CABINET MOUNTAINS GRIZZLY BEAR STUDY

1985 ANNUAL PROGRESS REPORT

Montana Department of Fish, Wildlife & Parks

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ABSTRACT

The Cabinet Mountains grizzly bear study began in April of 1983. Funding during 1985 was provided by U.S. Borax and Chemical Corporation, the U.S. Fish and Wildlife Service, the U.S. Forest Service, and the Montana Department of Fish, Wildlife and Parks. Trapping during 1983-1985 resulted in the capture of 3 grizzlies and 127 individual black bears. All the grizzlies and 19 black bears were radio collared and monitored. Composite minimum home range for female grizzly 678 over three years was 771 square km. Composite minimum home range for male grizzly 680 over two years was 1997 square km. A second male grizzly was captured and instrumented, but was killed three months later by bow hunters. Average male and female black bear minimum home ranges were 66.9 square km and 16.4 square km, respectively. Track observations indicated the presence of a female grizzly accompanied by a yearling or two-year-old. Average density of black bears was estimated to be 1 bear per 3.5 square km. Characteristics of habitat used by black and grizzly bears is reported and discussed. Effects of hunter harvest on black bear sex and age structure was evaluated and methods of monitoring harvest are proposed.

INTRODUCTION

The grizzly bear (*Ursus arctos horribilis*) is currently listed as a "threatened species" in the 48 adjacent states under the provisions of the 1973 Endangered Species Act. Six ecosystems were identified as supporting self-perpetuating or remnant grizzly populations (USFWS 1981). The Cabinet-Yaak Ecosystem (CYE) was one of three ecosystems designated by the recovery plan for the concentrated recovery effort.

The CYE is located in northwest Montana and northern Idaho. There is concern that human developments along U.S. Highway 2 could be fragmenting the 5576 square km CYE and creating an "island" population in the Cabinets (southern portion) The Yaak (northern portion) borders Canadian grizzly populations to the north. Occupied habitat south of Hwy. 2 covers 4204 square km while 1372 square km occur north of Hwy 2. Current designated habitat allows only one 8 km wide corridor to link the Yaak with the Cabinets.

The Cabinets have recently been subjected to increasing resource demands through mineral exploration, timber harvest and human recreation. Division of the CYE makes the Cabinet grizzly population more vulnerable to impacts resulting from these activities because of the lack of potential immigration. Therefore, the Montana Department of Fish, Wildlife and Parks (MDFWP) initiated the Cabinet Mountains Grizzly Study which began in April of 1983 through funding provided by U.S. Borax and Chemical Corporation. Funding was also provided by the U.S. Fish and Wildlife Service (USFWS).

Existing information on grizzly bears in the Cabinets consists largely of habitat surveys and examination of reports of sightings and sign (Hamlin and Frisina 1974, Erickson 1976, 1978, Joslin et al. 1976, Moore and Gilbert 1977). From 1979 until 1980 an unsuccessful effort was made to capture and radio-collar a grizzly in the Cabinet Mountains (Thier 1981). A large portion of the Cabinets has been grizzly bear habitat component mapped through use of a procedure described by Madel (1982). Present U.S. Forest Service (USFS) grizzly habitat management is based on the Cumulative Effects Analysis Process (Christensen 1982) and the Kootenai Forest Plan (USFS 1983). While this annual report is largely a compilation of all data collected during this study, certain information may be referenced from previous annual reports (Kasworm 1984, 1985).

OBJECTIVES

1. Review and analyze all previously collected data on grizzly bear distribution, movements, and habitat-use in the Cabinet Mountains.

2. Determine general seasonal patterns regarding distribution, movement corridors, habitat-use and preference, food habits, and behavioral patterns of radio-collared grizzlies.

3. Use collected data to make recommendations regarding validation or modification of the Cumulative Effects Analysis Process and other management policies.

4. Conduct black bear (*Ursus americanus*) studies incidental to grizzly bear investigations to provide basic ecological data on local black bear populations. Black bear productivity, population status, habitat-use, distribution movements, and behavioral data will be gathered and analyzed.

