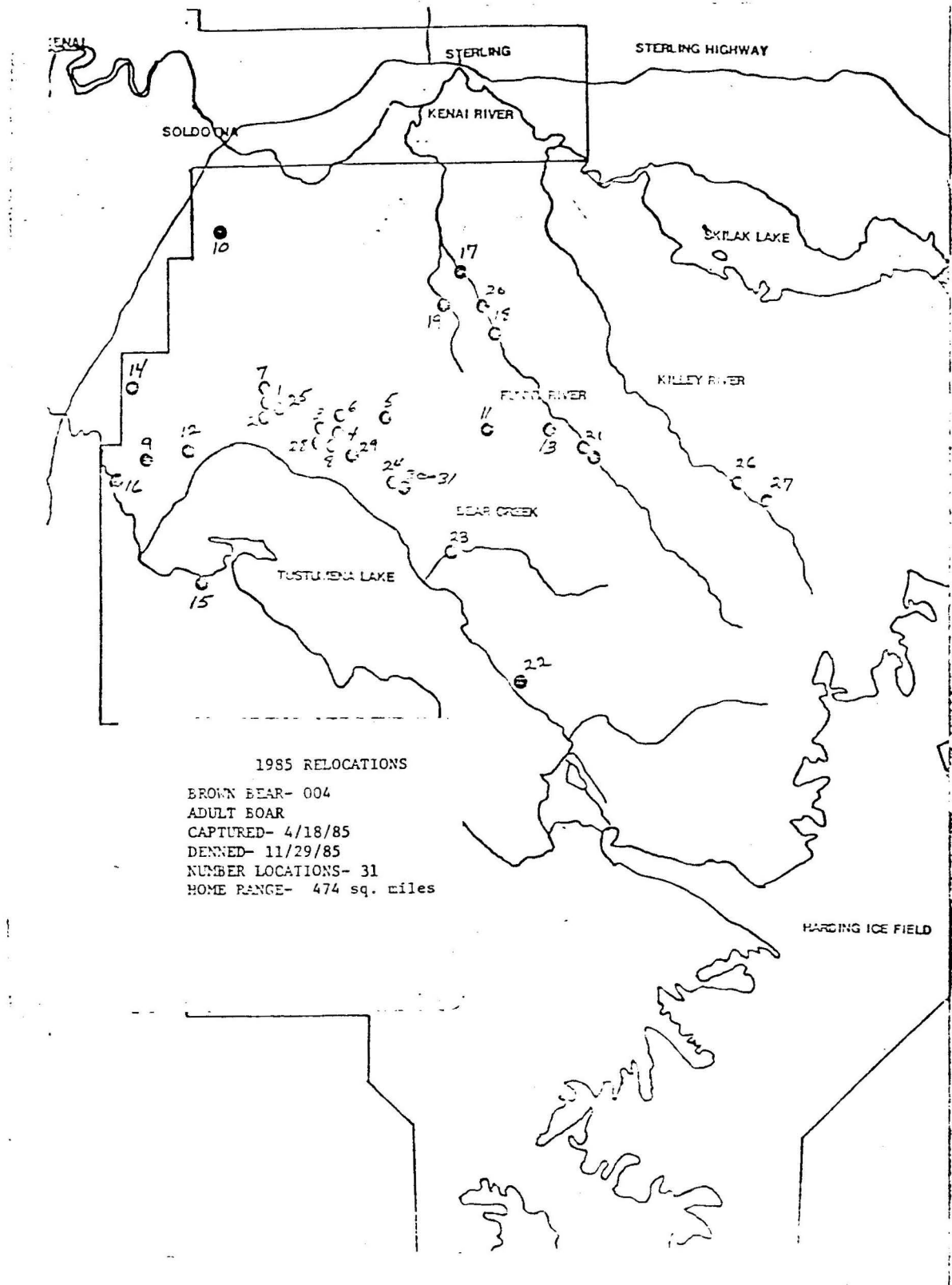


Figure 9. Radio locations of brown bear 004 on the Kenai Peninsula, Alaska, 1985.

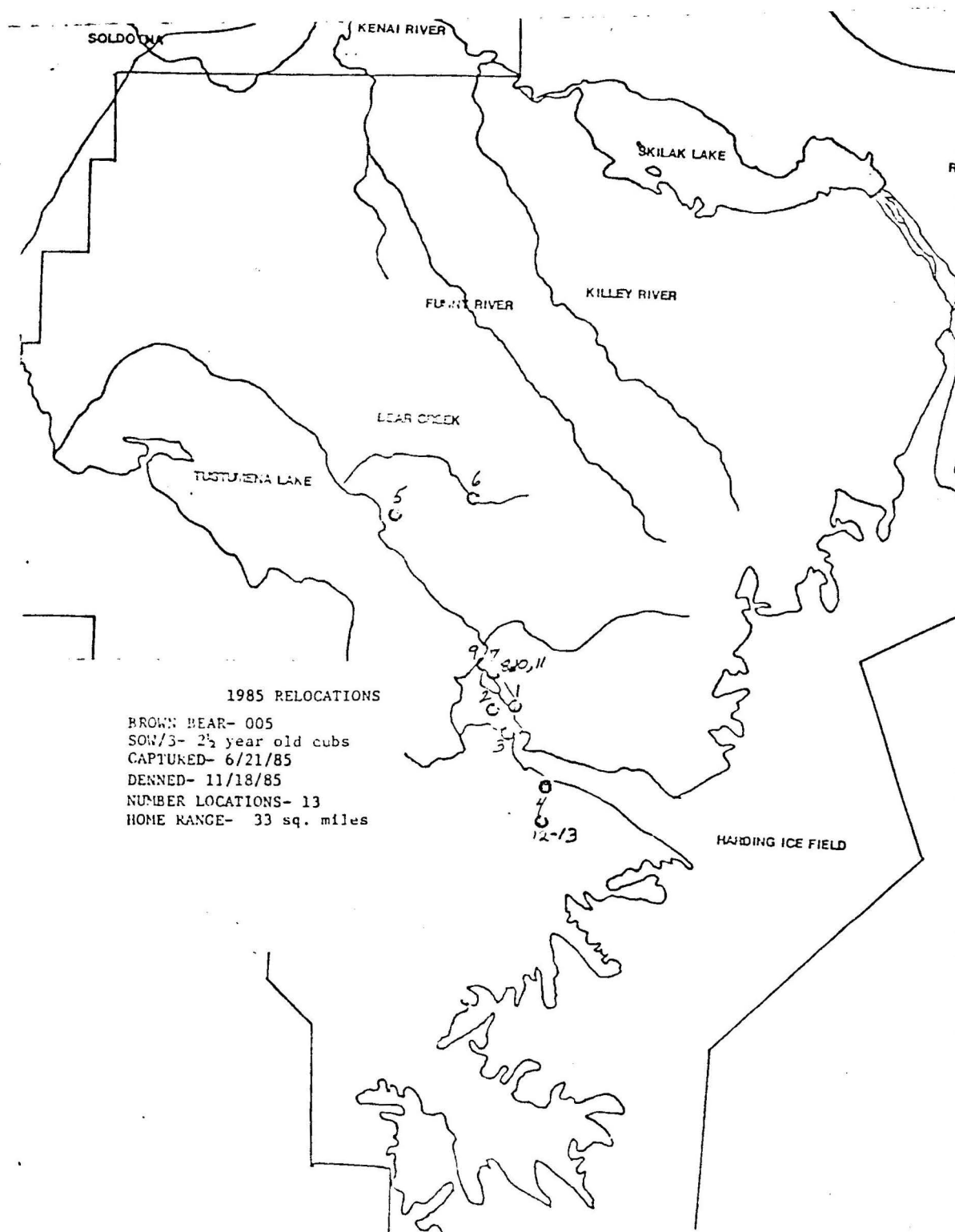


Figure 10. Radio locations of brown bear 005 on the Kenai Peninsula, Alaska, 1985.

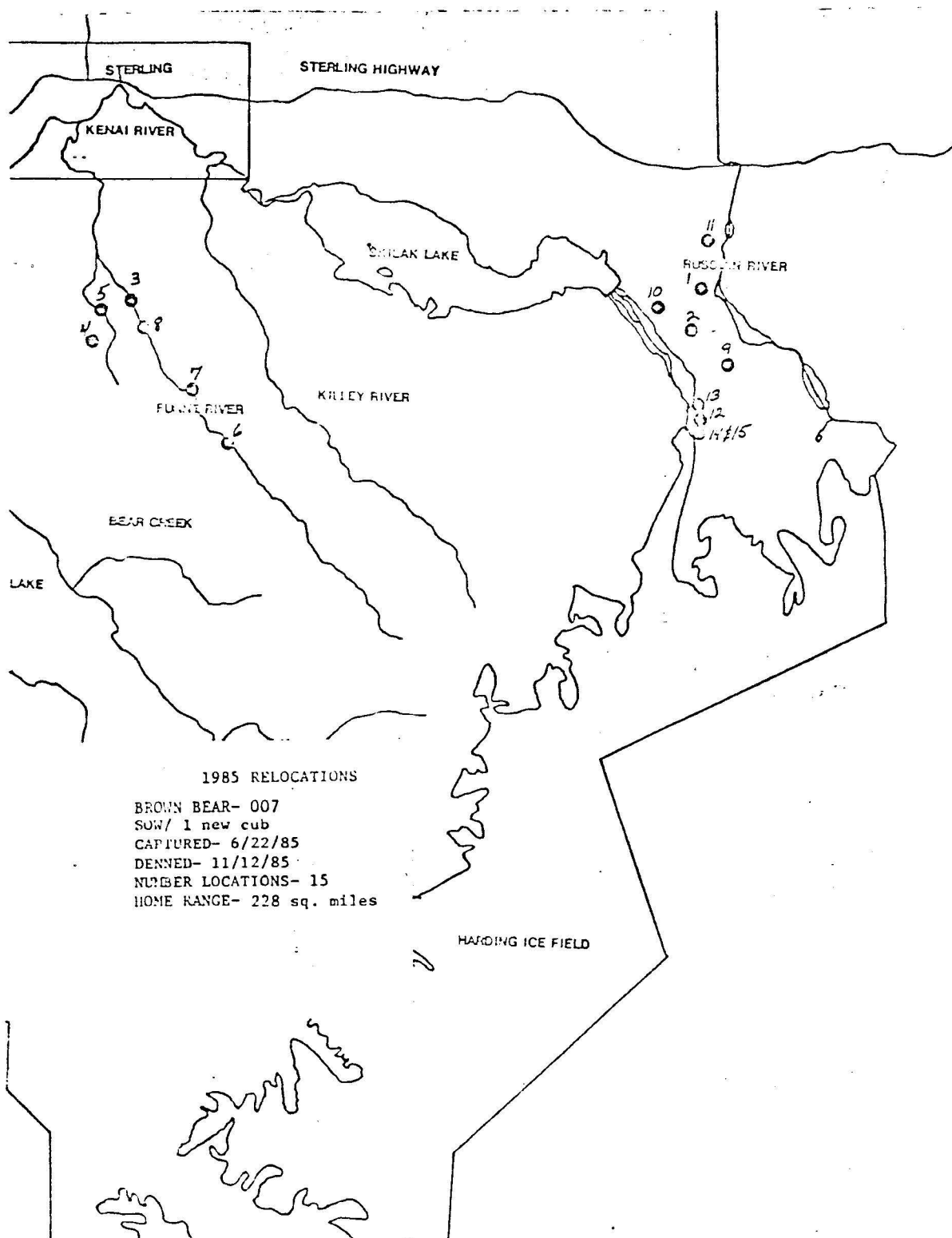


Figure 11. Radio locations of brown bear 007 on the Kenai Peninsula, Alaska, 1985.

Creek, which has a late run of coho, in early October (Fig 12). We were unable to find this bear again despite several extensive radio-tracking flights.

During 1984, we radio-collared 2 bears. Bear 003 was tracked for only a short period before she shed her collar. Bear 001 was a lone female captured on 3 August 1984 along the Funny River. She was located 17 times and used the central peninsula and associated salmon streams, including the Funny, Killey, and Kenai Rivers, before we lost contact with her on 21 November 1984 (Fig. 13). In spite of extensive searches in 1985, we were unable to relocate this bear.

From the minimal number of telemetry locations that we collected from these five bears in 1984 and 1985, plus our aerial searches, it appeared that most bear activity prior to early July was associated with alpine and subalpine habitats. We have a poor understanding of habitat use during early spring since many of the bears radio-tracked in 1985 were tagged after that time of year. From early July until shortly before the denning period, most bears were associated with salmon spawning streams. Movements to streams appeared to coincide with the average time of arrival of fish although in 1985 bears frequented the Funny River prior to the presence of fish.

Brown Bear Observations and Mortality

Thirty-three brown bears were observed and reported by members of the general public between April and September (Table 3, Fig. 14). Nine of these incidental observations were made by USFWS fisheries personnel conducting fisheries work on the Moose River, Fox River, lower Chickaloon River, and Clearwater Slough. Of the remaining sightings,

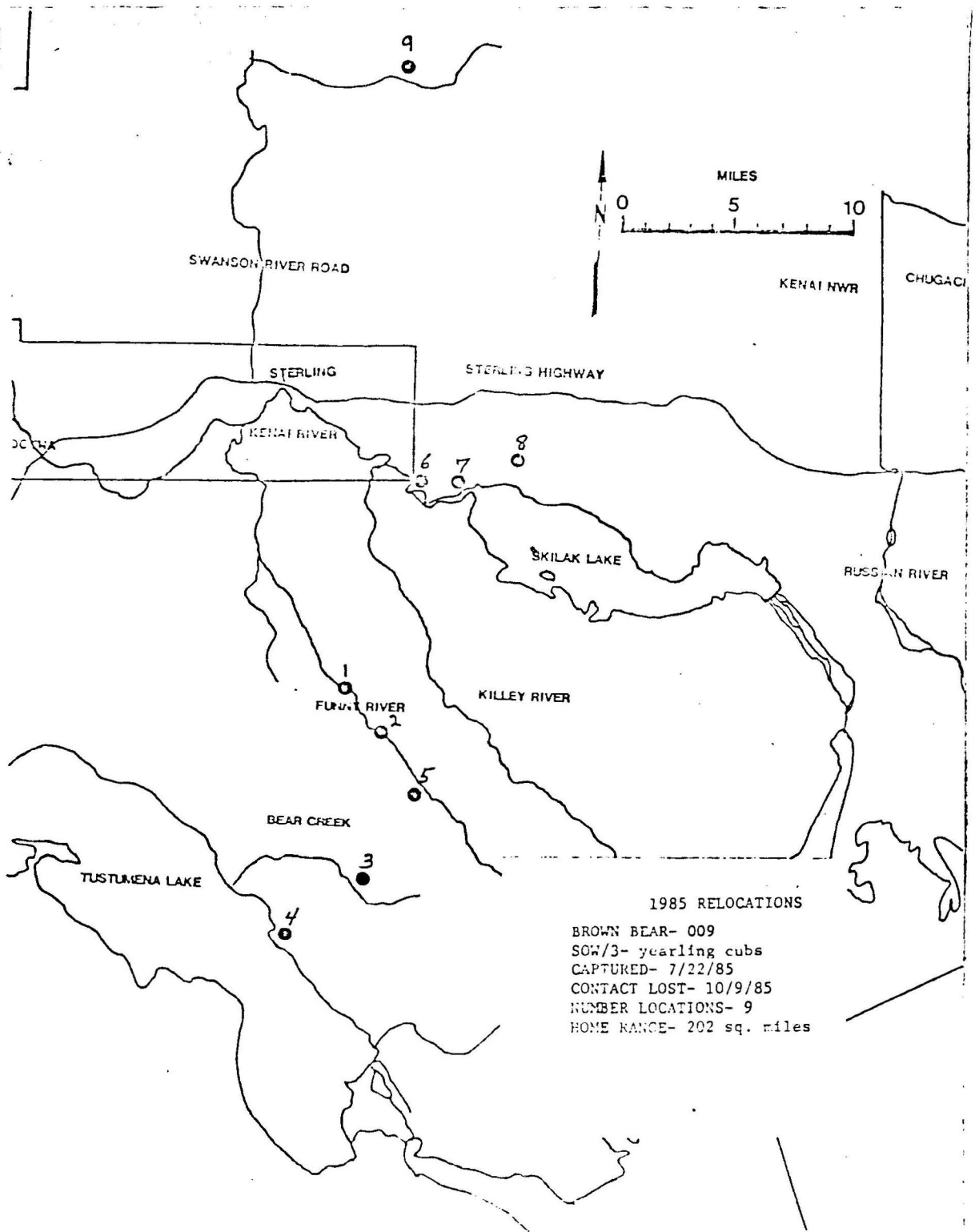


Figure 12. Radio locations of brown bear 009 on the Kenai Peninsula, Alaska, 1985.

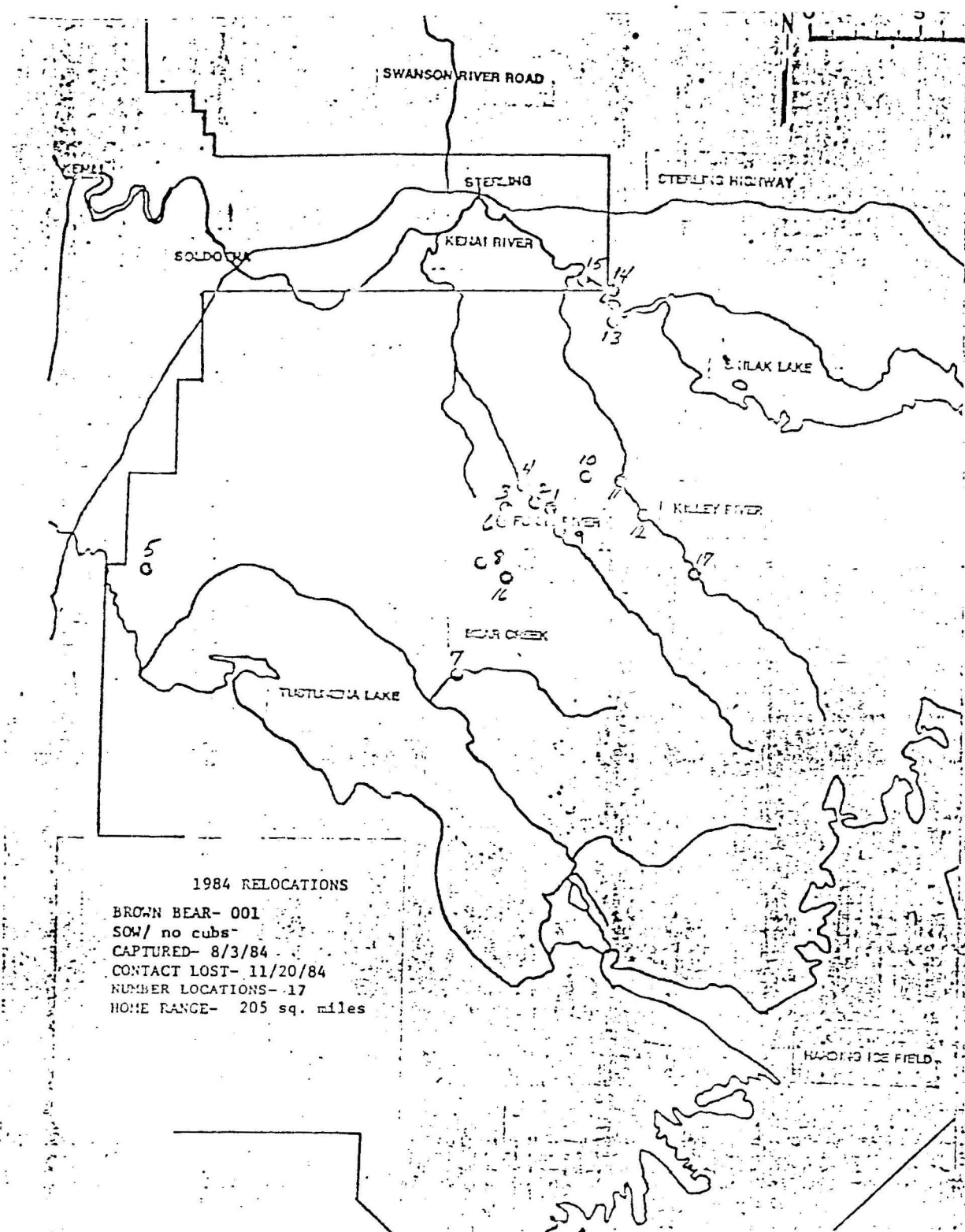


Figure 13. Radio locations of brown bear 001 on the Kenai Peninsula, Alaska, 1984.