STUDY AREA

The Cabinet Mountains are located in Lincoln and Sanders counties of northwest Montana and Bonner and Boundary Counties in northern Idaho. The mountain range extends along north-south trending faults between the Clark Fork River on the south and the Kootenai River 56 km to the north. The East and West Cabinets are separated by the Bull River which flows south to the Clark Fork River and Lake Creek flowing north to the Kootenai River (Fig. 1). Most of the CYE grizzly bear habitat is on public land administered by the Kootenai, Lolo, and Panhandle National Forests. Plum Creek Timber Company and Champion International are the main corporations holding significant amounts of land in the area. Individual ownership exists primarily along the major rivers and creeks and numerous patented mining claims along the Cabinet Mountains Wilderness boundary. The Cabinet Mountains Wilderness is an elongate area covering 381 square km of the upper elevations in the East Cabinets.

The Cabinets are a rugged range of mountains shaped by alpine and continental glaciation during the Pleistocene. Elevations range from 610 m along the Kootenai River to 2664 m atop Snowshoe Peak. The climate is characterized by short, warm summers and heavy, wet winter snowfalls. Average monthly temperatures at Libby vary from 19.4 degrees centigrade in July to -5.3 degrees centigrade in January. Annual precipitation varies from 49.3 cm in the valleys to 280 cm in some mountainous areas. (Appendix Table 16). Most mountain precipitation occurs as snow. Heavy snow accumulation and the resultant mountain avalanches maintain many of the seral shrub and forb fields thought to be important foraging areas for grizzlies during spring and summer. Valley bottoms to upper slopes are heavily forested with stands of mixed conifers. The Cabinet Range is vegetatively diverse with six habitat type series represented (Pfister et al. 1977). River bottoms are also diverse. Mixed stands of conifereous and deciduous trees are interspersed with riparian shrubfields and wet meadows. The study area has also been described by Joslin (1980).

Current resource development demands in grizzly bear habitat center around mineral exploration and extraction, timber harvest, and recreation. ASARCO operates the Troy mine complex 3 km west of Bull Lake. This facility began operation in 1979. Silver and copper are the primary minerals extracted. Mineral exploration activity centers in the southwestern portion of the Cabinet Wilderness Area. The Revett Formation, a quartzite bearing

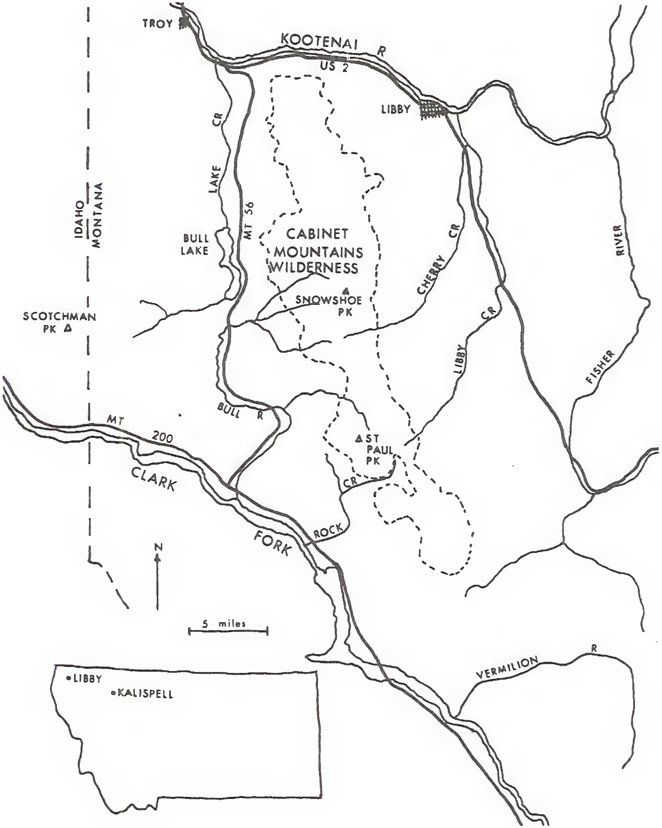

Figure 1. Map of the Cabinet Mountains study area.