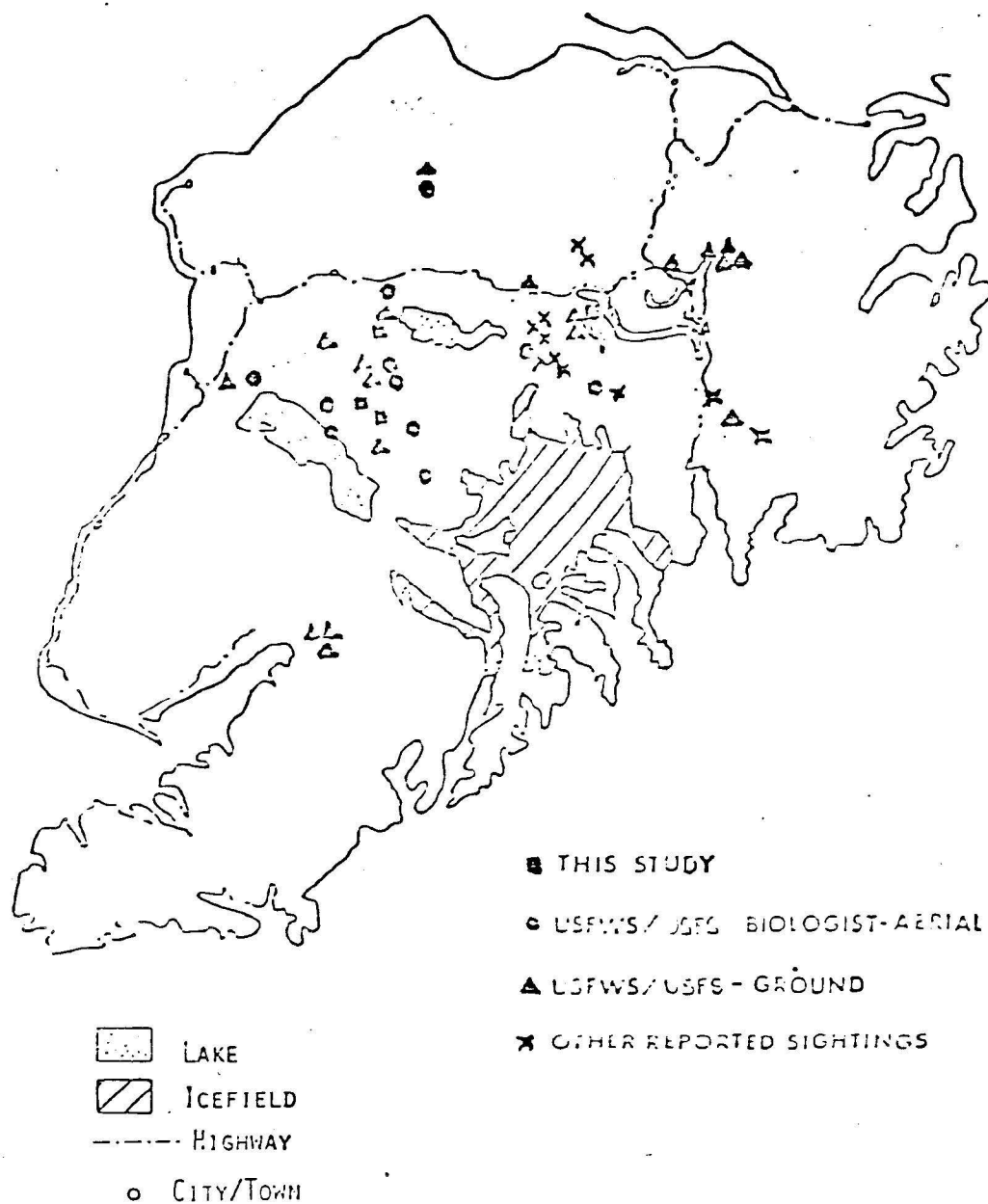


Figure 14. 1935 brown bear observations on the Kenai Peninsula, Alaska, 1935.

TABLE 3. BROWN BEAR OBSERVATIONS ON THE KENAI PENINSULA, APRIL-SEPTEMBER, 1985.

Date	Observer	Location	Status	Comments
4/25	1	T4N R7W S5	sow/3 yearlings	digging along shore
5/18	2	T4N R1W S13	1 adult	walking
6/2	3	T4N R4W S17	2 adults	feeding
6/2	3	T4N R4W S17	2 adults	ran away
6/13	1	T3N R11W S22	2 adults	ran from plane
6/15	1	T1N R7W	1 adult	
6/15	2	T5N R4W S35	3 cubs of year	crossing road
6/16	3	T5N R4W S1	sow/2cubs	feeding
6/17	3	T2N R1E S7	3 adults	feeding
6/17	3	T4N R4W S20	1 adult	feeding
6/18	3	T4N R4W S29	sow/1 cub	feeding
6/19	2	T3N R10W	1 adult male	running from plane
6/19	2	T1N R7W	1 adult male	traveling
6/19	2	T4N R4W S29	sow/2 yearlings	feeding
6/19	3	T5N R4W S2	1 adult	feeding
6/20	3	T4N R4W S32	1 adult	ran away
6/20	1	T3S R9W S10	sow/1 yearling	threatened then ran
7/4	1	T6N R7W S7	1 adult	---
7/8	2	T5N R1E S9	2 subadults	feeding
7/10	2	T1N R8W S1	1 adult	fishing in river
7/10	2	T2N R8W S1	1 adult	threatened then ran
7/13	2	T5N R1E S9	1 subadult	ran away
7/14	3	T3N R4W	1 adult	ran away
7/17	2	T5N R1E S7	2 adults	ran away
7/19	1	T6N R7W	1 adult	fishing in river
7/21	1	T4N R9W S24	2 adults	ran from plane
7/21	1	T3N R9W S1	2 adults	feeding
7/26	2	T6N R1E S15	1 adult	threatened then ran
7/30	2	T5N R1E	1 subadult	fishing in stream
7/31	1	T8N R5W S8	1 adult	ran away
8/3	1	T3S R9W	2 subadults	ran away
8/6	2	T2N R1E S20	1 adult	threatened then ran over one person while fleeing
8/11	2	T3N R4W S9	sow/1 cub	walking along trail
8/23	1	T3N R9W S26	sow/1 cub	ran away
8/25	2	T4N R3W S20	1 adult	traveling
9/2	3	T1N R1E S11	1 adult female	charged and was killed
9/6	2	T5N R1W S23	1 adult	carrying salmon

1 USFWS employee

2 USFS employee

3 Other (recreationist, pilot, railroad employee, etc.)

made, 4 were on Johnson Pass Trail, 2 on the South Fork of Snow River, 3 at Trout Lake, 1 on Railroad Creek, 1 at the mouth of Falls Creek, 3 at Mile 52 of the Seward Highway near Twins' Cafe, 4 on Trail Creek, 1 at Upper Trail Lake near the ADF&G fish hatchery, 2 near Upper Russian Lake, and 3 cubs on the Seward Highway where Quartz Creek enters Kenai Lake. Two of these bears observed were females with one cub each, and three were cubs were observed without their mother. The remaining bears were 8 subadults, and 9 adults.

Known brown bear mortality during 1984 included 7 harvested by sportsmen, 2 DLP kills; no illegal kills were reported (Holdermann, in press).

Russian River/Resurrection River/Cooper Lake Trail Survey

In 1985 the USFS continued to monitor human activity and bear/human encounters within the Russian River/Cooper Lake/Resurrection River trail system. Damage to reflectors in the electric-eye counter resulted in the loss of data from both Cooper Lake and Russian River. A branch waving in front of the Upper Russian River reflector also resulted in erroneous data. Approximately 5530 visitors used the area accessed by the 3 trailheads during the 1985 season; overall visitation in 1985 on all trails was higher than that in 1984.

An average of 48 people entered and exited the Russian River trail head each day between 1 July and 16 September, compared with an average of 38 people in 1984 (Table 4 and 5). These averages represent a total of 3947-4539 people for the entire season. Between 7 and 11 people per day entered the Russian River trailhead and went past Upper Russian lake; we estimated 554 to 850 people in the area from 1 July to 16

Table 4. Information collected from user survey of the Russian River, Cooper Lake, and Resurrection River Trails, on the Kenai Peninsula, Alaska, 1985.

Location	Registered Counts	# days	Periods of operation	Average # counts per day
Lower Russian	7475	78	7/1-30 7/31-9/16	96
Upper Russian	1419	62	7/1-15 7/31-9/16	23
Cooper Lake	568	68	7/1-8/14 8/20-9/12	9
Resurrection	443	72	7/2-9/12	6

Table 5. Estimated numbers of persons using portions of the Kenai Peninsula, Alaska trail system, as determined by questionnaire and trail user information, 1985.

Location	# responses	In and Out %	Est. # In and Out/day	In or Out % to Cooper-Russian-Resurrection	Est. # In or Out/day to Cooper-Russian-Resurrection	Total Use/day
Lower Russian	947	88	48	-8	0.7	54
Upper Russian	---	--	7-11	-----	1-9	12-16
Cooper	145	30	2	----- 14 -----	1	7
Resurrection	112	51	2	20-----30-----	0.8---	4
Total	1204	--	52	-----	2-----2	65

September. This compares with only 3.6 to 4.0 people per day in 1984 (Bevins et al. 1985). The remaining 3393 to 3689 people went no farther than Lower Russian Lake.

Between 1 July and 12 September 1985, 490 people entered and exited the trail system via the Cooper Lake trailhead, compared with 499 people between 22 May and 3 September, 1984 (Bevins et al. (1985)). About 71 people made the trip from the Cooper Lake trailhead to the Russian River trailhead, or vice versa, while 272 people made the one-way trip from the Cooper lake trailhead to the Resurrection River trailhead, or vice versa. In 1984, Bevins et al. (1985) reported 312 people made the trip from the Russian River trailhead, or vice versa, and no one made the trip to the Resurrection River trailhead.

From 1 July to 1 September 1985, 301 people both entered and exited at the Resurrection River trailhead; Bevins et al. (1984), reported 364 people made the round trip visit between 9 July and 4 September 1984. One-way trips to or from the Russian River and Cooper Lake trailheads were made by 88 and 59 people, respectively. Bevins et al. (1985) reported 106 people, during the period from 9 July to 3 September, that came from or went to the Russian River trailhead, but no one traveled to the Cooper Lake trailhead.

A total of 365 parties, composed 1144 visitors, completed the bear observation questionnaire. Ninety-nine black bears were seen during 59 observations (Table 6). Eighteen brown bears were seen during 11 observations in 1985. All 1985 observations were verified by telephone.

One observation contained a DLP report for a black bear. A female black bear with cubs, surprised at 2 m, charged a group of hikers and

Table 6. Bear observations reported by hikers within the Russian River, Cooper Lake, and Resurrection River Trail system, May-September, 1985.

Date	Species ¹	# Bears ²	Distance(m)	Location ³	Sow/cubs?	Bear's reaction
5/8	I	1	300+	T3N R3W	no	unaware
5/24	I	1	300	T4N R4W S6	no	unaware
5/24	I	2	200	T3N R3W	no	ran
5/26	I	1	300	T4N R4W	no	unaware
5/26	I	1	300	---	no	unaware
6/2	2	2	300+	T4N R4W	no	ran
6/2	2	2	300	T4N R4W S17	no	ran
6/2	2	2	300	T4N R4W	yes	unaware
6/2	I	1	300	T4N R4W	no	unaware
6/2	2	2	300	T4N R4W S17	yes	unaware
6/2	I	1	300	T4N R4W S17	no	unaware
6/11	I	1	200	T1N R2W S33	no	ran
6/14	I	2	100	T1N R2W S34	yes	indifferent
6/14	I	1	100	T2N R2W	no	ran
6/15	I	1	300	T4N R3W S9	no	unaware
6/15	I	2	100	T1N R2W	yes	unaware
6/16	2	1	100	T3N R3W S17	no	unaware
6/17	2	2	300+	T4N R4W S29	yes	unaware
6/17	2	1	300+	T4N R4W S20	no	unaware
6/17	I	1	300+	T4N R4W	no	unaware
6/20	2	1	200	T4N R4W S32	no	ran
6/20	I	1	--	T3N R3W	no	unaware
6/25	I	2	200	T4N R4W S2	yes	unaware
6/26	I	1	100-	T3N R3W	no	aggressive
6/28	2	1	100	T1N R1W	no	ran
6/29	I	2	100-	T4N R4W	yes	indifferent
6/30	I	2	300	T4N R4W S17	yes	indifferent
7/5	I	2	200	T4N R4W	yes	indifferent
7/6	I	4	100-	T1N R1W	yes	aggressive
7/7	I	4	100	T4N R4W S3	yes	ran
7/7	I	1	100	T3N R3W S15	no	ran
7/14	2	1	100	T3N R3W	no	ran
7/15	I	2	200	T3N R3W	yes	ran
7/16	I	1	100	---	no	ran
7/18	I	2	100	T4N R4W S9	yes	indifferent
7/26	I	1	300	---	no	unaware
7/27	I	1	100	T2N R2W	no	ran
7/28	I	2	100	T4N R4W	---	indifferent
8/1	I	1	200	T2N R2W	no	unaware
8/3	I	1	300+	T4N R4W	no	indifferent
8/4	I	2	300	T4N R3W S19	yes	unaware
8/4	I	2	100	T4N R4W	yes	indifferent
8/8	I	1	300+	T4N R4W S10	no	unaware
8/8	I	2	100	T4N R4W	yes	ran
8/11	I	1	100	T4N R4W S2	no	unaware
8/11	I	2	200	T3N R3W S12	---	ran
8/11	I	1	100	T4N R4W S9	no	ran
8/12	I	2	100	T4N R4W	yes	ran
8/15	I	1	200	T4N R4W S4	no	ran
8/15	I	1	100	T3N R3W S18	no	indifferent
8/15	I	1	100	T4N R4W S33	no	indifferent
8/16	I	2	300+	T4N R4W	yes	unaware
8/16	2	3	300	T3N R3W	yes	unaware
8/16	I	4	300	T3N R3W	yes	unaware
8/16	I	1	300	T4N R4W S8	no	unaware
8/16	I	1	100	T3N R3W S13	no	ran
8/17	I	1	200	T2N R3W S19	no	ran
8/17	I	1	100	T4N R4W	no	indifferent
8/19	I	1	100	T3N R3W S13	no	ran
8/19	I	1	300+	T3N R3W S7	no	unaware
8/20	I	2	300+	T3N R3W S12	yes	indifferent
8/20	I	2	300+	T4N R4W S16	yes	ran

Table 6. Continued

Date	Species ¹	# Bears ²	Distance(m)	Location ³	Sow/cubs?	Bear's reaction
8/21	1	2	200	T3N R3W	no	ran
8/22	1	2	100	T4N R4W S9	yes	indifferent
8/24	1	3	300	--- ---	yes	unaware
8/29	1	2	100	T3N R3W S13	yes	indifferent
8/30	1	3	300+	T3N R3W S36	yes	unaware
9/2	1	4	300	T4N R4W S8	yes	unaware
9/2	1	1	300	T4N R4W S9	no	unaware
9/2	1	4	300	T2N R2W S7	yes	unaware
9/3	1	4	300	T4N R4W S2	yes	unaware

1 1-black bear, 2-brown bear

2 Township, Range, and Section where bears were observed.

was shot and killed. The fate of the cubs was unknown. In all other instances, reports on the cards indicated that the bears were either unaware of the observers or ran away humans were detected. A few bears remained indifferent to the observers.

CONCLUSIONS AND RECOMMENDATIONS

Ground Surveys

Field surveys conducted in 1984 and 1985 addressed most of the information needs originally outlined for investigation in the step-down plan. Specific information concerning brown bear habitat and food preferences requires additional study. Field studies in 1985 identified grasses/sedges, horsetail and other forbs, salmon, and several species of berries as common bear foods, but preference and use of specific foods are largely unknown. Likewise, selection for specific habitats containing important foods needs further study. Although the methods of habitat evaluation outlined by Herrero et al. (1983) are a good first step toward brown bear habitat evaluation, standardized habitat mapping coupled with identification of the microhabitats selected by bears would help quantify habitat evaluation procedures. Ground surveys linked with "ground truthing" from radio-collared bear locations would improve our ability to identify critical habitat areas and buffer zones and possibly reduce potential human/bear conflicts.

Salmon spawning stream surveys have helped document the use by brown bears of different streams during different seasons of the year. Stream surveys have also identified specific feeding sites on these streams. Movements between streams, length of stay at streams, and

actual number of brown bears using the various spawning areas needs further refinement.

Several salmon spawning streams used by brown bears are in close proximity to areas of human development (roads, ATV trails, hiking trails, boating sites) and are therefore of greatest concern. The South Fork of Snow River is easily accessed by 4x4 vehicles which drive directly up the braided gravel river bed to get into more remote areas. Many of these areas are documented high use brown bear sites during certain times of the year. In 1985, three encounters with charging brown bears were reported. An adult female brown bear was killed as a result of one of these encounters. Additional information on the amount and timing of human use of this area and the impact of such use on brown bears is required.

Upper Russian Lake and its tributaries contain thousands of spawning sockeye and silver salmon which attract large numbers of brown bears. Unfortunately, the salmon also attract large numbers of sports fishermen. Presently, most fishermen and hikers avoid areas where use by brown bear is high, but increased human encroachment into these areas may result in bear displacement. Because of this potential displacement of brown bears we recommend close monitoring of the Russian Lake area to assure continued use by brown bears and to reduce the potential for bear-human conflicts. Current fishing regulations limit fishing for salmon to 300 yards below the Russian River Falls and, occasionally, to the Fish and Game wier which is located about 100 yards below the outlet of Lower Russian Lake.

The third salmon spawning stream and bear use area of special concern is the headwaters Caribou Hilla and the headwaters of Deep

Creek. At present, more than 75 recreational cabins occur in this area and are easily accessed by ATV's during the spring, summer, and fall or by snow machine in the winter. Seismic lines converted to regular back-country roads are the primary access routes. Hunter harvest of brown bears on the Kenai Peninsula is greatest in this area. Increasing use by humans in this important brown bear area has the potential to reduce bear use of the area. Close monitoring is recommended.

Other areas bears often use, which should be monitored, are Trail Creek, a 5 km stretch of the Kenai River west of Skilak Lake, middle portions of the Chickaloon River, and several tributary streams of Tustumena Lake. More remote areas which at present seem secure are the Funny River, upper Killey River/Benjamin Creek, the Anchor River above Beaver Creek and the upper sections of Bear and Nikolai Creeks on Tustumena Lake.