strata in the middle of the Belt Supergroup (Precambrian Rocks), crops out extensively in the vicinity of St. Paul Peak where it contains copper and silver deposits (Bannister et al. 1981). ASARCO and U.S. Borax conducted intensive exploration in this area until December 31, 1983. Congress imposed a 20 year limit om mineral exploration in wilderness areas in the 1964 Wilderness Act. Exploration and development has continued outside the wilderness and on validated claims inside the wilderness. In 1984 ASARCO proposed a plan of development for a mine in the West Fork of Rock Creek. In 1985 U.S. Borax submitted a conceptual plan to develop a mine in the East Fork of Rock Creek.

Recreation and other demands involve wilderness designations and a proposed ski area. The West Cabinets (Scotchman Peaks) and areas adjoining the Cabinet Wilderness are under consideration as additions to the wilderness system. On the east side of the main Cabinets, a ski area has been proposed on Great Northern Mountain. The U.S. Forest Service is reviewing this proposal (Madel 1983). Big game hunting provides recreation and is part of the local economy. Hunting districts 103 and 121 encompass the Cabinet Mountains on the north and south, respectively. In 1984 district 121 had the largest harvest and number of hunter days for black bear of all districts in Montana (Table 1). These two districts had a combined harvest of about 5500 deer and 570 elk.

Table 1. Harvest and hunter recreation days of black bear, deer and elk MDFWP in hunting districts 103 and 121 (Brown et al. 1985).

	District 103 Harvest	District 103 Hunter Days	District 121 Harvest	District 121 Hunter Days
Black Bear	66	2567	144	4421
Deer	2931	16780	2629	16098
Elk	151	10370	419	16374

Timber harvest is the principle land management activity over much of the CYE. During 1985, 66,930,000 board feet of timber was sold from occupied grizzly bear habitat on the Kootenai National Forest (KNF). Average bid for 23 KNF timber sales in grizzly bear habitat were 2.5 times the average minimum advertised price during 1983-1985 (Table 2). These prices include the restrictions imposed on harvest practices in grizzly bear habitat. While the difference between these means declined in 1985, the bid price still exceeded the advertised minimum by 60%. This reduction occurred over a time when grizzly bear restrictions were already in place.

Table 2. Timber volume sold, advertised minimum price, and average bid for timber sales in grizzly bear habitat on the Kootenai National Forest, 1983-1985.

Year	Sales	Volume (mmbf)	Average Advertised Minimum ($/mbf)	Average Bid ($/mbf)
1983	8	94.90	12.64	48.85
1984	9	64.84	21.06	52.71
1985	6	66.93	23.91	41.40
TOTAL	23	226.57	18.88	48.41

METHODS

Information about historical distribution and kills was gathered from existing documentation and personal interviews with long time residents or persons familiar with the observations. Veracity of all reports was determined by the interviewer and only those judged reliable were included in this report.

Bears were trapped with foot snares (Aldrich Snare Company, Clallam Bay, Washington) in cubbies or trail sets baited with road-killed deer and miscellaneous meat scraps. Scraps of bait were dragged along roads and trails to produce scent trails to attract bears to cubbies. Snares were boiled for several hours with bark, needles, leaves and paraffin. From that point, snares were handled only with gloves. Warning signs were posted to minimize bear/human encounters. Snares were checked daily by vehicle and/or foot.

Captured bears were immobilized with ketamine hydrochloride (Ketaset or Vetalar) and xylazine (Rompun). Dosages used were reported by Perry (1978). Drugs were delivered with a Palmer Cap-Chur gun, jab stick or a blow gun.

Plastic ear tags were used to mark captured bears. One numbered tag was placed in each ear. Although each ear may have held a different number, the tags were usually sequential. Colored armortite streamers, 3.75 cm in width and 15 cm in length, were attached to the ear tags. Physical measurements of the bear were also taken. Scale weights were obtained for as many bears as possible. The first premolar was extracted and used to determine the age of the individual by counting cementum annuli (Stoneberg and Jonkel 1966).