Four additional salmon streams not surveyed during 1984 or 1985 should be investigated in 1986. These are Crooked Creek, the Placer, the Chakok, and the Ninilchik River. Field investigations should also place emphasis on streams containing late-spawning (Oct-Nov) silver salmon. One drainage of special interest is that of the Resurrection River in the Chugach National Forest. Reports indicate a large number of silver salmon use this system in the fall. This drainage receives extensive use by bears during the spring.

Aerial Surveys and Bear Tagging Efforts

We successfully located brown bears from the air. Based on the number of bears sighted during aerial surveys, it appears that we can use aerial searches and the new method proposed by Miller et al. (in press) in conjunction with an intensive radio telemetry study to estimate the density of brown bears in the study area. Efforts to tag bears using fixed-wing aircraft in conjunction with helicopter darting were successful, but expensive. Based on the information obtained in 1984 and 1985, it seems likely that the cost to collar a brown bear on the Kenai Peninsula using this method will be \$2000 per successful capture. If the objectives of a proposed study are to collar mainly adult females, some of the captured bears cannot be used as study animals since it is often difficult to distinguish between juvenile males and females. Consequently, \$2000 cost is probably minimal. This cost per captured bear might be reduced with an alternate capture technique. Bear are currently being captured in southeast Alaska using Aldrich foot snares (Schoen, pers. commun.) with good success. Since brown bears on the Kenai Peninsula are concentrated on salmon streams after June, foot snaring may be feasible. Access into remote areas and manning the snare sets will be the main cost incurred in such a capture operation. We plan to investigate this capture technique on a limited scale during the 1986 field season on Benjamin Creek and possibly the Funny River. Based on our assessment of this capture method, we may be able to greatly reduce the actual cost per bear collared.

Radio telemetry data indicate that routine tracking flights of brown bears are feasible, but may require extensive searching. Due to

the large area used by most bears, successful relocations are contingent upon tracking flights which cover large geographic areas. We have experienced "missed signals" from some bears which suggests that collared bears may be using geographic areas not covered in previous flights. This indicates that additional flight times may be required to locate these bears. Based on our tracking efforts, it also appears that visual sightings of collared bears are limited since we were able to sight bears only 18% of the time we located them. Signal change associated with the inverse mortality mode also indicated that the bears reacted to the presence of our tracking aircraft several minutes before we sighted the bear. This response indicated that radio-collared bears probably moved to heavy cover when approached by the tracking aircraft and the resulting behavior probably precludes using radiolocations to determine preferred feeding habitats, or using male bears to aid in locating female bears in heat. For this reason, plus the lack of information from spring bears, we plan to have the 1986 field crew locate radio-collared bears from the ground and attempt to determine the habitats used by these individuals. Caution will be maintained to assure that the crew's presence does not cause the marked bear to leave the area, and also to assure that the crew does not get into a dangerous situation. We plan to determine that a radio-collared bear has moved into a given area for some time based on repeated aerial locations. After it has been determined that the bear is using a particular habitat, the field crew can investigate the area to determine why the bear was there. Based on indirect evidence (scats, beds, feeding areas) we plan to evaluate the use of these areas by bears.

Part of the long range planning originally proposed in our step-down plan outlined the need for an intensive research effort to answer specific questions regarding brown bear demographics, distribution, and density on the Kenai Peninsula. This is still a major objective of the IBBST. Bear survey efforts, tagging operations, and radio-tracking flights all indicate that such an effort is feasible assuming adequate manpower and funding are available. Current studies and information obtained from marked bears are inadequate to answer the original questions outlined in the step-down plan. For this reason, we recommend that after completion of the feasibility study following the 1986 field season, the agencies involved pool their resources and begin intensive studies. If this is not feasible, we recommend that current tagging efforts, radio-tracking flights, and intensive surveys now associated with the feasibility study be discontinued until such a study can be funded. If the intensive surveys are stopped, we also recommend that the ADF&G, USFS, and USFWS maintain a conservative management approach to brown bears considering the rate and types of human activities increasing on the Kenai Peninsula.

Brown Bear Observations and Mortality

We recommend that maps and files concerning current information on land status, bear harvests, habitat use, and salmon spawning areas should be updated annually. Brown bear observations and encounters should continue to be recorded by both agency personnel and other sources. Trends noted from DLP kills relative to human activity areas need to be monitored carefully.

Russian River/Resurrection River/Cooper Lake Trail Survey

The original outline in the step-down plan proposed that we conduct surveys at the Russian River/Resurrection River/Cooper Lake Trail systems for two years to obtain current trail use information. This objective has been met. We have two options at this point; one is to wait the 5-10 years as originally proposed and repeat the survey to determine trends in use. The second option is to repeat the survey again in 1986. Trail use changes between 1984 and 1985 indicated a 13% increase in user activity (630 additional individuals). Because the use increased so much between 1984 and 1985, we recommend repeating the survey again in 1986. This will give us an additional year of information, and hopefully allow us to more accurately determine the user trend within this trail system.

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BROWN BEAR HABITAT SURVEY

LOCATION:

TRANSECT #:

H = High

M = Medium

L = Low

t = trace

DATE:

OBSERVERS:

SPECIES	TRANSECT SEGMENT			
	A	B	C	D
Sedge (<i>Carex</i> sp.)				
Other sedge (<i>Cyperaceae</i>)				
Grasses (<i>Graminae</i>)				
Horsetail (<i>Equisetum</i> sp.)				
Lady Fern (<i>Athyrium</i> sp.)				
Other ferns				
Cow Parsnip (<i>Heracleum lanatum</i>)				
Angelica (<i>Angelica</i> sp.)				
Dandelion (<i>Taraxicum</i> sp.)				
Mountain Sorrel (<i>Oxyria digyna</i>)				
Wild Cucumber (<i>Streptopus amplexifolia</i>)				
Chocolate Lily				
<i>Astragalus</i> sp./ <i>Oxytropis</i> sp.				
<i>Hedysarum</i> sp.				
Willow (<i>salix</i> sp.)				
Cottonwood (<i>Populus trichocarpa</i>)				
Blueberry (<i>Vaccinium</i> sp)				
Salmonberry (<i>Rubus spectabilis</i>)				
Crowberry (<i>Empetrum nigrum</i>)				
Devil's Club (<i>Oplopanax horridum</i>)				
Highbush Cranberry (<i>Viburnum edule</i>)				
Lowbush Cranberry (<i>Vaccinium vitis-idaea</i>)				
Bearberry (<i>Arctostaphylos</i> sp.)				
Mountain Ash (<i>Sorbus</i> sp.)				
Currant (<i>Ribes</i> sp.)				
Elderberry (<i>Sambucus racemosa</i>)				
Rose/Raspberry (<i>Rosa</i> sp., <i>Rubus</i> sp.)				
Salmon				
Moose				

BROWN BEAR HABITAT EVALUATION REPORTS

The following is a list of potential brown bear foods on the Kenai Peninsula. We rated their potential use based on their importance in other areas and on limited information we were able to collect on food habits during our surveys and interviews. We used this list as a guide for evaluating habitat during our surveys.

Food Item	Spring			Summer			Fall		
	(To Mid-June)			(Mid-June -Aug)			(Sept-Nov)		
	Maj	Min	Sus	Maj	Min	Sus	Maj	Min	Sus
Calamagrostis		x							
Other grasses	x			x				x	
Sedges	x			x				x	
Equisetum	x			x				x	
Athyrium	x				x			x	
Other ferns					x				
Heracleum	x				x				
Angelica	x				x			x	
Astragalus/									
Oxytropis		x						x	
Hedysarum	x			x			x		
Taraxacum		x							
Oxyria			x						
Streptopus			x						
Frittilaria			x						
Willow					x				
Cottonwood			x			x			
Blueberry					x		x		
Salmonberry				x			x		
Crowberry	x						x		
Devil's club				x				x	
Highbush cranberry				x			x		
Lowbush cranberry		x		x			x		
Bearberry				x			x		
Mountain ash								x	
Current					x		x		
Elderberry						x			x
Rose/Raspberry						x		x	
Salmon		x		x			x		
Moose	x				x			x	
Rodents		x			x			x	
Insects		x			x			x	

Maj- Potentially a major food source during this time period

Min- Probably a minor food source during this time period

Sus- A suspected food source

BROWN BEAR HABITAT EVALUATION SURVEY

Area: North Fork Snow River
Personnel: Risdahl/Schloeder

Date: 5/23/85

Efforts of this survey were concentrated in the lower portion of the North Fork of the Snow River drainage and the low timbered benches on the north side of the river. A primary interest was to find a trail built by the Civil Conservation Corps (CCC) during the depression that originally wound its way up to Paradise Valley and the Paradise Lakes. Location of this trail would aid in a later habitat evaluation survey from Ptarmigan Lake over Snow River Pass to Paradise Lakes and back down the North Fork of Snow River.

Segment A begins at mile 13.5 on the Seward Highway where the railroad crosses the highway and Snow River. Access to the North Fork of Snow River is across the railroad tracks and down onto the gravel bars bordering the river.

The first mile of this section closely follows the curve of the river, confining itself to the gravel and sand bars along the north shore. Because of the unusually late spring, no green vegetation had yet appeared, but dessicated plant material and unleaved trees and shrubs indicated that the primary plant community was a tall alder/bluejoint ecosystem with scattered black cottonwood and spruce trees. No green vegetal matter was yet available as a potential bear food source. One mile up the river, we encountered a medium sized set of brown bear tracks on a sand bar. The tracks were several days old and crossed from the sand bar on the north side of the river to a gravel bar on the southern shore. From this point on, upstream, there were no more gravel or sand bars bordering the north bank, but a trappers trail taking off here made continued access up the drainage easy.

The second mile and a half of this segment borders a wet grass/sedge meadow. This meadow appears to be part of an old oxbow lake formed when the North Fork altered its channel. Adjacent to this portion of the trapper's trail and meadow is a spruce/hemlock stand with a menziesia/moss understory. Some crowberry and lowbush cranberry occurred right along the trail. On the east shore of the oxbow lake, we located the small spruce that had been rubbed by a dark chocolate brown bear that we discovered last year. We found no evidence of recent rubbing by any brown bear, but last year's hair still clung to the seedling's oozing sap.

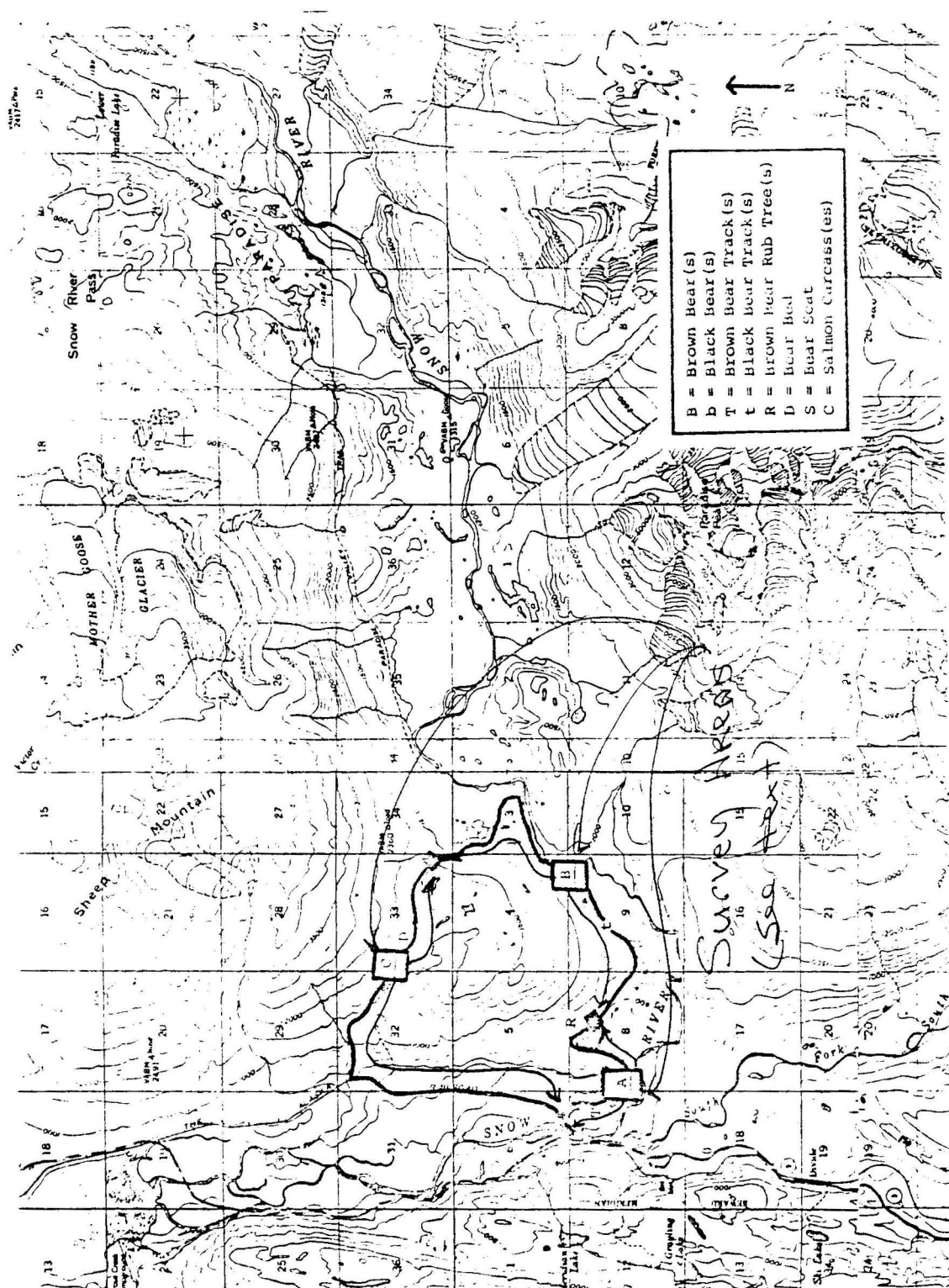
Segment B begins at a spruce forest north of the wet grass/sedge meadow. Within 100 yards of the meadow, we located the trapper's trail again. It was marked with orange and pink strips of surveyors tape. The trail shows evidence of trail maintenance from sawed logs and trimmed trees. This section of the trail initially winds through a spruce forest with a menziesia/moss and devils club understory with occasional isolated patches of alder. The trail parallels the river for three miles as it meanders through small timbered hills and later, spruce/hemlock stands alternated with open shrubby knobs of hemlock with a crowberry/lichen ground cover. Much of this portion of trail was under two to four feet of wet snow, but the trail was still clearly visible as a swath cut through the trees. Blazes were found regularly on spruce trees. The going was rougher where the path cut through overgrown

alder patches, but the trail was still readily discerned by flagging tape. After about three more miles, the trail turns northward, away from the river, as it enters a gorge with a 30 foot waterfall. It then zig-zags up the mountain over a trail that has been built up with stones in several places. One old set of melted out black bear tracks were seen along the central section of the trail. We followed the trail all the way to a small frozen lake within one mile of timberline. We then veered left around the lake to avoid deeper snow.

Segment C begins at timberline and remains just above the forested benches in the alpine. The primary exposed vegetation was bluejoint grass slopes interspersed with alder chutes and knobs of crowberry/lichen and a little shrubby hemlock. In this first mile of alpine, we were able to look down on three more small frozen lakes. In this section (section 33, T3N, R1W), we discovered a fairly fresh set of black bear tracks and four piles of scat. All scats consisted primarily of grass shoots and some over-wintered highbush cranberries. A little further on, nearing the corner of the mountain, we picked-up some brown bear hair matted on the hillside.

From there, we followed a large snowchute of bluejoint grass and devils club down one-half mile to the valley bottom. A two mile walk along the railroad tracks brought us back to our starting point. Some early horsetail and bluejoint grass shoots were seen in this section along the tracks. Spruce (primarily Sitka spruce) and some black cottonwood interspersed with small wet meadows dissected by tributary streams border the tracks.

In summary, because of the lateness of spring's arrival, little green vegetation was yet available in this area as post-denning food. No bears were observed, but a minimal amount of sign indicated brown bear use of both the river bottom and alpine areas. We found no evidence of concentrated use of a specific site, but suspect some spring use of the wet grass/sedge meadows and horsetail clumps, and late summer to fall use of the lower elevation highbush cranberry and devils club berry patches and upper elevation crowberry fields.



BROWN BEAR HABITAT AND CABIN SITE EVALUATION SURVEY

Area: Cooper Lake/Upper Russian Lake
Personnel: Risdahl/Schloeder

Dates: 5/28-30, 1984

This survey was instigated around the potential construction of one or two public-use cabin(s) on the Cooper/Russian/Resurrection Trail system. Consequently, efforts were confined primarily to the lowland areas between Cooper Lake and Upper Russian Lake. A small portion of the Resurrection River Trail near its junction with the Cooper Lake Trail was also examined.

Segment A

This segment begins at the Cooper Lake trailhead and follows the Cooper Lake Trail for six miles to the Cooper/Russian/Resurrection Trail junction. It then continues for approximately one more mile toward the northern end of Upper Russian Lake.

The first five miles of trail meanders through a spruce/hemlock forest closely following stream bottoms and wet sedge meadows. These meadows often occur in conjunction with small lakes and/or beaver ponds. Willows commonly occur near the sedge meadows and stream bottoms. Alders are found intermittently in patches in these same areas as well as along steeper side drainages. Spring and early summer foods such as grasses and sedges are common in the wet meadows and around beaver ponds and lakes. Other spring/summer food sources including twisted stalk, ferns and horsetails were noted during the previous year's survey of the area. These species were not yet available this year because of the winter's late retreat. One to two feet of snow covered the first five miles of trail and surrounding country. Travel by snowshoes was often necessary. Last year's survey also documented that lowbush cranberry, highbush cranberry and devils club were available on the stream bottoms as fall foods, and crowberry and blueberry were common on the more open timbered knobs.

The late spring allowed for easy identification of fresh sign in the melting snow. Near the southern end of Cooper Lake, in the delta area of willow and sand/gravel bars, we noted an early winter moose mortality. Wolf sign was found near the moose remains. The first brown bear tracks encountered were within one and one-half miles of the Cooper Lake trailhead in section 12, T3N, R3W. A large brown bear had traveled a good distance along the trail, apparently using it as a travelway. At about the four mile marker, near a long, thin, north-south lying lake (section 13, T3N, R3W), a set of black bear tracks were noted. Approximately one-quarter mile further down the trail, past two small lakes, more melted-out brown bear tracks were sighted (section 15, T3N, R3W). While returning to base camp on the 29th, a fresh set of brown bear sow and cub's tracks were encountered three-quarters of a mile east of the Cooper/Russian/Resurrection Trail junction. The pair traveled about 100 yards down the trail then suddenly veered off into the woods. These bears' tracks were so fresh that we felt we may have frightened them off the trail. Their tracks were also found in section 15, T3N, R3W.

From about mile 5.5 to mile marker 7, the Cooper Lake Trail passes through several cottonwood/bluejoint parks and several alder shrubfields on the pass between Cooper Lake and Upper Russian Lake. Graminoids, ferns and cow parsnip are abundant along this section. Potential fall food sources include elderberry and some devils club. Just before reaching the trail junction, we picked up a black bear sow and cub's tracks. Then, from the trail junction to Upper Russian Lake, at least one large brown bear had been traversing the trail. In addition, all the foot bridges on this section of trail had been clawed, chewed and rubbed on by brown bear(s). Hand railings had been bitten and broken off. Various shades of brown hair were commonly found in slivers of wood on these hand railings and on the bridges themselves.

Scat was rarely encountered along the trail. A probable explanation is simply the absence of food at that time. The lasting winter allowed only a minimal amount of bluejoint grass to begin sprouting. No sedge, horsetail or other forb was yet available. In section 21, T3N, R3W, a rotten log had been torn apart and scattered over the trail. Clawmarks on the log indicated that a bear was responsible. Other sign of note includes the many blazed trees that had been clawed and rubbed by brown bears. A proportionately larger number of blazed to unblazed trees had been scarred and rubbed by brown bears. Several spruce saplings had also been rubbed, and often, their tops broken off. Various shades of brown bear hair (chocolate brown, blonde, cinnamon) was stuck in the pitch of the damaged trees.

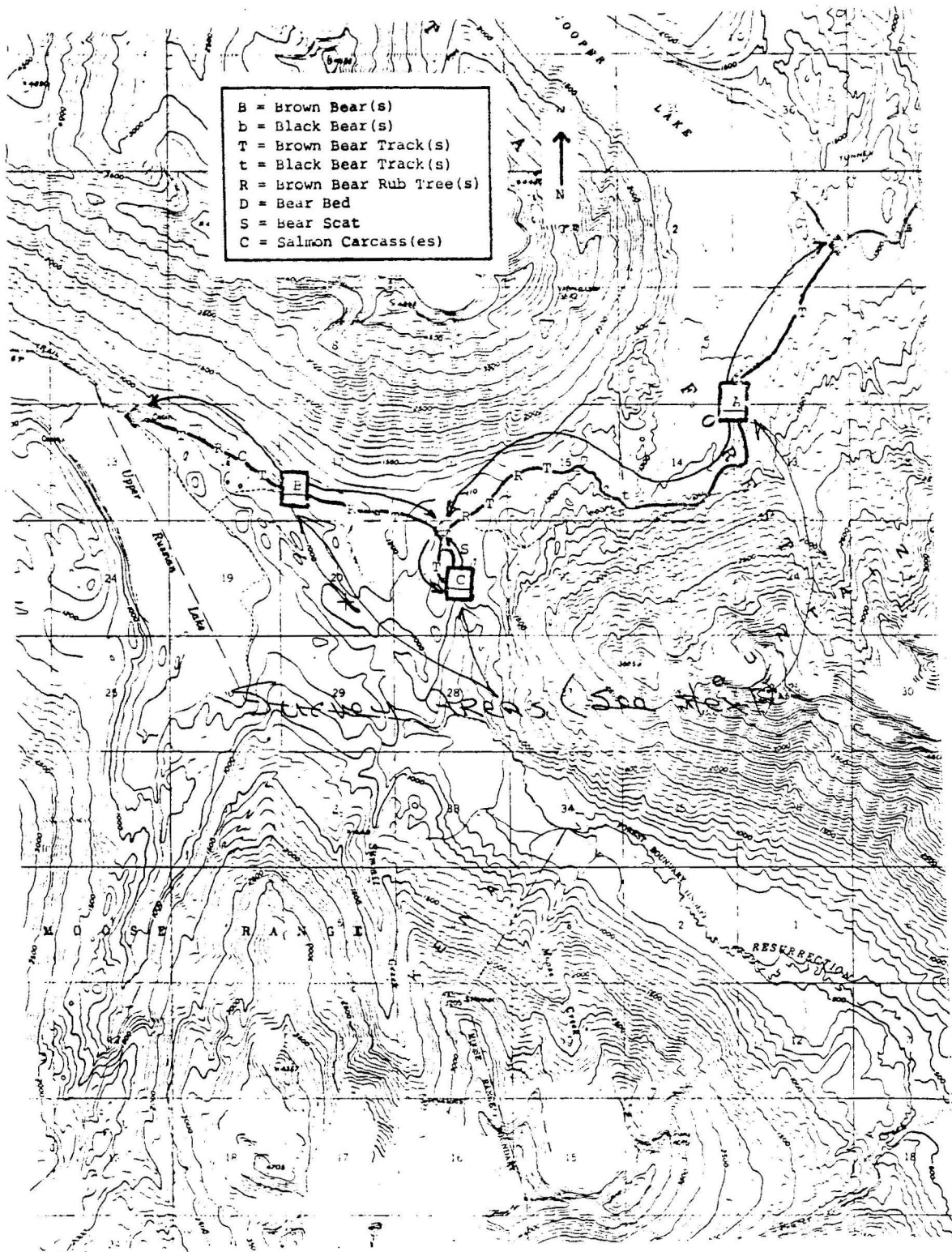
Segment B

Spruce and some hemlock occur at the beginning of segment B on the Upper Russian Lake side of the pass. Again, spring bear foods are common along stream bottoms as well as fall berry crops such as elderberry, highbush cranberry, devils club and current. Higher elevation sites contain some good patches of crowberry and blueberry. The later portion of segment B has numerous wet meadows of grass and sedge. These meadows are extensive along the southeast shore of the lake. Several of last year's sockeye salmon carcasses had been recently uncovered and were lying alongside the trail in section 18, T3N, R3W. Found near the salmon bones were the tracks of a large brown bear.

Segment C

Segment C originates in the cottonwood/bluejoint parks and alder shrubfields at the Cooper/Russian/Resurrection Trail junction and extends south for one mile along the headwaters of Resurrection River. Within one-quarter mile of the trail junction, there is a spruce/hemlock forest with a menziesia/moss understory. Due east of the trail and within 50 to 150 yards is a large wet graminoid meadow dotted with beaver dams and huts. The grasses and sedges in the meadow and forbs and horsetails in the forest understory provide excellent spring/summer bear food sources. One bear scat was observed in the meadow and a large brown bear's tracks occurred the entire length of the section of trail explored.

In sum, the lower elevation areas explored provide particularly good spring and summer food sources. These foods appear to be actively sought after by both black and brown bears alike. A total of at least four different sets of black bear tracks and three to four sets of brown bear tracks were noted during this survey. Scat was uncommon probably because of the absence of food in the area because of the late spring. Brown and black bear sign occurred throughout the entire length of the trail system explored, but was most common from the small lakes in section 10, T3N, R3W to Upper Russian Lake (section 18, T3N, R3W).



BROWN BEAR HABITAT EVALUATION REPORT

Area: South Fork Snow River
Personnel: Risdahl/ Schloeder

Dates: 6/4-7/85

Areas evaluated on this trip include approximately 13.5 miles of the 15 mile length of the South Fork of Snow River, the three known spawning streams documented in 1984, and the surrounding alder shrubfields and alpine slopes. The river bottom of the South Fork was the primary travel route used in this survey. A comparison of the amount of activity in early spring was made with the amount of activity documented in mid-September and October during the 1984 field season.

Our survey began at mile 13 on the Seward Highway, one-quarter mile upstream from where Snow River's two forks join. The South Fork is a braided stream meandering through a wide valley bottom. The lower ten miles of river bottom are easily accessed at low water by 4x4 vehicles because of its many shallow channels and gravel and sand bars. It is also a natural travel corridor for big game species such as moose, brown bear and black bear and is used extensively by each species. Above the highwater mark, many large wet meadows of willow, grass and sedge are interspersed with groves of cottonwood or sitka spruce. The lower slopes of the surrounding mountains are primarily alder shrubfields and bluejoint meadows. The entire length of the South Fork provides excellent brown and black bear spring, summer and fall food sources. The best spring foods found in abundance include the early sprouting grass shoots, sedges and horsetails. The onset of summer's warmer weather brings out many forbs and greater quantities of graminoids and horsetails. Mid- to late-summer and fall provides sockeyes, silvers and pinks as well as a fair amount of devils club and highbush cranberry, and a generous amount of crowberry and some blueberry.

Brown bear sign was first observed within one-and-a-half miles of the Seward Highway. A large brown bear had traveled down the gravel and sand bars no more than one day ahead of us. The bear had entered a spruce forest to the south of the river onto an old blazed trail. Exploration of this trail last year indicated that it received repeated use by bears. A set of small black bear tracks was found nearby.

Approximately 3.5 miles upstream is the first salmon spawning stream. Walking the stream, we found fairly fresh tracks of a brown bear, two scats composed mainly of rotten fish carcasses and brown bear hair on a number of overhanging tree branches and willow branches. There were also three locations where last year's salmon carcasses had been dug up and partially eaten, probably by wolves. Wolf sign was abundant the entire lower ten miles of the river.

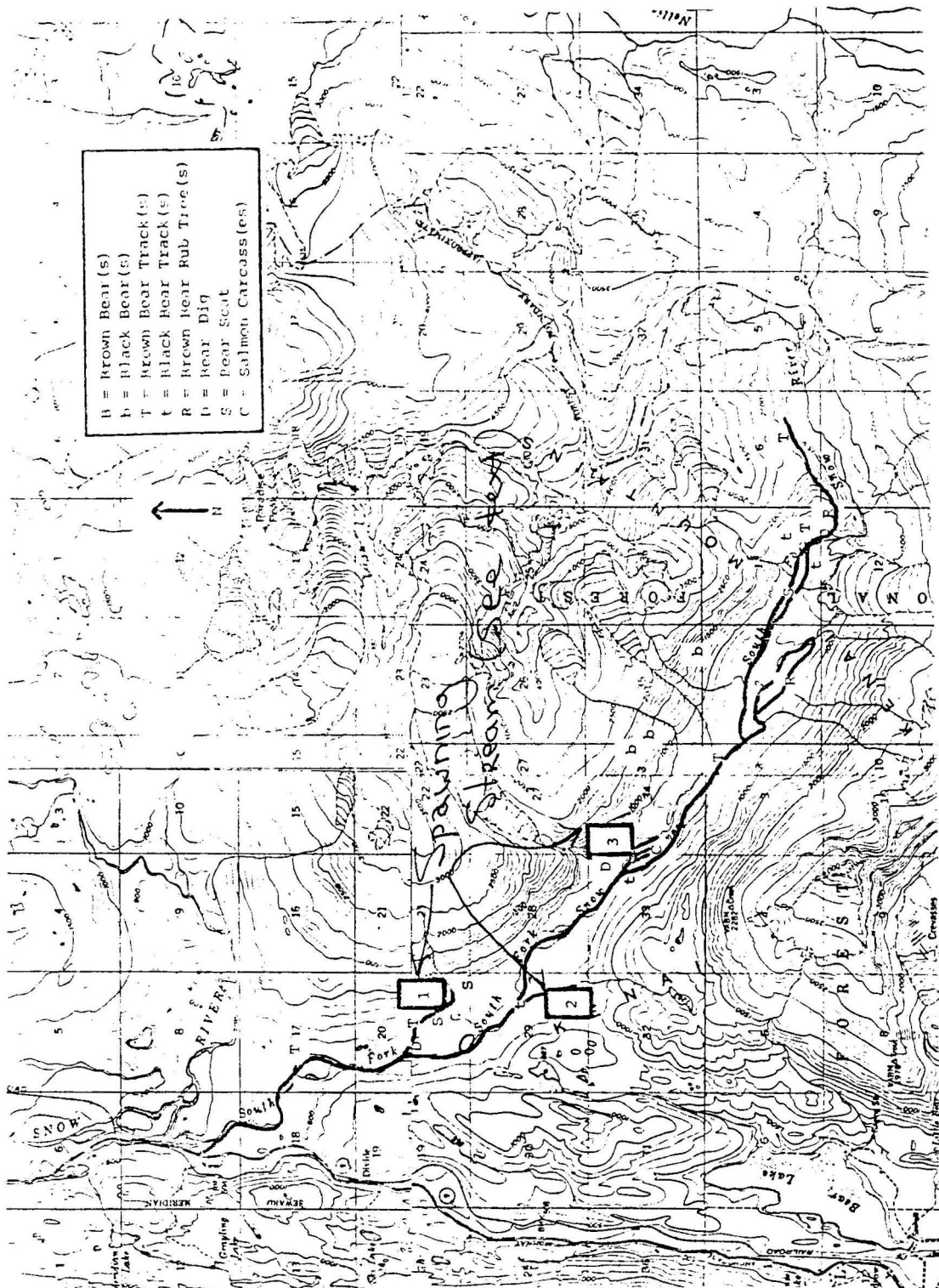
One mile further upstream is the second spawning stream. Walking southward from its confluence with the South Fork, we found only the tracks of a medium-sized black bear.

Roughly two miles further upstream, two channels of the South Fork of Snow River meet. The new channel lies to the north and the old channel lies to the south. Between these two channels is a large willow/bluejoint meadow dotted with a few spruce and cottonwood trees. Emerging from this meadow are three main seeps, each of which contained some spawning salmon last September. Fresh bear sign was scarce in this area. We found one set of fresh black bear tracks along the southern branch of the old streambed. Three digs for microtine (probably vole) rodents were noted adjacent to one of the seeps. Six spruce trees had been stripped of their lower bark and the cambium had been scraped off by a bear. A fair number of last year's salmon carcasses littered the banks, but showed no evidence of having been used this spring. One-and-a-half miles further upstream, in section 28, T1N, R1E, we spotted a black bear sow and yearling cub on the 5th, and in the same area on the 6th, we spotted a single black bear. Approximately one mile further upstream, also on the 6th, we sighted another black bear sow and yearling cub (possibly the same bears seen the day before). All these black bears were observed grazing in bluejoint meadows bordering alder shrubfields.

On the river bottom, directly below where the first black bear observation was made, we noted numerous places where a large brown bear had traversed the sand and gravel bars. A short distance upstream in section 2, T1N, R1E, two major forks of the South Fork meet. This area is composed of spruce/cottonwood stands intermingled with extensive willow shrubfields. Moose trails and sign are extensive and a few old brown bear rubbed trees were found along the trails.

There is an old blazed trail along the main channel of the South Fork beginning in section 1, T1N, R1E. It takes off most clearly on the north side of the river just upstream from where a major glacial tributary stream enters the river. Both brown and black bear tracks were found in the snow where this trail takes off from the river's north shore. Southward, across the glacial stream where the trail cuts a poorly used path through a tall alder field was a large (two-and-a-half inches in diameter) brown bear scat of grass. Brown bear hair was found in the scat and around it in a bed. A little further up the trail, again on the north side of the river, the trail passes by an old collapsed cabin. Beyond that, the trail continues to climb, keeping just above the level of the river. The river here climbs rapidly in a series of waterfalls. This section of trail goes through some large spruce and hemlock trees, a number of which have been scarred and rubbed by brown bears. The trail was lost when we left the timber and entered deep snow. Hiking across snow that was five feet or more deep, then around the corner and onto a south facing slope overlooking the river, we found some snow-free areas of bluejoint grass and salmonberry, and some sloughed-off muddy hillsides. A large brown bear had come from the east - the Nellie Juan divide - which was completely snowbound at the time.

In conclusion, even though salmon are unavailable at this time, it appears that both brown and black bears use the South Fork of Snow River as a travel corridor, at least, but good spring and summer food sources are also available to them. As during our October 1984 survey, we found tracks of at least four different individual brown bears. We determined this from careful track measurements including footpad width, length and total length with claws. We also observed the tracks of at least four different black bears.



LOCATION: South Fork Snow
River

TRANSECT #:

DATE: 6/4-7/85

OBSERVERS: GR/CS

H = High
M = Medium
L = Low
t = trace

SPECIES

Sedge (Carex sp.)	H
Other sedge (Cyperaceae)	—
Grasses (Gramineae)	H
Horsetail (Equisetum sp.)	H
Lady Fern (Athyrium sp.)	L
Other ferns	L
Cow Parsnip (Heracleum lanatum)	t
Angelica (Angelica sp.)	—
Dandelion (Taraxicum sp.)	—
Mountain Sorrel (Oxycia digyna)	—
Wild Cucumber (Streptopus amplexifolia)	t
Chocolate Lily	—
Astragalus sp./Oxytropis sp.	L
Hedysarum sp.	—
Willow (salix sp.)	H
Cottonwood (Populus trichocarpa)	H
Blueberry (Vaccinium sp.)	M
Salmonberry (Rubus spectabilis)	t
Crowberry (Empetrum nigrum)	M
Devil's Club (Oplopanax horridum)	M
Highbush Cranberry (Viburnum edule)	M
Lowbush Cranberry (Vaccinium vitis-idaea)	M
Bearberry (Arctostaphylos sp.)	—
Mountain Ash (Sorbus sp.)	—
Current (Ribes sp.)	—
Elderberry (Sambucus racemosa)	L
Rose/Raspberry (Rosa sp., Rubus sp.)	L
Salmon	L
Moose	t

BROWN BEAR HABITAT EVALUATION SURVEY

Area: Resurrection River
Personnel: Risdahl/Schloeder

Dates: 6/25-27/85

The area surveyed begins at the Resurrection River Trailhead near Exit Glacier and extends northwest ten miles. The surveyed area ends three-and-one-half miles short of the Cooper/Russian/Resurrection River Trail junction.

SEGMENT A

This section of trail runs from the trailhead to Martin Creek, four miles upstream. The trail runs parallel to the river bottom and up on low timbered benches and hillsides of spruce (primarily sitka spruce). The trail veers northeast within one-quarter mile of Martin Creek then crosses the creek about 200 yards upstream. An abundance of lady ferns, oak ferns and horsetail occur along the river bottom and small tributary streams. No large sedge or bluejoint meadows occur in this section. Devils club is fairly common in this four mile stretch, but increases substantially the last mile just before Martin Creek. Elderberry and highbush cranberry occur in limited amounts throughout. A few alder patches are mixed in with the timber. Within the first mile of trail, we found three bear scats of grass/sedge and horsetail. At the one-and-a-half mile mark, a brown bear sow and cub's tracks were located on the 25th. Two days later, a fresh set of tracks from a single medium-sized brown bear were found along the trail southeast of Martin Creek. Between Martin Creek and the trailhead, 21 scats were counted. All but two were composed of grass/sedge and horsetail. The other two scats contained a good portion of animal hair.

SEGMENT B

Segment B is the two mile stretch of trail between Martin Creek and Boulder Creek. The habitat is quite similar to that in Segment A, except that there are more cottonwood stands and devils club patches. There is a stand of large spruce and hemlock trees the last mile just before Boulder Creek. Almost centrally located between Martin and Boulder Creeks is a new USFS public-use cabin. We counted 11 piles of scat and all were composed of grass/sedge and horsetail in this stretch. Both brown and black bear tracks were seen on this section of trail.