All grizzlies and selected black bears were fitted with radio collars (Telonics, Mesa, Arizona). Radio instrumented bears were monitored from air and ground. Locations were plotted on 1:24,000 USGS topographic maps by Universal Transverse Mercator (UTM) coordinates. Home ranges were calculated by the minimum polygon method (Mohr 1947, Hayne 1959) and measured with a planimeter. Radio locations were also classified by habitat type (Pfister et al. 1977), grizzly bear habitat component (Appendix Table 17), land type (USFS 1984), management allocation

(USFS 1983), elevation, slope, aspect, topography. Distance measurements from roads and trails to radio locations were used to examine their relationships to bear distribution. Closed roads were considered to be trails for analysis. If open roads were closer to locations than the nearest trail, the distance to the road was entereed as the measurement for the nearest trail as well. Distance to perennial water was also recorded. Statistical analyses were performed through use of the computer package MSUSTAT (Lund 1983).

Several radio locations were visited to determine bear activity at the site. If activity could be determined or some sign located, a circular vegetation plot (175 square m) was delineated. Vegetation canopy coverage and structure were recorded. Plant nomenclature followed Hitchcock and Cronquist (1973). Seasons were defined as Spring (den emergence - June 30), Summer (July 1 - August 15), and Fall (August 16 - denning).

Scats were collected, tagged, and frozen for food habit analysis. Only scats accompanied by other sign (tracks, hair, or radio locations from instrumented bears) were considered to be grizzly. Scats were analyzed by William Callaghan. Methods of analysis consisted of a hot and cold wash of the sample over two different size mesh screens (.40 and .24 cm). The contents of the screens were examined with the aid of microscopes and identified to species where possible. Plant part was also noted. The percent volume was visually estimated. Frequency, percent frequency, total volume, percent volume, percent composition, importance value, and importance value percent were calculated by the following formulas:

Frequency = Number of scats having the same item

Percent Frequency = Frequency of item / Total number of scats X 100

Total Volume = Total volume of the same item in all scats of the sample

Percent Volume = Total volume of item / Number of scats with item X 100

Percent Composition = Total volume of item / Number of scats with item X 100

Importance Value = Percent Composition X Percent Frequency / 100

Importance Value Percent = Importance value of item / Sum of importance values for all items

Real time motion sensing collars aided in determining activity patterns through continuous monitoring for 24 hour periods. Motion sensing collars emit two different pulse rates dependent upon orientation of the collar. Bears were monitored every one-quarter to one-half hour to record signal strength, constancy, and mode. Motion sensitive collars were used only on grizzlies.

Bear dens were located by chance, radio telemetry, and reports from individuals. Physical and vegetative data were recorded about the site as well as the condition and type of den.

RESULTS AND DISCUSSION

Historical and Current Grizzly Bear Distribution

Distribution and a listing of 53 known grizzly bear kills in the Cabinet Mountains from 1950 until the present are shown in Figure 2 and Table 3 respectively. The number indicated may not reflect total man-caused mortality during the specified time frame. Illegal kills probably occur, but the magnitude of this mortality factor is unknown. Of the total known legal and illegal kills, at least 12 were adult females. Average rates of reported mortality has dropped from the decade of the 1950's (3.1 per year) through the decades of the 1960's (1.2 per year) and the 1970's (.9 per year). The list will be updated as more information becomes available. A special licensing system for grizzly bear hunters began in 1967 and detailed information for hunter kills is available only since that date. The grizzly bear hunting season in the Cabinets was closed in 1974.

Distribution of sighting and sign in the CYE from 1959-1985 is shown in Figure 3. Several areas of concentrated sightings and sign appear on this map. One is the area in the southern half of the Cabinet Mountains in and around the wilderness area. Evaluations concerning this information must consider observer effort or number of persons visiting an area and the observability or the nature of the habitat (e.g. more animal observatons may come from open habitat than from thickly vegetated habitat). Since 1975, 16 observatons of females with young have been reported in the Cabinet Mountains. Nine of these observations have occurred since 1980.

Trapping

Spring trapping activities began on 6 May and ended on 16 July for a total time of 69 days. Two trap teams were used in 1985. Trapping was conducted on the east side of the main Cabinets in the Fisher River, Libby Creek, and Cherry Creek drainages.