SEGMENT C

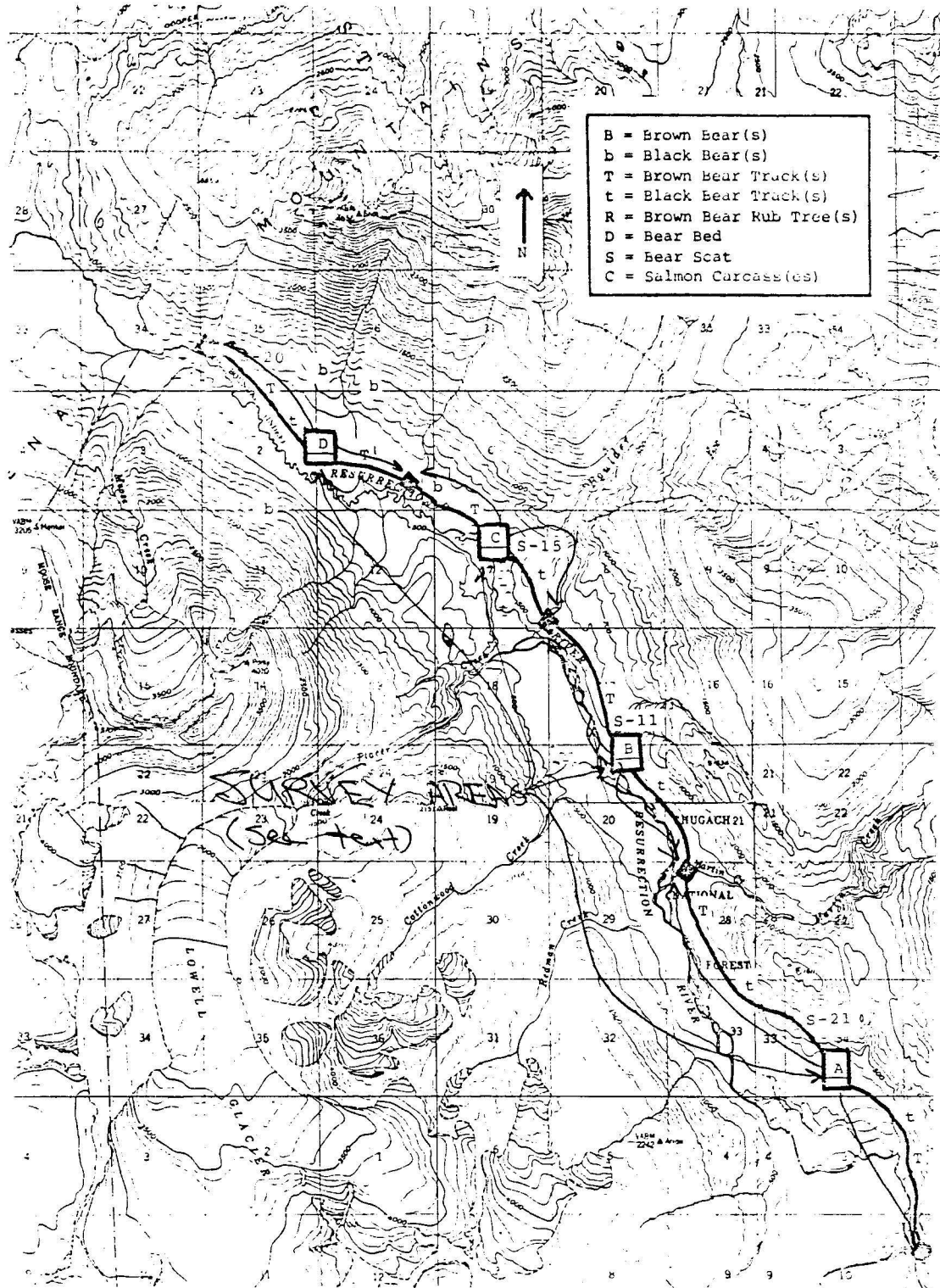
Segment C begins on the north side of Boulder Creek in an extensive patch of devils club shaded by some very large cottonwoods and spruce, and some small patches of alder. Leaving the devils club patch, the trail passes through a transition of cottonwood to spruce and hemlock and ends at a large grass/forb snowchute approximately one-and-three-quarters of a mile from Boulder Creek. At the time of our survey, greenup was late and grasses and horsetails were still very short, and devils club, wood fern and lady fern leaves were still unraveling. Yet, these spring foods were still commonly accessible in moist low sites along creek bottoms or adjacent to the river bottom. Alder shrubs and cottonwoods were already pretty well leafed-out, however. Twisted stalk, highbush cranberry and elderberry occurred frequently in the understory.

The snowchute itself was primarily bluejoint grass with a mixture of cow parsnip, chocolate lilies, other forbs, and sedge. This segment contained 15 bear scats, all were composed of grass/sedge and/or horsetail. Both brown and black bear tracks were commonly seen, but were rarely of measureable quality. One short brown bear track was discernable from the other three sets already mentioned. This bear's left front foot was seven-and-one-quarter inches wide, but was only six inches long, with one-and-a-half inch long claws. The sow's track seen earlier was seven-and-a-half inches long and seven-and-a-half inches wide, and had 2 inch long claws. The medium-sized bear's tracks that were seen on the 27th, were 6 inches wide. We also encountered an aggressive black bear within 200 yards of the snowchute. After a 45 minute confrontation with this 140 pound black, I was forced to fire a warning shot to scare him away. This animal had circled almost completely around us and finally ended up cutting us off on the trail, woofed, lunged, stomped its front paws and lateral displayed until he was within 25 feet of us. The shot sprayed mud and dirt in his face and he ran about 20 yards, then sauntered off into the woods, seemingly little alarmed.

SEGMENT D

Segment D runs from the snowchute through a spruce/hemlock forest to a large open stand of cottonwoods, willows and alders. Along the northern edge of the trail, just barely in sight through the trees, are a series of wet sedge meadows. These meadows consist of dwarf birch, shrubby cinquefoil, laborador tea, bog rosemary and moss. The birch and cinquefoil were secondarily abundant to the sedges. This section of trail contained the greatest number of bear scats per mile. This two-and-a-half mile section of trail contained 20 scats on the trail alone and one more in the largest sedge meadow. Again, these scats were all composed of graminoids and horsetails. Both brown and black bear tracks were frequently seen along the trail. Extensive use by humans and animals both (including moose, brown and black bears, wolves and coyotes) made accurate determination of different individual bears difficult. At the northern end of the largest meadow was a brown bear footprint trail in the grass/sedge and moss. This trail led to two broken and rubbed spruce saplings. There were cub tracks inside the large bear's tracks and chocolate brown hair on the saplings. The bear trail led from the meadow through two waterholes that resembled wallows, and continued on into a spruce/hemlock forest to the north. Mid-afternoon scanning of the slopes revealed three different black bears grazing in the alder/bluejoint/ zone. Observations were made at 2:20, 4:00 and 5:00 PM.

In conclusion, the valley bottoms, large sedge meadows and extensive alder/bluejoint sidehills offer good spring and summer sources of food to brown bears. The entire ten miles of Resurrection River Trail explored is used intensively by both brown and black bears. The large numbers of tracks (from no less than five individually identifiable brown bears) and scats (67 on the trail alone) is supportive evidence that this is a high use area in the spring and summer. In addition, track, live salmon and bear-killed salmon counts made along the Resurrection River last fall further show that this drainage is a year round high use area.



LOCATION: Resurrection
River

TRANSECT #:

DATE: 6/25-27/85

OBSERVERS: GR/CS

H = High
M = Medium
L = Low
t = trace

SPECIES	TRANSECT SEGMENT			
	A	B	C	D
Sedge (<i>Carex</i> sp.)	t	t	t	H
Other sedge (<i>Cyperaceae</i>)	—	—	—	—
Grasses (<i>Gramineae</i>)	L	L	M	M
Horsetail (<i>Equisetum</i> sp.)	H	H	H	H
Lady Fern (<i>Athyrium</i> sp.)	H	H	H	H
Other ferns	H	H	H	H
Cow Parsnip (<i>Heracleum lanatum</i>)	t	—	M	t
Angelica (<i>Angelica</i> sp.)	t	—	L	—
Dandelion (<i>Taraxicum</i> sp.)	—	—	—	—
Mountain Sorrel (<i>Oxyria digyna</i>)	—	—	t	—
Wild Cucumber (<i>Streptopus amplexifolia</i>)	L	L	M	L
Chocolate Lily	—	—	M	—
<i>Astragalus</i> sp./ <i>Oxytropis</i> sp.	—	—	—	—
<i>Hedysarum</i> sp.	—	—	—	—
Willow (<i>Salix</i> sp.)	L	L	M	M
Cottonwood (<i>Populus trichocarpa</i>)	L	M	H	M
Blueberry (<i>Vaccinium</i> sp.)	L	t	t	t
Salmonberry (<i>Rubus spectabilis</i>)	t	—	—	—
Crowberry (<i>Empetrum nigrum</i>)	t	L	L	L
Devil's Club (<i>Oplopanax horridum</i>)	M	t	H	M
Highbush Cranberry (<i>Viburnum edule</i>)	L	L	H	M
Lowbush Cranberry (<i>Vaccinium vitis-idaea</i>)	L	L	L	L
Bearberry (<i>Arctostaphylos</i> sp.)	—	—	—	—
Mountain Ash (<i>Sorbus</i> sp.)	t	—	—	—
Current (<i>Ribes</i> sp.)	t	t	—	t
Elderberry (<i>Sambucus racemosa</i>)	L	L	H	M
Rose/Raspberry (<i>Rosa</i> sp., <i>Rubus</i> sp.)	t	t	t	t
Salmon	—	—	—	—
Moose	—	—	t	—

BROWN BEAR HABITAT EVALUATION SURVEY

Area: Ptarmigan Lake/Snow River Pass/Paradise Valley
Personnel: Risdahl/Schloeder

Dates: 8/26-30/85

The area surveyed begins at the Ptarmigan Creek Campground near mile marker 23 on the Seward Highway and follows the Ptarmigan Creek Trail to the east end of Ptarmigan Lake. It then goes south over Snow River Pass, then southwest down Paradise Valley and out near the mouth of the North Fork of Snow River at mile marker 13.5.

Segment A begins at the east side of the Ptarmigan Creek Campground and follows the Ptarmigan Creek Trail to Ptarmigan Lake. It then continues along the north shore of the lake following a fisherman's trail to the lake's east end. The last mile of the fisherman's trail was reconditioned into a standard USFS trail this summer by a volunteer trail crew under the supervision of USFS personnel. The first three miles of this trail receives heavy use by humans from where it begins in a spruce/cottonwood forest to where it passes through a mixed spruce/hemlock forest on the way to the lake. Two alder/bluejoint snowchutes occur at the upper end of the trail near the lake. The understory is a mixture of forbs and shrubs including devils club, menziesia, highbush cranberry, lowbush cranberry, crowberry, twisted stalk, horsetails, ferns and moss. Some good potential bear foods are available but appear to receive little use by bears. This may be because human use of the area is so extensive. Bevins and Risdahl found no use by brown bears of the spawning sockeye salmon in Ptarmigan Creek during their survey in September 1984 (Bevins et al. 1984). But a small brown bear was reported seen by a seasonal employee a week prior to their survey in the area. We found no evidence of black or brown bear use along this section of Segment A.

Segment A continues around the north shore of the lake and terminates where Upper Ptarmigan Creek enters Ptarmigan Lake. Here, the habitat is primarily spruce/cottonwood forests mixed with alder and bluejoint snowchutes. There are also a few birch groves and some willow. Near the upper end of the lake, there are more cottonwood stands and later, spruce are found mixed in with the cottonwoods. Good bear habitat is limited to the narrow, relatively level ground along the lake and about one quarter to one third the distance up Ptarmigan mountain. Steep slopes quickly give rise to rock cliffs, scree and talus. Potential spring and early summer foods found here are bluejoint grass, horsetails and some early growing forbs. Potential fall food sources include devils club berries, highbush cranberries, lowbush cranberries, crowberries and twisted stalk berries. A few wild raspberry bushes and trailing raspberry plants are also available. At the time of our survey, only one small bear scat of vegetation was seen along this section of Segment A.

Segment B begins where Upper Ptarmigan Creek enters Ptarmigan Lake. It terminates at Snow River Pass in section 17, T3N, R2E. The first three miles of this segment follows the gravel stream bed of Upper Ptarmigan Creek. Surrounding habitat is primarily a spruce/cottonwood forest with patches of alder along the stream bank. Alder patches are also mixed in with the timber. Devils club, horsetails and moss predominate in the understory. One small set of black bear tracks were seen along the creek bottom and a black bear was sighted on a north facing slope in section 6, T3N, R2E.

This bear was feeding in an alpine bearberry, alpine blueberry and crowberry patch. Two more black bears were seen feeding on a low alpine finger extending southeast of Ptarmigan Mountain in section 32, T4N, R2E. These bears were also feeding on the ripening berry crops. Dolly varden were seen in Upper Ptarmigan Creek but, of course, no salmon occur in this stream. Moose tracks and other sign indicated their frequent presence in the valley as well. Numerous mountain goats and dall sheep were sighted in very accessible terrain in this area.

Closer to Snow River Pass and away from Upper Ptarmigan Creek, a dense alder/devils club bottom with some cottonwood and spruce trees is encountered. This jungle of alder and devils club changes to spruce, menziesia and moss and then to hemlock as the pass is neared. There is a large spruce and hemlock stand that was wiped out by an avalanche about one and one half miles north of the pass. Next to this avalanche area is a large wet sedge meadow. Another spruce/hemlock forest with a thick menziesia understory occurs next. Then an area of bluejoint/forb meadows interspersed with alder patches followed by a full mile of solid alders is encountered. Devils club, horsetails or ferns occur under the alders depending on the amount of available moisture.

Throughout this segment, we occasionally located the old Civil Conservation Corps (CCC) trail built in the 1930's, but soon lost it in a maze of alders or a forest of deadfall. We noticed two very old brown bear rub trees along this trail. The portions of the CCC trail that are still discernable have been maintained by moose activity. Recent use by humans is not visible.

After cutting our way through the mile long alder patch, we picked up the CCC trail again as we entered some open grass/cowparsnip meadows and small willow patches, one quarter mile north of the pass. Snow River Pass itself is an area of rolling hills lying between the major mountains. These hills are covered with hemlocks interspersed with occasional alder patches.

Segment C begins in some open grassy benches along the southeast end of Andy Simons Mountain bordering the timbered hills south of Snow River Pass. These grass benches contain a wide variety of forbs. Cowparsnip is particularly common in the lower benches. Willow and alder grow in the moister sites around the benches. A few small ponds and lakes occur in the hilly area as well as among the open benches. Sedge meadows often encircle these small bodies of water and line their inlet and outlet streams. Hiking through these open benches, we sighted one black bear and several bear scats. About half the scats were composed of horsetails and the other half of crowberries and lowbush cranberries. Wolf and coyote sign were even more abundant.

Moving south from Snow River Pass, we maintained our elevation to avoid the thick underbrush and alders so common in the lower, wetter areas. We hiked from these open benches across a moderately steep side slope covered with grass/forbs and low growing willows. After about a mile stretch of sidehilling, we again were able to walk on some low benches overlooking Paradise Valley.

At this time, we took a short side excursion into the alpine to check for berry crop production and sign of use by bears. The primary berry producers in this particular area were crowberry, alpine bearberry, alpine blueberry and lowbush cranberry. The several scats we found reflected the available food sources. All but two bear scats were composed of crowberry. The other two were of green vegetation. Further glassing revealed no bears, but more dall sheep and mountain goats were observed.

A remarkably beautiful view of Paradise Valley and the North Fork of Snow River was had while surveying the benchlands and alpine. Several glaciers hang among the rock peaks or sweep close to the river bottom. Lakes and ponds dot the valley bottom and benches. The thalo green of spruce/hemlock forests is offset by some huge lime colored grass/sedge meadows. Sparkling streams meander through the meadows to join the North Fork and its wide gravel bars.

From our alpine hike in section 19, T3N, R2E, we crossed the grass/forb and willow sidehills to reach easier walking on more low, rockier benches bordering Paradise Valley. Moist grass/cowparsnip meadows, then willow fields followed by grass/sedge meadows occurred among the lower rocky benches as we continued our descent to the valley floor. Leaving these open benches, we entered a thick hemlock and alder forest. Here, we again discovered the old CCC trail. But as usual, we lost it in the alders and deadfall. Another avalanche had wiped out an acre section of hemlocks similar to the one we encountered earlier near Snow River Pass. Two very old brown bear rub trees were seen along the trail in this section.

After chopping our way to the bottom, we entered a Cottonwood/bluejoint park that bordered a huge sedge and willow meadow. We walked along the edge of the meadow a little over a mile till we reached the gravel floodplain of the North Fork. We found the tracks of a small brown bear both where we entered the sedge meadow and where we exited it on the gravel alongside the river (sections 35 and 36, T3N, R1E). Moose and wolf sign were quite common in this area and an albino sparrow was sighted along the edge of the meadow.

Segment D begins where we camped on the gravel and sand river bottom of the North Fork. It extends upstream approximately two and one half miles along the river bottom, and back to camp through some rolling rocky knobs and the southern portion of the large sedge/willow meadow. The vegetation beside the river is composed of dense willow fields and dry forb fields with scattered cottonwoods. Both these flat dry areas and knobs bordering the sedge meadow are dominated by crowberry and lichens. Alders are thick in spots along the river as are spruce and willow. Further from the river, the rocky knobs are covered with low growing hemlocks. Wet sedge meadows are scattered in the low areas between the rocky knobs. Dominant plant species around the sedge meadows are dwarf birch, laborador tea, fireweed, lowbush cranberry, bunchberry and club moss. Some larger patches of highbush cranberry are mixed in with willows where they both occur under the cover of spruce trees.

Bear scats, both crowberry and green vegetation¹, mainly sedge, were common. We found a total of 8 crowberry scats and 7 vegetation scats during our random wandering on the river bottom. We noted at least two sets of brown bear tracks and two sets of black bear tracks (a sow and her cub). Moose, wolf, otter, beaver and mink sign were all fairly common. A small green cabin was seen on the opposite bank of the river in section 35, T3N, R1E, but the river was too deep and swift to ford to investigate it.

Segment E also begins at our camp on the gravel river bed. It extends southwest paralleling the North Fork of Snow River along the old CCC trail all the way to an oxbow lake in section 8, T2N, R1E. From there, it follows a trapper's trail to the railroad tracks and across the river to mile 13.5 on the Seward Highway.

We were lucky to discover that the old CCC trail had been flagged with surveyors tape all the way from the river bed, within a quarter mile of camp, back to the oxbow lake. The trail really saved us a lot of time and probably took us through some of the better spots to look for bear sign. The hike out took us through a spruce/hemlock forest with numerous wet sedge meadows. Alder and willow choked some of the drainages into and out of the small meadows. Devils club was fairly common in the wetter, shaded depressions as was alder. Crowberry was common in areas under the hemlocks as well as menziesia and moss.

We decided to leave the CCC trail when we came to the oxbow lake and follow the trapper's trail instead, because a lot of large old growth spruce trees had fallen across the trail making passage difficult. Traveling along the CCC trail, we saw six crowberry scats, two mixed scats of crowberry and vegetation, one mixed scat of devils club berries and vegetation and four of vegetation. We noted black bear tracks in two places along the trail. The only brown bear tracks we saw were from a small individual down on the river bottom where the North and South Forks join. We also saw three small digs in one of the sedge meadows in section 3, T3N, R1E.

In summary, because of the relatively inaccessible nature of the Snow River Pass/ Paradise Valley area and the good potential sources of spring and fall foods for bears, we feel that this is potentially good brown bear habitat. No brown bears were sighted, but the tracks of three different individuals were seen. A number of different sets of black bear tracks were noted as well as the observation of four different bears. Other brown bear sign was observed, but because the habitat had little exposed soil or sand to take tracks, more use by brown bears may occur than was readily apparent.

LOCATION: Ptarmigan L./Snow River Pass/Paradise Valley
 DATE: 8/26 - 30/85
 TRANSECT #:
 OBSERVERS: GR/CS

H = High
 M = Medium
 L = Low
 t = trace

SPECIES	TRANSECT SEGMENT				
	A	B	C	D	E
Sedge (<i>Carex</i> sp.)	t	L	H	H	H
Other sedge (<i>Cyperaceae</i>)	—	—	—	—	—
GRASSES (<i>Gramineae</i>)	L	H	H	M	L
Horsetail (<i>Equisetum</i> sp.)	H	H	H	L	M
Lady Fern (<i>Athyrium</i> sp.)	H	M	H	t	L
Other ferns	H	L	L	t	L
Cow Parsnip (<i>Heracleum lanatum</i>)	L	M	H	—	L
Angelica (<i>Angelica</i> sp.)	—	L	L	—	—
Dandelion (<i>Taraxicum</i> sp.)	—	t	t	—	—
Mountain Sorrel (<i>Oxyria digyna</i>)	—	—	—	—	—
Wild Cucumber (<i>Streptopus amplexifolia</i>)	M	L	L	—	M
Chocolate Lily	—	—	—	—	—
Astragalus sp./Oxytropis sp.	L	—	M	—	—
Hedysarum sp.	—	—	—	—	—
Willow (<i>Salix</i> sp.)	L	M	H	H	L
Cottonwood (<i>Populus trichocarpa</i>)	L	L	L	M	H
Blueberry (<i>Vaccinium</i> sp.)	L	—	H	M	L
Salmonberry (<i>Rubus spectabilis</i>)	—	L	—	—	—
Crowberry (<i>Empetrum nigrum</i>)	H	—	H	H	H
Devil's Club (<i>Oplopanax horridum</i>)	H	H	H	—	H
Highbush Cranberry (<i>Viburnum edule</i>)	M	L	t	H	L
Lowbush Cranberry (<i>Vaccinium vitis-idaea</i>)	H	t	H	H	M
Bearberry (<i>Arctostaphylos</i> sp.)	—	—	H	t	—
Mountain Ash (<i>Sorbus</i> sp.)	—	—	—	—	—
Current (<i>Ribes</i> sp.)	—	—	—	—	—
Elderberry (<i>Sambucus racemosa</i>)	L	L	L	—	t
Rose/Raspberry (<i>Rosa</i> sp., <i>Rubus</i> sp.)	t	L	L	—	—
Salmon	H	—	—	—	—
Moose	—	—	t	t	t

SALMON SPAWNING AREA EVALUATION SURVEY

Area: Funny River
Personnel: Risdahl/Schloeder

Dates: 7/8-12/85

The Funny River is a major tributary of the Kenai River that enters from the south near river mile 30.5 in section 28, T5N, R9W. This river is an important spawning area for king salmon and receives an annual escapement of about 1300 fish. Pink and silver salmon also spawn in this river. Kings enter the Funny in late May to early July and reach peak numbers by late July/August. Kings are known to spawn up as far as section 20, T2N, R7W. Many brown bears have been observed on the Funny River during the annual salmon spawning migration by US Fish and Wildlife Service (USF&WS) employees.

We flew into Timberline Lake on July 8, in the USF&WS piper cub with pilot, Bob Richey. The flight took two trips as the plane has passenger room for only one. Cathy spotted a cinnamon colored brown bear on the lower part of the Funny on her flight in. I spotted a black just off the bottom in a bluejoint meadow.

We began our survey of the Funny River just short of tree line near its headwaters. The stream in this area is an average of about 12 feet wide and less than two feet deep. The surrounding habitat is primarily a cottonwood park with a bluejoint and forb understory. Alder and willow patches are common on the bottom but thicker on the valley side hills. Spring/summer bear foods are abundant on the stream bottoms in addition to the salmon. Horsetail, alpine blueberry, alpine bearberry and crowberry are common in the higher areas in addition to the ever present dwarf birch and willow.

During the evening of the 8th, we spotted a black bear sow and two cubs in a bluejoint meadow near the river bottom in section 28, T2N, R7W. Three hours later, we came upon the family on the river bottom in a cottonwood park. As the sow started her cubs up a big cottonwood, we backtracked and made a wide circle around them. That same evening, we observed a black bear boar and sow mating in section 34, T2N, R7W. We observed only three bear scats, all of vegetation, during that short six mile section of alpine and river bottom. Moose and shed antlers as well as sign were abundant. The moose trails made travel on the bottom easy.

On the morning of the 9th, we picked up surveying the river bottom where we left off the previous day. Brown bear sign began to appear in section 21, T2N, R7W. A few rub trees and footprint trails leading to mark trees (trees clawed, bitten and rubbed, often with their tops broken off) were present. A messy hunting camp was encountered in section 20, T2N, R7W. Two brown bear mark trees were in the camp. They had been stripped of their bark up to eight feet high and had copious amounts of brown bear hair stuck in the oozing pine pitch.

One-half mile downstream from the hunting camp, a small stream flows in from the east in section 17, T2N, R7W. Fresher brown bear sign began appearing and lots of older sign. The first sighting of king salmon occurred in this area also. Up till this point, 12 piles of bear scat were seen. Again, all appeared to be horsetail and some grass.

Three scats were very large, over one quart in volume and greater than two-and-one-half inches in diameter. The further we walked downstream, the more brown bear sign we encountered. Brown bear trails, including mark trees and footprint trails, were very common along both sides of the river, especially the east side. Mark trees were spaced out regularly along the trail every 100-200 yards. We also noted several trees that had their bark stripped and the inner cambium scraped off by a bear.

From the point where we first began seeing salmon to a point about three miles downstream in section 12, T2N, R8W, we counted 30 live salmon. On two occasions, we smelled rotting fish but were unable to locate any bear killed salmon. An estimate of the number of different individual bears determined by track measurements was nine brown bears and two black bears. The browns included:

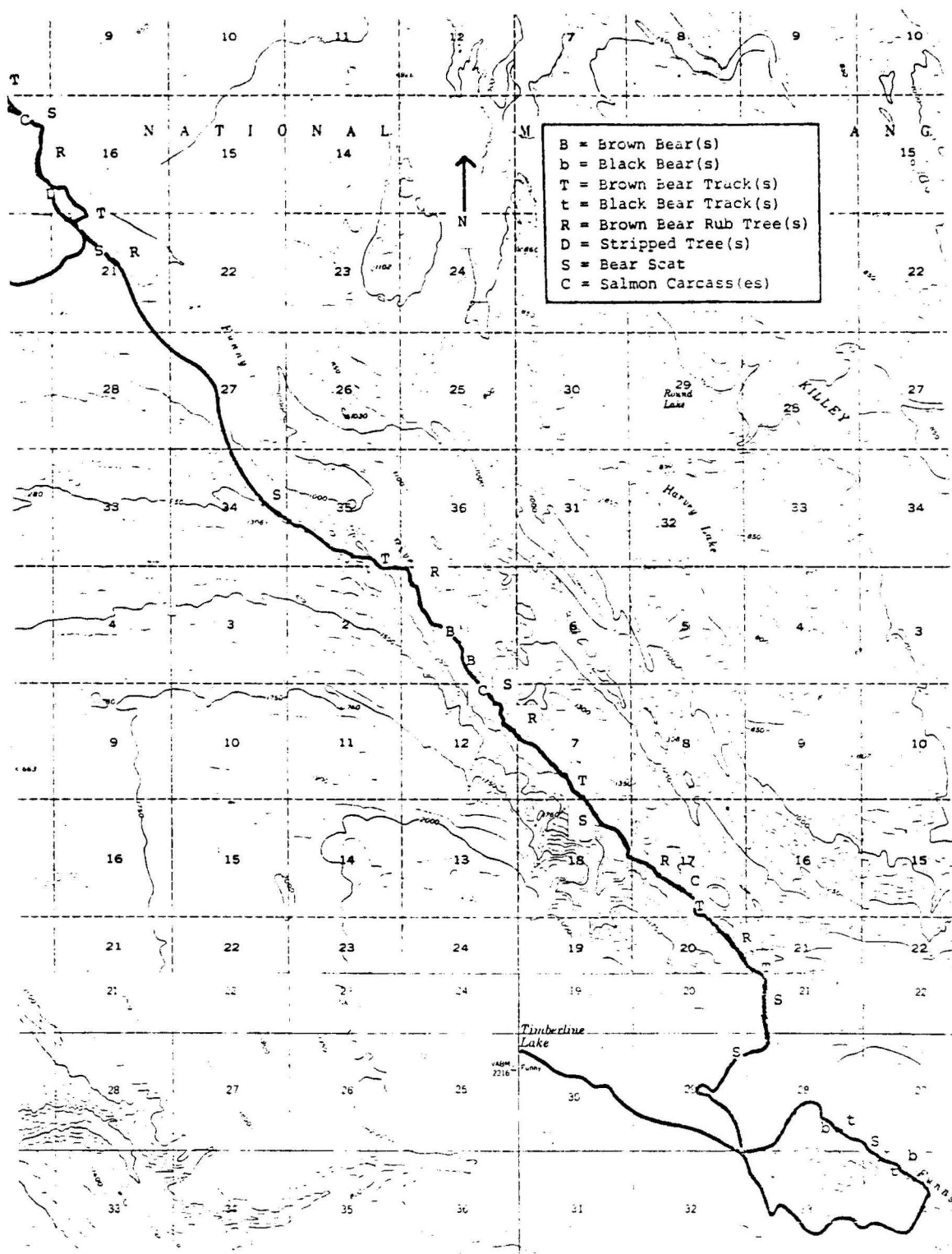
- 1 sow with 1 cub of the year - fresh tracks
- 1 sow with a larger cub - moderately fresh tracks
- 1 large single bear - fresh tracks
- 1 small single bear - moderately fresh tracks
- 1 large single bear - old tracks
- 1 sow with a larger cub - old tracks

Some overlap of individuals may occur between old and fresh sign. The river bottom in this area has become increasingly choked with willow and alder. Travel by alternating on moose/bear trails and the river bottom itself made travel moderately easy, however.

At 11:35 AM on the morning of the 10th, we ran into a large cinnamon/blonde brown bear walking upstream. At a distance of 35 yards, the bear saw us, spun around, charged across the river and disappeared into the woods. Thirty minutes later, we were still tromping down the stream when suddenly, a dark chocolate brown bear made loud alternating sucking and blowing, growling sounds from some tall willows about eight yards away. I swung the .375 on this bear and he ran off into the woods just as the first bear had. Both bears were seen in section 1, T2N, R8W. A fresh sow and cub brown bears' tracks were also seen in this area. Radio contact with Ed Bangs made us aware that two of our radio collared brown bears were just downstream of us as well. We then chose to travel on the old horse packing trail on the south side of the river as the brown bear activity was so intense on the main river bottom. It appeared that the browns were using the area intensively - waiting for the kings to arrive. We sighted only one live king and one bear killed salmon on this stretch.

The horse trail in this section goes through a spruce forest with a menziesia and moss understory. Brown bear sign on the trail was scarce. Only a few tracks and scats were seen. The horse trail itself is often quite similar to the abundant moose trails. Picking the proper fork in the trail was occasionally a problem because of the minimal impact on the packing trail by horses.

We explored the river bottom again on the 11th, from section 21, T3N, R8W to the northern edge of section 17, T3N, R8W. We counted 17 live salmon and one bear killed salmon in this two mile stretch of river. Tracks were still very common, but not nearly as prolific as where we encountered the two brown bears. The main tracks in this area were a fresh set from a sow and cub, and an old set of larger tracks. The several bear scats that we saw were composed primarily of Equisetum, probably Equisetum arvense, as it is particularly abundant in this area.



SALMON SPAWNING AREA EVALUATION SURVEY

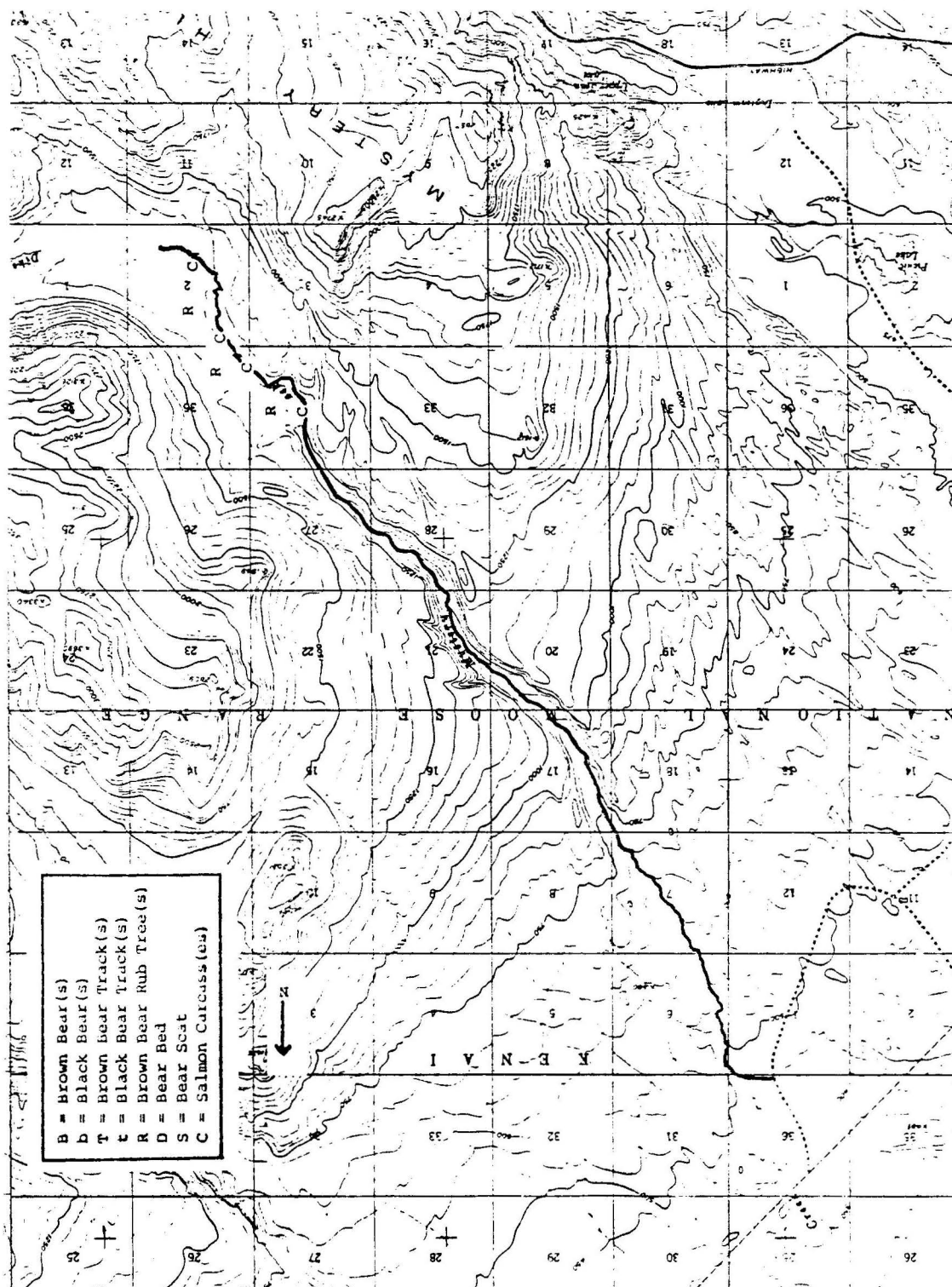
Area: Mystery Creek
Personnel: Risdahl/Schloeder

Date: 7/17/85

Mystery Creek originates in Mystery Hills and behind Round Mountain north of the Sterling Highway. It enters the Chickaloon River approximately one-and-one-half miles east of Moose Lake in section 35, T8N, R6W. We began our survey about seven air miles upstream of the pipeline road in section 36, T7N, R6W, with USF&WS fisheries technician, Jeff Booth. The stream distance traveled was estimated to be close to twice the air distance. Mystery Creek receives an estimated annual migration of ~ king salmon and ~ sockeye salmon, with peak spawning times on July 20-25 and July 15, respectively.

From the drop off point, in a relatively large willow meadow, to three miles downstream, we counted 174 live king salmon, four bear kills and one that had been devoured by eagles. No sockeye salmon had been up that far. Recent brown bear sign in this section was minimal. It appeared that one medium sized brown bear and one black had walked the whole distance to that point. There was no evidence of brown bear having spent much time in the area, but dark chocolate brown bear hair was seen on a number of rub trees along a trail adjacent to the creek. There was quite a bit of very old brown bear sign, however. There were several old trails and lots of old mark trees, but very little fresh sign. Moose trails and sign were also unusually rare.

We found the remains of two dead moose. Wolf scats were located nearby but no bear sign. Walking was very difficult in this drainage because of a slick rocky stream bottom, downed timber, log jams, alder and devils club; plus the non-existence of game trails. We consequently missed surveying the last three miles of stream and were forced to hike through a spruce/cottonwood forest. Sockeye salmon were not seen in the river until we were five air miles downstream from our starting point. This stream does not currently appear to receive much use by brown bears as evidenced by the lack of fresh sign.



SALMON SPAWNING AREA EVALUATION SURVEY

Area: Upper Chickaloon River
 Personnel: Risdahl/Schloeder

Date: 7/23/85

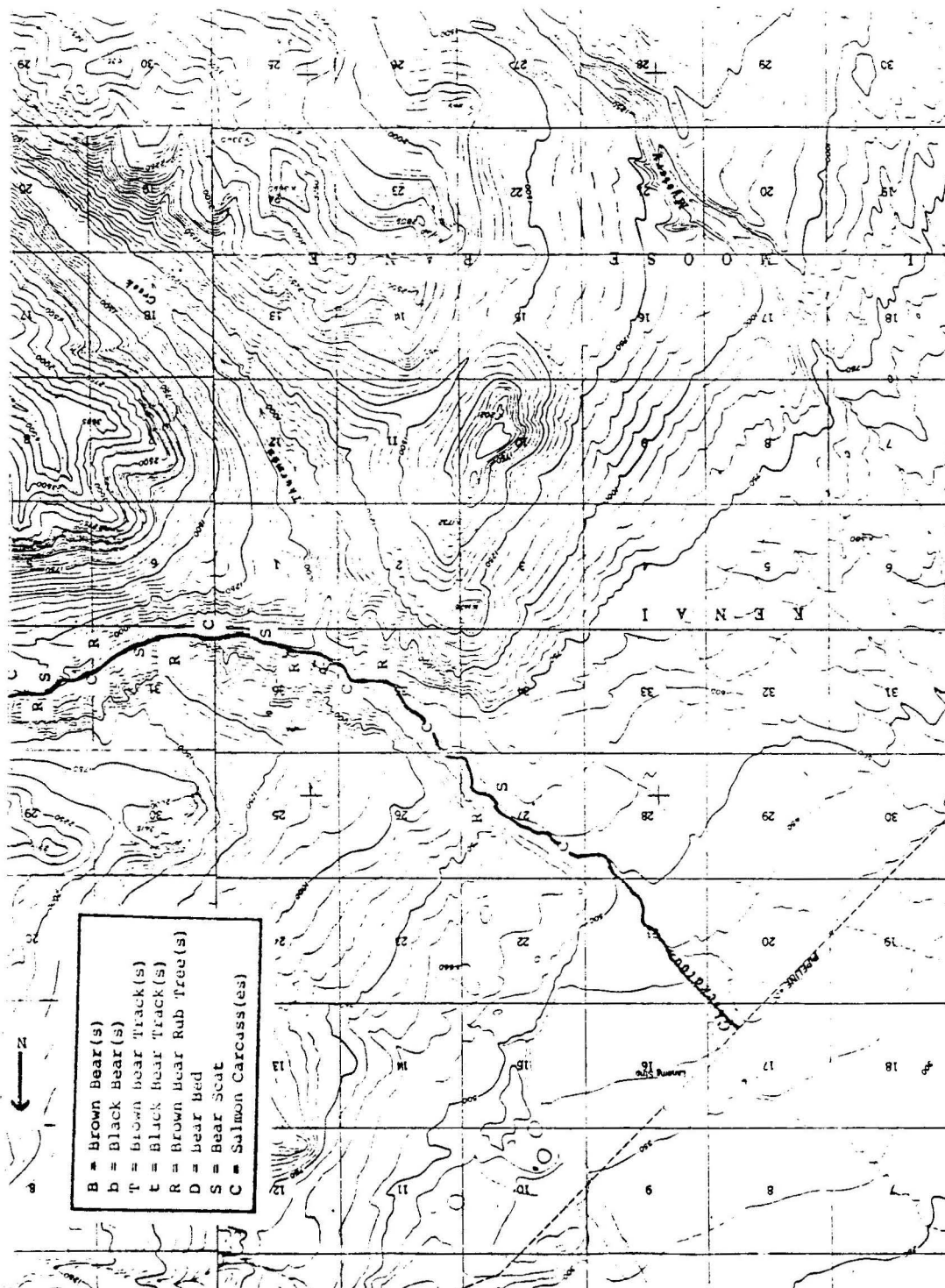
The Chickaloon River and its tributaries provide an extensive amount of spawning habitat for king, sockeye, pink and silver salmon. Last year, the lower 26 miles were surveyed by US Forest Service wildlife technicians Bevins and Risdahl. That year, an estimated 50,000+ pink salmon used their traditional spawning grounds between river mile 9 and 19. Numbers this year were dramatically lower because the pink is a two year spawner. Brown bear use of several areas of this section of the river was heavy to intense.