A total of 46 black bears were captured 63 times during 1985. Three adult grizzlies were captured. Two of the three grizzlies were recaptures of previously instrumented animals. Collars were replaced on the two recaptured animals. The additional male grizzly and another ten black bears were newly fitted with radio collars.

Trap success by 10 day time period during 1985 was less than 1983, but comparable to 1984 (Figure 4). Overall trap success for 1985 was similar to 1984, but lower than 1983 (Table 4). Trap success in hunting district 103 was comparable to that in hunting district 121. Most observations of spring grizzly sign and all five grizzly captures occurred on the east side of the Cabinet Range in district 103.

Table 3. Known grizzly bear kills in the Cabinet Mountains, 1950-1985 (some information compiled from Halvorson 1974, Madel 1983, K.R. Greer Pers. Comm.).

Map No. *	Date	Location	Sex-Age
1	Summer 1950	Squaw Cr.	1 subadult
2	Fall 1951	Goat Cr.	1 subadult male
3	Spring 1952	Lake Cr.	2 adult females, 3 yearling males, and 1 yearling female
4	1953	Kenelty Mtn.	unknown bear
5	1953	20-odd Mtn.	unknown bear
6	Fall 1953	O'Brien Cr.	1 subadult male
7	1954	N. Fk. Bull R.	unknown bear
8	1954	S. Fk. Bull R.	unknown bear
9	1954	Cedar Lk.	unknown bear
10	1954	Cedar Lk.	unknown bear
11	1954	Taylor Pk.	unknown bear
12	1954	Allen Pk.	unknown bear
13	Fall 1954	Silverbow Cr.	1 adult female
14	Spring 1955	Wolf Cr.	1 adult male
15	Summer 1955	Mt. Headley	1 yearling
16	Fall 1955	Bear Cr.	1 male yearling
17	Fall 1955	Baree Cr.	1 adult male, 1 adult female
18	Fall 1958	Squaw Cr.	1 adult female
19	Fall 1959	Rock Lk.	1 adult female, 1 cub
20	Fall 1959	W. Fk. Thompson R.	1 adult female, 3 cubs
21	Fall 1959	Cliff Cr.	unknown bear
22	Fall 1960	Prospect Cr.	1 adult female, 1 cub
23	Summer 1964	Graves Cr.	2 yearlings
24	Fall 1964	Wanless Lk.	3 subadults (1 adult wounded)
25	Fall 1965	Snowshoe Lk.	2 subadults
26	Spring 1968	Bear Cr.	1 adult female
27	Spring 1968	Granite Cr.	1 subadult male
28	Fall 1969	Priscilla Pk.	1 adult female
29	Spring 1970	Thompson Falls (?)	unknown bear
30	Fall 1970	Cameron Gulch	2 subadult males
31	Fall 1970	Squaw Cr.	1 adult female, 1 subadult female
32	Fall 1971	Murr Cr.	1 adult female
33	Fall 1972	Rock Lk.	1 subadult
34	Fall 1974	Swamp Cr.	1 adult male
35	Fall 1977	Rabbit Cr.	1 adult male
36	Fall 1985	Lyon's Gulch	1 adult male

* Map No. - Refers to Figure 2.