This year's survey took place in the upper portion of the Chickaloon River. US Fish and Wildlife Service (USF&WS) technicians Mark Dean and Jeff Booth accompanied us on this trip. We were helicoptered into section 32, T7N, R5W, seven miles upstream of the pipeline road. Meanwhile, Dave Furot (USF&WS) surveyed the middle section of the Chickaloon. Dave's starting point was our ending point - about one mile upstream of the pipeline road in section 21, T7N, R5W. Dave surveyed about four air miles of stream downstream of the pipeline road as well as the one mile section upstream of the pipeline road. This upper one mile of stream is classified as an index site for estimating total escapement.

The Chickaloon above the pipeline road flows through some relatively "easy to walk through" spruce and cottonwood forests with menziesia/moss understories. Some willow, aspen and birch stands are also occasionally encountered. Game trails are very abundant and the stream is easy to walk down. In addition, a well used, blazed hunting trail is located on the north side of the river.

Bear trails line both sides of the river, but occur more heavily on one side of the river or the other, depending on topography and vegetation. Brown bear use in this area was quite heavy. Many footprint trails and mark trees occur along the bear/moose trails and the blazed hunting trail. The blazed trees on the hunting trail appear to have been scratched, bitten and rubbed proportionately more than other trees along the trail. Spruce trees were marked more frequently than any other kind. We also noted that several other trees had been stripped of their bark and the cambium scraped by bears. From track measurements and comparisons, we felt there were at least six different brown bears using the stream. A number of bear scats, some of fish and some of grass, horsetail and a few of berries, were found. There was one moose calf kill located near the water where we surveyed. Bear paths led in three different directions from the kill. The total numbers of king and sockeye salmon counted in the three sections of stream surveyed are as follows.

<u>Section</u>	<u>Salmon Type</u>	<u>Salmon Condition</u>		
		<u>Live</u>	<u>Dead</u>	<u>Bear Kill</u>
From drop off point to index site	king	1109	76	109 (includes both types)
	sockeye	100	154	
From pipeline to index site	king	556	62	not counted
	sockeye	95	221	not counted
From pipeline down- stream for four miles	king	344	19	not counted
	sockeye	43	29	not counted



SALMON SPAWNING AREA EVALUATION SURVEY

Area: Skilak Lake Tributaries
Personnel: Risdahl/Schloeder

Dates: 7/24-26/85

Skilak Lake is a large east-west lying lake located just south of the Sterling Highway on the Kenai National Moose Range. There is road access to the lake from 2 locations off the Sterling Highway. One access point is five miles east of Sterling at mile marker 75. The other access point is 10.5 miles west of Cooper Landing at mile marker 58. The Kenai River empties into Skilak Lake near its eastern end and drains it at its western end. A number of small tributary streams and Skilak River empty into Skilak Lake from its southern shore. The purpose of this trip was to survey those creeks suspected of being used by spawning salmon, i.e., Skilak River, Pipe Creek, Cottonwood Creek and King County Creek.

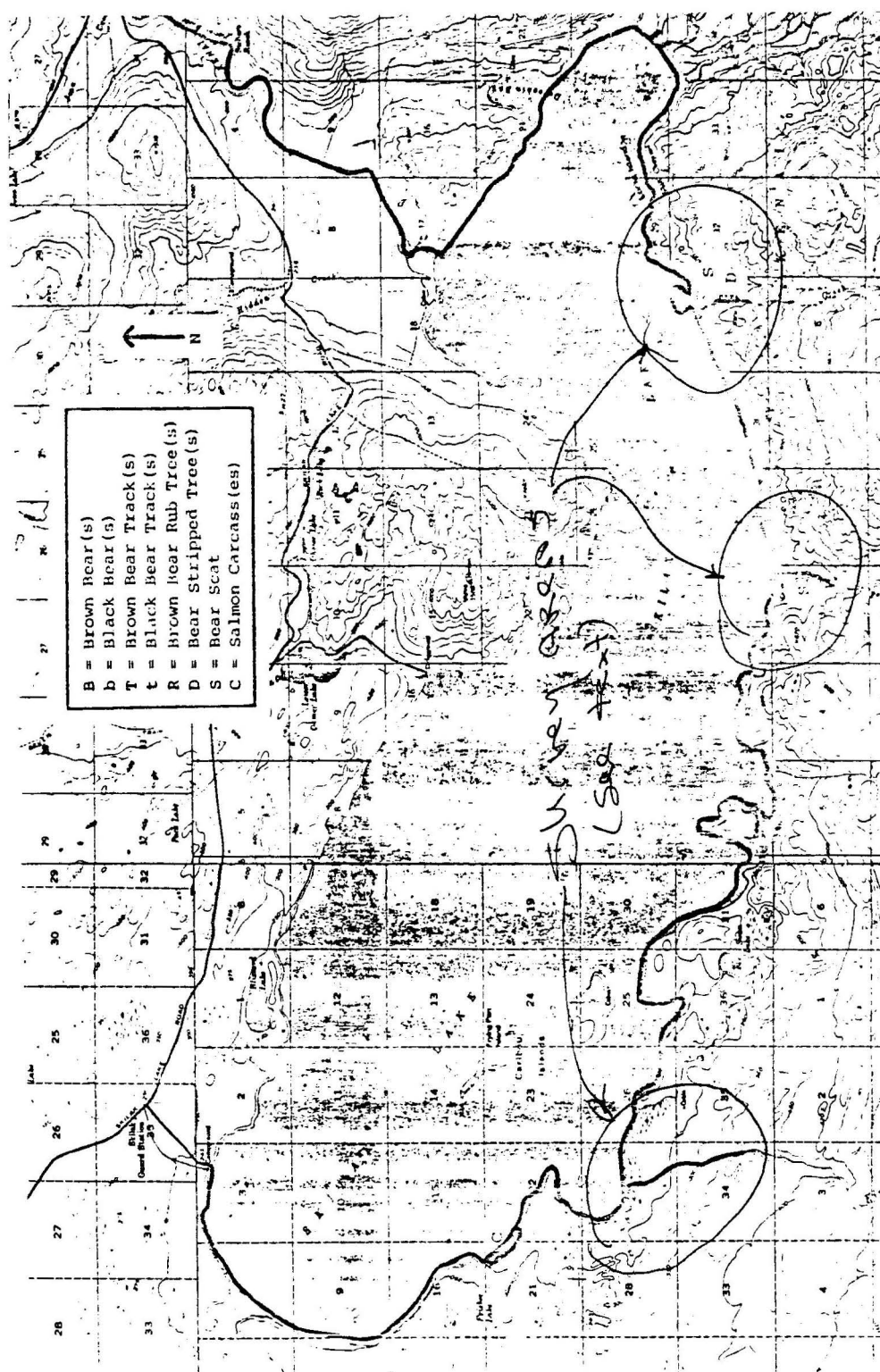
An attempt to survey the braided outlet of Skilak River was made on July 7th. Shallow water with a non-supportive sandy bottom and engine trouble precluded our surveying efforts of this river. Chris (National Park Service) and Gary (Fish and Wildlife Protection) Titus report, however, that sockeye salmon spawn in at least one clearwater stream about two to three miles upstream on the west side of Skilak River. The Titus' have a residence on the remote southern shore of Skilak Lake and are quite familiar with the area. They also report that brown bears use this particular clearwater stream extensively while the salmon are spawning.

A new engine was ferried to us on July 8th, and we were able to continue our survey. The first stream we explored was Pipe Creek. Pipe Creek enters Skilak Lake's south shore directly across from where Kenai River enters the Lake's north shore (section 31, T4N, R5W). The mouth of Pipe Creek was approximately ten feet wide at that time. Its gradient was a fairly constant uphill and appeared a little too steep for good salmon spawning habitat. In addition, the stream's substrate was medium to large cobbles for the entire distance we examined. No good spawning gravel was present. The one-half mile that we explored went through a spruce forest with a moss and menziesia understory. Some alder, devils club and horsetail were present on the bank. The only evidence of use by salmon was a very old lower jawbone of a sockeye salmon found about 15 yards west of the mouth of Pipe Creek along the beach. We also saw one stripped tree where the cambium had been scraped off by a bear. Two small bear scats of vegetation were found several yards away from the creek.

The second stream we surveyed was Cottonwood Creek. Cottonwood Creek enters Skilak Lake's south shore close to the center of the lake in section 3, T3N, R6W. The Titus cabin is located about 200 yards west of the mouth of Cottonwood Creek. At the time of our survey, Lorie Fenner, a former US Fish & Wildlife Service employee, was caretaking the Titus residence. She had been there a number of weeks and had seen no evidence of spawning salmon up the creek. Lorie's and Chris and Gary Titus' observations of no salmon spawning up either Pipe or Cottonwood Creeks are confirmed by our observations. Cottonwood Creek is similar in size to Pipe Creek and has a similar stream flow and substrate composition. Cottonwood Creek also flows through the same spruce habitat type as Pipe Creek. We found no evidence of spawning salmon or bear use on the stream. We walked the Cottonwood Creek trail back to Skilak Lake and found several small bear scats comprised of vegetation.

King County Creek flows into Skilak Lake toward its west end in section 27, T4N, R7W. This stream appeared to have the most potential to be a good salmon spawning stream of the three surveyed. Additionally, some good spring and summer bear foods were present. King County Creek winds through a spruce/cottonwood forest at a much more leisure pace than either Pipe or Cottonwood Creeks. The lower quarter mile of stream channel has changed substantially in recent years and braids through a large sedge marsh. Upstream of the marsh, back in the creek's old channel, good appearing salmon spawning gravel is present for the next mile. We found no evidence of recent or past salmon spawning or bear use, however. Minnows or fry and dolly varden were present throughout the old channel section that we explored. Sam Ward, the only full-time resident of nearby Caribou Island, is reported to fish for silver salmon in King County Creek (Titus, personal communication), however.

The only salmon that we encountered along the south shore of Skilak Lake were near a grassy point cut off from the main land. This "island" was close to where a small rivulet flows from an unnamed lake southeast of Frisby Lake. A large school of sockeye salmon was hanging out just off shore in section 16, T4N, R7W. We explored a quarter mile of shoreline in this area and found the remains of many previous years' sockeye carcasses. Carcasses were seen both underwater and on the rocky shoreline. No salmon were seen in or near the small rivulet. Instead, all fish were concentrated around that small grassy piece of land in five to ten feet of water.



SALMON SPAWNING AREA EVALUATION SURVEY

Area: Deep Creek/Caribou Hills
Personnel: Risdahl/ Schloeder

Dates: 8/9-12/85

Deep Creek is an important king salmon spawning stream located in the southwestern portion of the Kenai National Wildlife Refuge. Its headwaters are in Caribou Hills and its termination is in Cook Inlet, just south of Ninilchik. Deep Creek receives an estimated annual escapement of 900 kings (Alaska Department of Fish & Game records). The peak of the spawn is during the end of July. Caribou Hills have long been a popular moose and brown bear hunting area. Brown bears are attracted to the king salmon run in July and early August, but also probably use the area heavily during the spring and fall as well. Spring and early summer food sources such as graminoids and horsetails are common throughout the area. The success of autumn brown bear hunters attests to the use of the area by brown bears during this time of the year. Access into Deep Creek and Caribou Hills is easy by all terrain vehicles (ATV's) or snow machines. Currently, there are over 75 hunting/winter recreation cabins located here.

We began our expedition into the headwaters of Deep Creek on August 9, after postponing our helicopter flight one day because of 60 mph winds. Kenai Air picked us up about six-and-one-half miles up the graveled portion of Oilwell Road in section 20, T2S, R12W. Monty, our pilot, first flew us up the North Fork of Deep Creek, keeping low to the river in an attempt to spot spawning salmon as well as bear tracks on sand bars. Both salmon and bear sign were scarcely seen from the air, so we decided to fly up the Middle Fork and see if more activity occurred there. Indeed, we sighted more salmon and many more bear tracks on the sand bars on this fork. So, we disembarked just below a number of beaver dams in section 15, T3S, R12W.

This upper portion of the Middle Fork of Deep Creek is a mixture of short willow fields and small grass meadows. Horsetails (Equisetum arvense) occur commonly on the sand bars along the river. Lining the valley are spruce forests that reach up into the more open alder fields and grassy knobs of Caribou Hills.

The stream in this area is five to ten feet wide and one foot deep - except in occasional pools. Beaver dams one-and-one-half to two feet high and two to four feet wide are responsible for many of the pools. Salmon are getting above such dams, but are few in number. At the time of our survey, it appeared that the spawn was one to two weeks past its peak. The condition of the kings seen was very poor and few were seen on the banks indicating that most of the mortalities had already floated downstream. Spawning redd^s were commonly seen in the gravelly areas. The age of most of the brown bear tracks was one to two weeks old, further confirming that the spawn was on the downhill swing.

Evidence of use by brown bears was heavy to intense. From our starting point to the junction of the Middle Fork and the North Fork of Deep Creek, careful track measurements indicated that at least eleven different individual brown bears had used the area.

This figure included three sows, each with a single cub. Brown bear activity remained constant throughout this seven to eight mile section of stream, but the number of salmon (live, spawned-out and bear-killed) increased as we neared the junction. During the two days it took to survey this portion of the river, we counted a total of 101 live, 15 spawned-out and 24 bear-killed salmon. We probably missed a number of the bear-killed salmon, however, because the weather wasn't warm enough to carry the smell of rotting salmon, many of the kills upstream had not started smelling yet, the willow and grass were tall enough to conceal salmon directly in view and the bears commonly carried the carcasses well away from the water.

We also noted six vegetation scats, six fish scats and one berry scat. On two occasions, we found digs in the sand along the river. These appeared to be bed-like.

Coinciding with the increase in numbers of salmon and salmon carcasses downstream was the occurrence of more cover. The valley narrows as it begins flowing northward and spruce trees are soon found along the banks of the river in addition to the willows. In this area, we began to see regular brown bear footprint trails and rub trees. Cottonwood trees and alders soon make up part of the habitat near the main river valley.

We stopped briefly and checked out where Cytex Creek flows into the Middle Fork (section 5, T3S, R11W). The mouth of Cytex Creek is blocked by several large beaver dams, yet kings are apparently going over these dams and are moving up the stream. We observed two kings in a pool above a dam two feet high. We watched one of them slide back over the dam and swim downstream. A third king was caught in the branches of the dam and had died. There were several sets of brown bear tracks all around the dam, lodge and surrounding area.

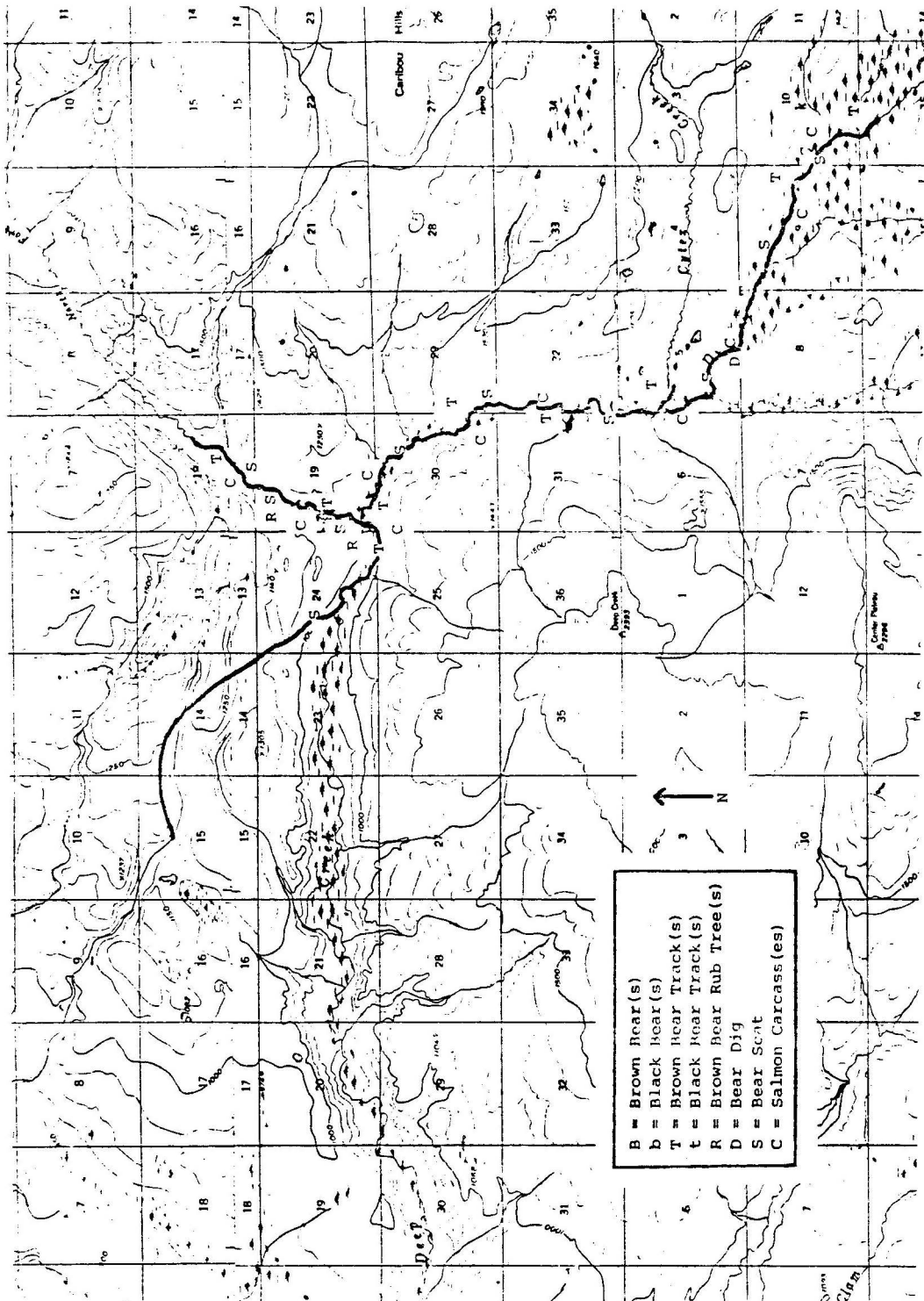
On August 11th, we attempted to survey the lower portion of the North Fork of Deep Creek. We began this survey in a drizzle and turned back after two miles, in a torrent. This section of stream closely resembles the main channel of Deep Creek as far as vegetation. Cottonwoods and spruces are intermingled in willow fields and grass meadows. Old beaver ponds are frequently encountered. Horsetails and other forbs are abundant. The North Fork was much clearer and cleaner appearing at the time of our survey than the Middle Fork. Its width and depth were about the same, however. Brown bear use of this segment of the North Fork of Deep Creek was moderate compared to the Middle Fork. Positive identification of only two different brown bears was made through track measurements on this fork. In this two mile section of river, we counted 14 live, three spawned-out and 13 bear-killed salmon. Therefore, a proportionately greater number of kings were apparently caught in the North Fork in this lower section than in the Middle Fork. Two vegetation and two fish scats were found along the banks and a fairly well used brown bear trail occurred primarily on the west side of the river. This trail turned into a footprint trail in the cover of spruce and cottonwood trees and had occasional rub trees along it as well.

In section 19, T2S, R11W, an ATV trail coming off a seismic line crosses the North Fork of Deep Creek. This trail parallels the North Fork on the east side until it nears the junction of the two forks. It then curves around the mountain and heads west towards Caribou Hills. About one-quarter mile upstream of the ATV trail crossing, there is a log cabin built by Cecil and Troy Jones of Homer in 1976-77.

The main river below the junction is considerably murkier and deeper than either of the two forks. The river here meanders through a valley of spruce and cottonwoods, willows and grass/sedge meadows. It cuts through a number of hillsides that have resulted in large dirt and clay cutbanks. Mud and clay are continually eroding into the river from these steep cuts. A spruce forest with occasional birch trees and a moss understory is adjacent to the river bottom habitat. Large lush patches of horsetails occur in some areas and willow and sedge meadows occur in others.

Walking along the river, we were unable to see any salmon in the water because the water was too deep and cloudy. In the first half mile below the junction of the two forks, we found only one bear-killed salmon, and it was located very near the junction. We also found one fish scat. A brown bear trail with footprint trails in the timbered areas and rub trees occurs along the north side of the stream. This trail is only moderately used and appears to be used primarily by a single brown bear with an unusually short stride. One possible explanation for the vagueness of the game trails along Deep Creek is the apparant low density of moose in the area. We saw no moose during this trip and fresh sign (pellets and tracks), and evidence of browsing on willows was extremely rare. Hunting pressure is obviously very heavy in this area.

In summary, brown bear use on the Middle Fork of Deep Creek appears to be heavy and at least 11 different brown bears had been using the area one to two weeks before our survey. The lower North Fork appeared to be moderately used by at least two brown bears. No sign or evidence of use by black bears was seen.



SALMON SPAWNING AREA EVALUATION SURVEY

Area: South Fork Snow River
Personnel: Risdahl/Schloeder

Dates: 9/4-6/85

We surveyed the lower eight miles of the South Fork of Snow River, the three known salmon spawning areas and several other tributaries on September 4-6. From last year's data, we suspected that we would be late for the peak of the sockeye salmon run, and indeed, it appeared that the peak was three to four weeks past. The first mile and one-half of the South Fork had changed course beginning in section 17, T2N, R1E. Because of this and the extremely low water condition of the river, we were able to drive within one-quarter mile of the first salmon spawning stream in section 20, T2N, R1E. This stream has changed since our last stream survey also. Several beaver dams that had restricted migrating salmon last year had washed out. Consequently, sockeye salmon were found to have spawned the entire length of this stream. We walked an estimated three miles counting spawned out salmon until we reached the stream's origin. Undiscovered last year, this stream closely follows the curvature of the mountain to the northeast. It passes through a rather rich riparian area of cottonwood, spruce, aspen, willow and sedge. The stream's origin appears to come from two sources: water draining off the mountain to the northeast and underground seeps from the South Fork. The stream's headwaters are in a willow and grass/sedge meadow within 100 yards of the South Fork. It is slightly upstream of the outlet of the second spawning stream located across the river in section 29, T2N, R1E. We counted 462 spawned out sockeye, 216 bear kills and only one live fish in this stream. Use of the stream by brown bears was intense. Tracks of at least four, probably six, different brown bears were observed on the stream. This includes a sow and a single cub's tracks. We found seven fish scats, one devils club scat, one devils club/green vegetation scat, three horsetail scats and one horsetail/moss scat. No black bear sign was seen on this stream.

During the peak of the spawn, on August 6, USFS fisheries technicians, Kitty Roush and Bill Ruhberg encountered a large dark brown colored brown bear on this stream. The bear charged the two technicians and knocked Roush to the ground, stepping on her and tearing her shirt. The bear then proceeded to run into the woods, leaving the two shaken, but unharmed. Two days before we began this survey, Bob Estes, of Bear Lake Road, shot and killed a seven foot dark brown colored female brown bear as it charged him. The bear came within ten feet of Estes and was killed with three shots from a .338 magnum rifle. Estes' hunting partner had been charged to a very close range by this same brown bear the day before while moose hunting in section 2, T1N, R1E. Estes had gone back to the spot with the intent of seeing the bear and possibly killing it. From the description of the bear, its foot pad measurements (a foot pad width of seven and one half to eight inches) and its behavior from both these two parties, there is cause to believe the incidents may have involved the same brown bear.

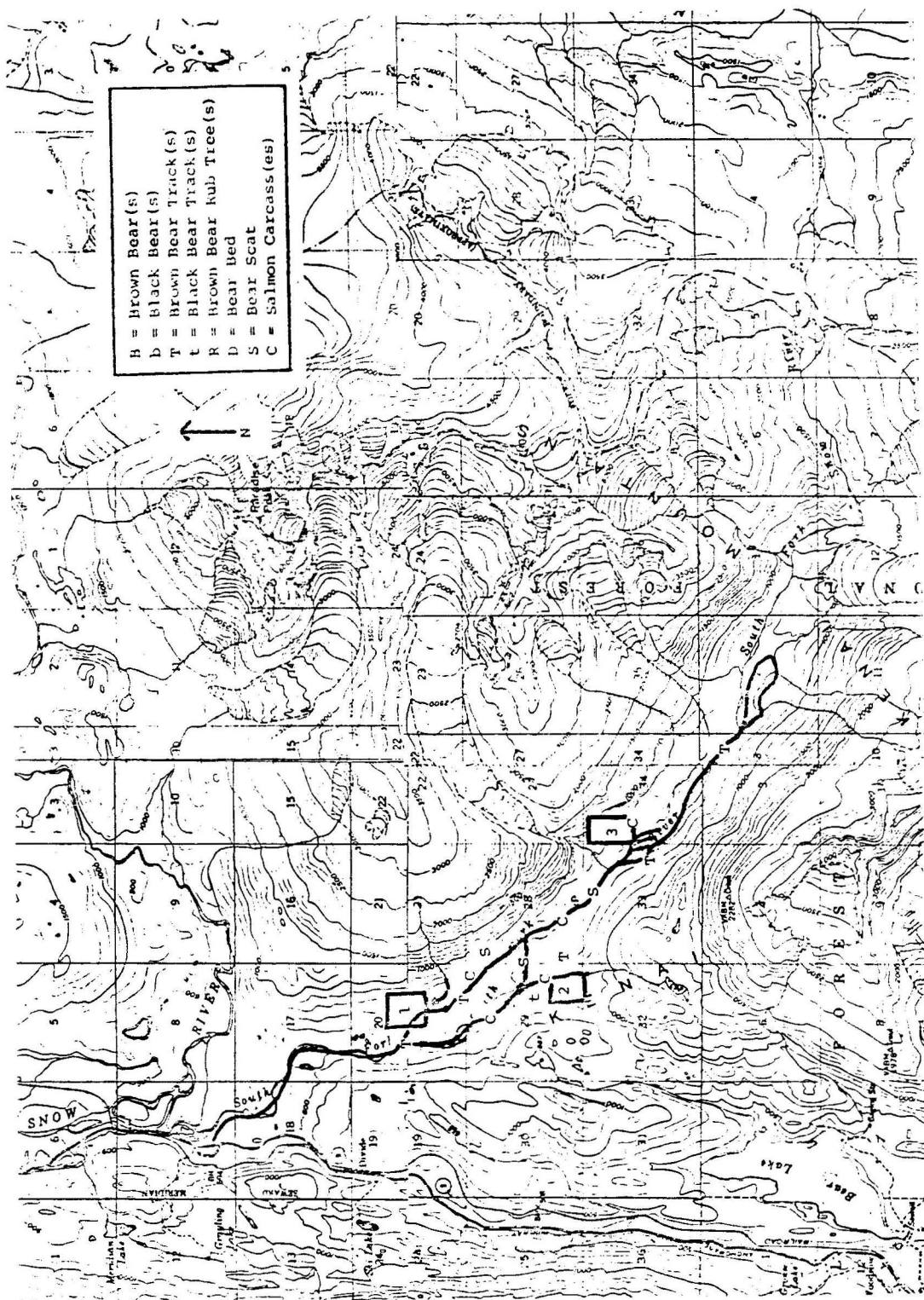
The second spawning stream, containing one mile of spawning habitat, had two live sockeye salmon, 30 spawned out fish and 88 bear kills in it. The sockeye appear to have spawned in about the same distance of the stream as the silvers did during last year's survey. (A log jam had restricted the spawning sockeye salmon last year to the lower half mile of the creek.)

It appeared that many of this year's mortalities may have washed downstream into the main river already. An inordinate number of fish occurred in piles along ~~the~~ gravel at the outlet of the stream. Brown bear use of this creek was quite heavy also. Tracks of several individuals and well used trails occurred the length of the spawning grounds. One set of black bear tracks were noted as well. One large grass scat was found along the bank.

The third salmon spawning area in sections 33 and 34, T2N, R1E, consist of three seeps (see earlier report on the South Fork). The first seep was dried up ~~o~~ probably because of the river's extremely low water condition. The second seep (one quarter mile long) contained four live sockeye salmon, 12 spawned out individuals and 60 bear kills. We saw one horsetail scat on this seep. The third seep (also about one quarter mile long) contained no live salmon and no spawned-out individuals, but it had 67 bear kills. We found three scats of grass and salmon beside this seep. In addition, there was one small dig ~~o~~ made for unknown reasons. This entire area was covered with brown bear tracks. Again, however, as with the majority of the sign seen on the other creeks, it appeared that the bears had left the area shortly after the peak of the spawn, two to three weeks earlier. A few fresher tracks were also seen, nevertheless.

Along the main river bottom itself, we measured the tracks of at least six different individual brown bears. We saw three scats of salmon and one of about 98 per cent brown bear hair and two per cent horsetails. Seven bear killed sockeye were found along the gravel bars as well. We were unable to locate the exact spot where Estes had killed the female brown when we took a hike up to the general area. We found no trace of the slain bear, but some brown bear hair and tracks were seen along heavily used moose trails through some willow meadows that were surrounded by spruce and cottonwood trees.

In sum, use by brown bears of these spawning areas was very intense. Track measurements indicated that at least six brown bears had been working the area between the tributary streams that we surveyed. The tracks of two brown bear sows, one with one cub and one with two cubs were among those tracks measured. Many of the bear kills on these creeks were almost entirely eaten leaving only portions of the jaws and gills. In addition, a good proportion of the mortalities may have been washed downstream already as evidenced by the concentrations at the outlets of the tributary streams. No silver salmon were seen in the river or spawning streams at the time of the survey.



SALMON SPAWNING AREA EVALUATION SURVEY

Area: Resurrection River
Personnel: Risdahl/Schloeder

Dates: 9/9-11/85

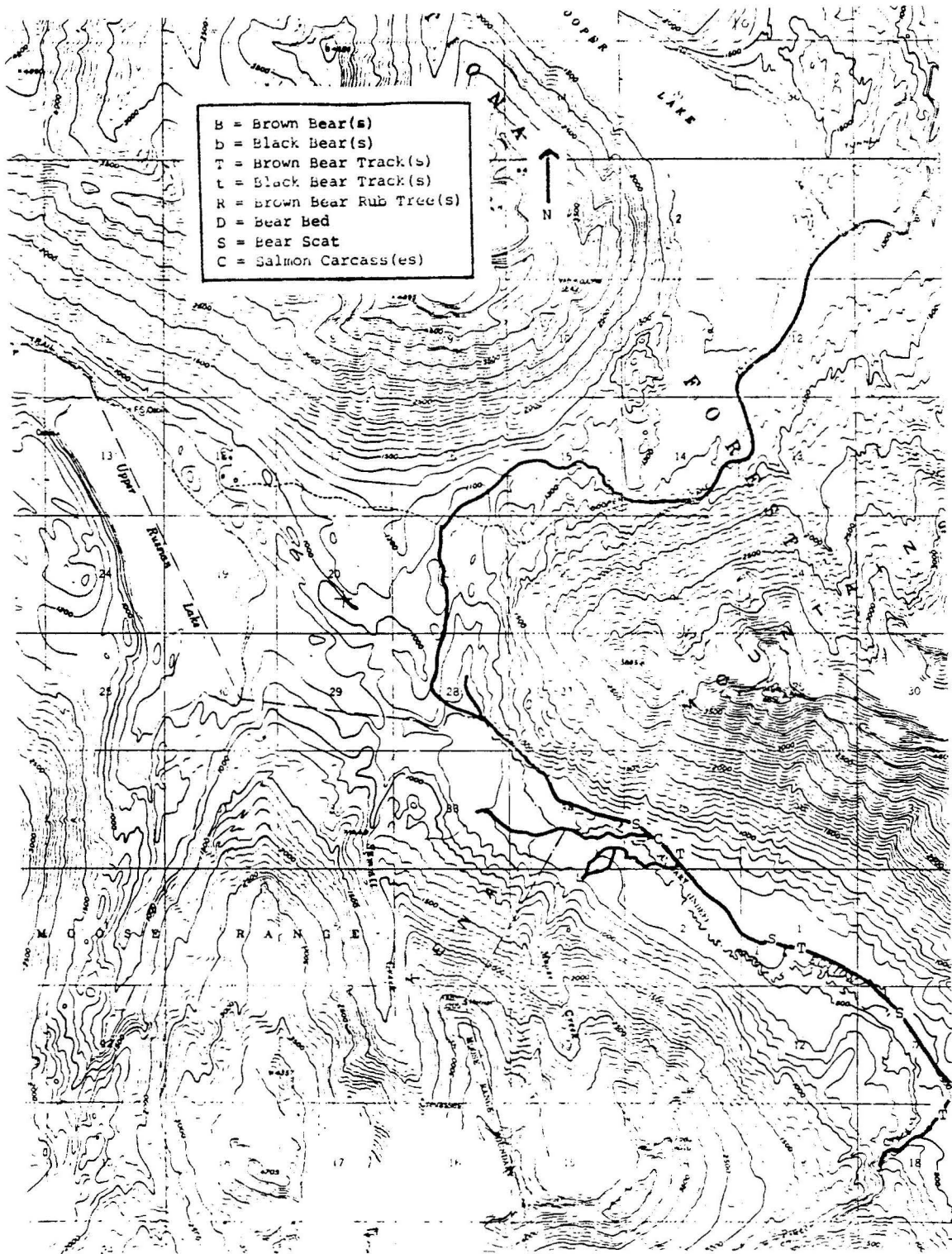
An estimated 30 to 40 thousand silver salmon spawn in Resurrection River and its tributaries from late August to mid November (Bevins et al. 1984). Last year, wildlife technicians John Bevins and Greg Risdahl surveyed portions of Resurrection River and its tributary streams on the northeast side of the river. They counted less than 300 total silver salmon during that survey. This season, we examined several tributary streams on the southwest side including Placer Creek, Moose Creek and an unnamed creek northwest of Moose Creek. None of these streams contained any evidence of spawning salmon - past or present.

The only salmon we observed were at the outlet of the uppermost clearwater stream in section 28, T3N, R3W. There, we counted only one dozen silver salmon. We walked a short distance up the stream and saw no other salmon, or evidence of use by bears. It appeared that the salmon were just arriving on their spawning grounds in this particular stream. Last year, Bevins and Risdahl counted 120+ live silver salmon in this same quarter mile section of stream one week later in September.

Both Moose Creek and the unnamed creek contained minnows and/or fry. Both of these creeks flowed through thick alders and were choked with deadfall and other debris. Moose Creek was especially silty and neither stream had gravel available to salmon for spawning. Placer Creek was extremely swift and dirty, and carried a heavy load of sediment. There were two sets of brown bear tracks on the gravel delta at the mouth of Placer Creek. We also saw two sets of brown bear tracks along the main river as well as one large scat of devils club berries and one bear killed silver salmon.

We hiked out on the Resurrection River Trail and saw tracks (eight inches wide) of a large brown bear and two berry scats. One was composed of devils club and one of highbush cranberry. These two scats were found between the Russian/Resurrection/Cooper Lake Trail junction and Boulder Creek. From Boulder Creek to the trailhead near Exit Glacier, we saw the tracks of one brown bear, four highbush cranberry scats and one crowberry scat. Both types of berries were common along the trail at the time of our survey.

Like the previous season's survey, we were surprised to see so few salmon considering the high estimated escapement. Perhaps the salmon spawning migration reaches its peak much later in the season, or perhaps some of the tributary streams downstream, below Boulder Creek, such as Cottonwood Creek or Redman Creek, contain a larger portion of the spawning salmon.



Mathematical Calculations for all 3 trailheads, 1985

Russian RiverIn and Out

1. $95.83 = 7475 \div 78$
2. $88.0\% = 833 \div 947$
3. $12.0\% = 100\% - 88.0\%$
4. $54.4 = 95.83 \div [.88(2) + .12]$
5. $47.9 = 95.83 \times [.88 \div (.88(2) - .12)]$
6. $6.5 = 54.4 - 47.9$
7. $4243 = 78 \times 54.4$

to Cooper

1. $8.5\% = 81 \div 947$
2. $.710 = 81 \div 114$
3. $4.6 = .71 \times 6.5$
4. $364 = 78 \times 4.6$

to Resurrection

1. $3.5\% = 33 \div 947$
2. $.29 = 33 \div 114$
3. $1.9 = .29 \times .65$
4. $148 = 78 \times 1.9$

Cooper LakeIn and Out

1. $8.61 = 586 \div 68$
2. $30.0\% = 42 \div 145$
3. $70.0\% = 100\% - 30.0\%$
4. $6.62 = 8.61 \div [.30(2) + .70]$
5. $1.98 = 8.61 \times [.30 \div (.30(2) + .70)]$
6. $4.64 = 6.62 - 1.98$
7. $489.8 = 74 \times 6.62$

to Russian

1. $14.5\% = 21 \div 145$
2. $.206 = 21 \div 102$
3. $.956 = .206 \times 4.64$
4. $70.7 = 74 \times .956$

to Resurrection

1. $55.0\% = 81 \div 145$
2. $.794 = 81 \div 102$
3. $3.68 = .794 \times 4.64$
4. $272.3 = 74 \times 3.68$

Resurrection RiverIn and Out

1. $6.15 = 443 \div 72$
2. $50.9\% = 57 \div 112$
3. $49.1\% = 100\% - 50.9\%$
4. $4.07 = 6.15 \div [.509(2) + .491]$
5. $2.07 = 6.15 \times [.509 - (.509(2) + .491)]$
6. $2.0 = 4.07 - 2.07$
7. $301.2 = 74 \times 4.07$

to Cooper

1. $19.6\% = 22 \div 112$
2. $.4 = 22 \div 55$
3. $.8 = .4 \times .2$
4. $59.2 = 74 \times .8$

to Russian

1. $29.5\% = 33 \div 112$
2. $.6 = 33 \div 55$
3. $1.2 = .6 \times 2$
4. $88.8 = 74 \times 1.2$