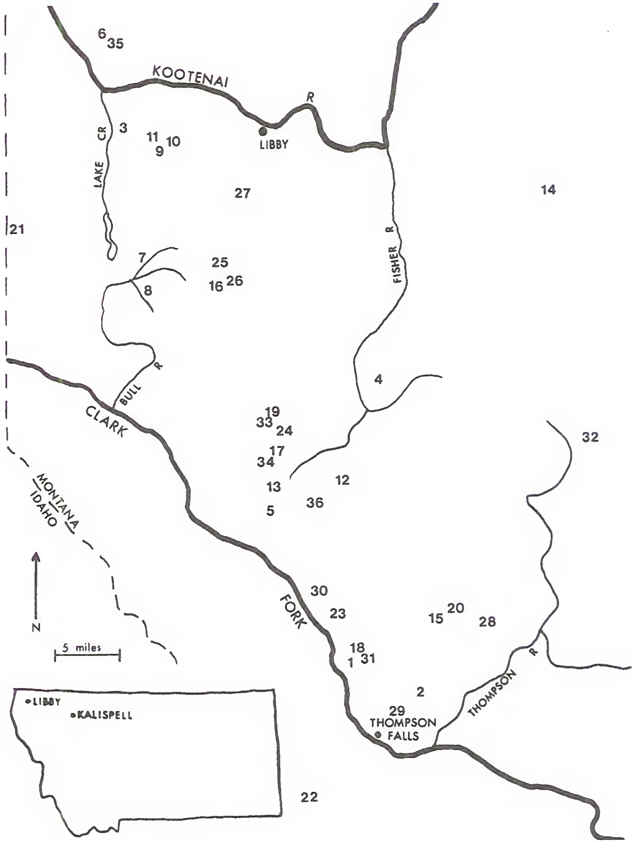

Figure 2. Distribution of known grizzly bear kills in the Cabinet Mountains, 1950-1985 (Numbers refer to Table 3).

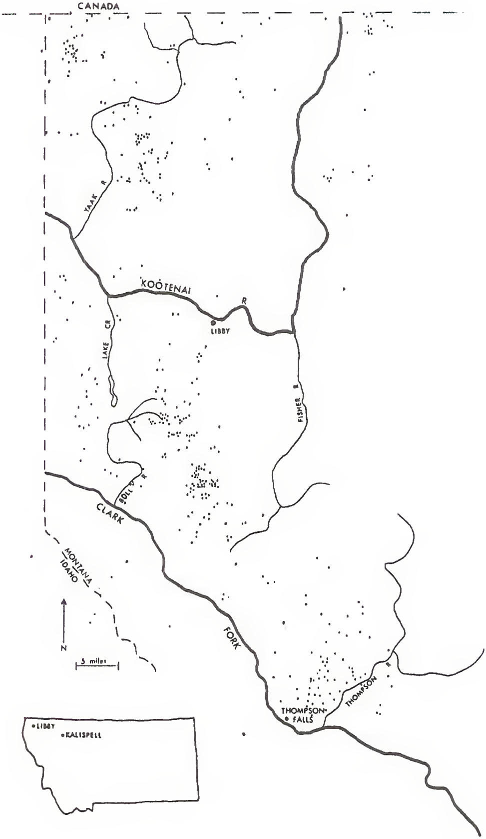

Figure 3. Distribution of grizzly bear sightings in the Cabinet-Yaak Ecosystem, 1959-1985.

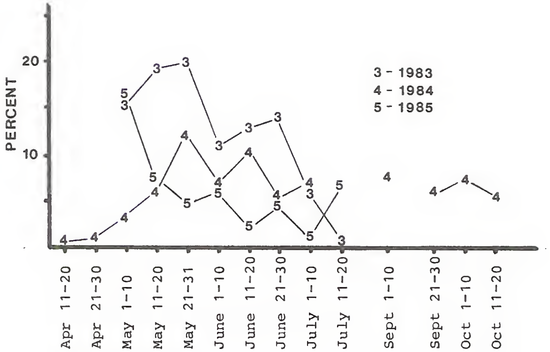

Figure 4. Percent trap success during 10 day time periods in the Cabinet Mountains, 1983-1985. Trap success expressed as the percent of operational snares capturing bears each night.

Table 4. Snare-nights, bear captures, and trap success from hunting districts 103 and 121 in the Cabinet Mountains, 1983-1985.

	Snare-nights	Total Captures	Percent Success
1983	365	45	12.3
1984	1461	86	5.9
1985	1333	66	5.0
Total	3159	197	6.2
District 103	2013	134	6.7
District 121	1146	63	5.5

Grizzly Bear Population Data

Three adult grizzly bears were captured in Bear and Cherry Creek drainages during 1985. Physical measurements and estimated weights were obtained (Table 5). All bears appeared to be in fair to good physical condition.

Table 5. Physical measurements (cm) of grizzlies 680, 678, and 14 captured in the Cabinet Mountains, 1985.

	680	678	14
Date	5/12/85	6/1/85	6/19/85
Age and Sex	12.5, Male	30.5, Female	27.5, Male
Weight	200 kg (e)	79.5 kg	151 kg (e)
Total Length	179	155	185
Neck Girth	78	54	69
Chest Girth	128	86	109
Shoulder Height	99	78	86
Shank Length	39	37	39
Foot Measurements:			
Front Pad Width	14.6	10.8	15.2
Front Pad Length	7.0	6.4	7.9
Front Foot Length	12.4	11.4	13.0
Front Claw Length	4.8	5.7	4.1
Front Claw Arc	9.2	7.9	7.6
Hind Pad Width	13.0	10.8	15.2
Hind Pad Length	17.5	15.6	17.8
Hind Foot Length	21.6	19.7	22.5
Testicle Width	N/A		4.4
Testicle Length	N/A		7.3
Bacculum Length	N/A		14.9
Reproductive State		Anestrous	
Fat Index *	4	2	3
Left Ear Tag	Yellow 680	Yellow 678	White 14
Right Ear Tag	Yellow 681	White 20	White 14
Lip Tattoo	680	678	14

* Fat Index - An arbitrary measure of the animal's condition on a scale of 1 to 5; 1 being emaciated, 3 being average, 5 being very fat.

Grizzly 680 (12.5 year-old, male) was recaptured on 12 May. On 21 November 1984 this animal was shot twice at close range with a .30 caliber rifle by a hunter (Kasworm 1985). Both wounds were examined and treated. One bullet entered at the base of the neck on the animal's right side and exited out the shoulder. The two wounds were about 20 cm apart. A two cm square chip of bone (possibly scapula) was removed from the shoulder wound. Another wound was noted on the animal's left side in the center of the posterior one-third of the rib cage. There appeared to be a healed, broken rib at the site of the wound. Examination and probing of the wound revealed a mushroomed .30 caliber bullet which was removed. The exact path of this bullet and any additional ventral wounds could not be determined, due to conditions at the trap site, the size of the animal, and our concerns regarding unnecessary trauma. All wounds appeared to be healing normally and there was no sign of any infection. The animal was in excellent body condition with an estimated weight of 200 kg. The animal was 16 kg heavier than the previous capture on 19 June 1984 (weight was estimated by a regression utilizing chest girth and total length).

Grizzly 678 (30.5 year-old, female) was recaptured on 1 June. The only previous capture was 29 June 1983. The animal weighed 79.5 kg. The 1985 weight was 7 kg less than the 1983 weight and the animal was in poorer body condition. This decrease in weight may have been related to a poorer observed berry crop in the Cabinets during 1984. No young were observed with the female. A small quantity of milk was exuded from the nipples, but the same phenomena was noted in 1983. This is possibly residual milk and not indicative of active lactation. The absence of young for the past three years may indicate that the animal is past reproductive age or that her body condition has not been sufficient to allow blastocysts to implant and embryos to develop.

Grizzly 14 (27.5 year-old, male) was captured on 19 June. The animal was in good body condition at the time of capture and weighed approximately 151 kg. When the bear was first observed in the snare, it was noted that the lower left canine tooth appeared broken. After anaesthetizing the animal it was determined that the canine and several lower incisors were broken and that possibly the distal tip of the mandible was broken. This injury possibly occurred while this animal was fighting the snare, though it is not known exactly how it happened. After evaluating the extent of the injury, the body condition of the bear, and the fact that the animal could be carefully monitored with the telemetry equipment, the project biologist determined that the animal could be released.

Fourteen observations of grizzly bear sign (tracks, hair, capture) were made during 1983-1985. Tracks were considered to be made by a grizzly when claw length exceeded 4 cm. Of 103 black bears captured in the Cabinet Mountains, only one had a claw length that exceeded 3.2 cm. Using all 14 observations of tracks and measurements of the three collared grizzlies, seven individuals were identified (Fig. 5 and Table 6). Separation of individuals was based on front track widths that differed by at least 1.3 cm or were made at a time when instrumented bears were

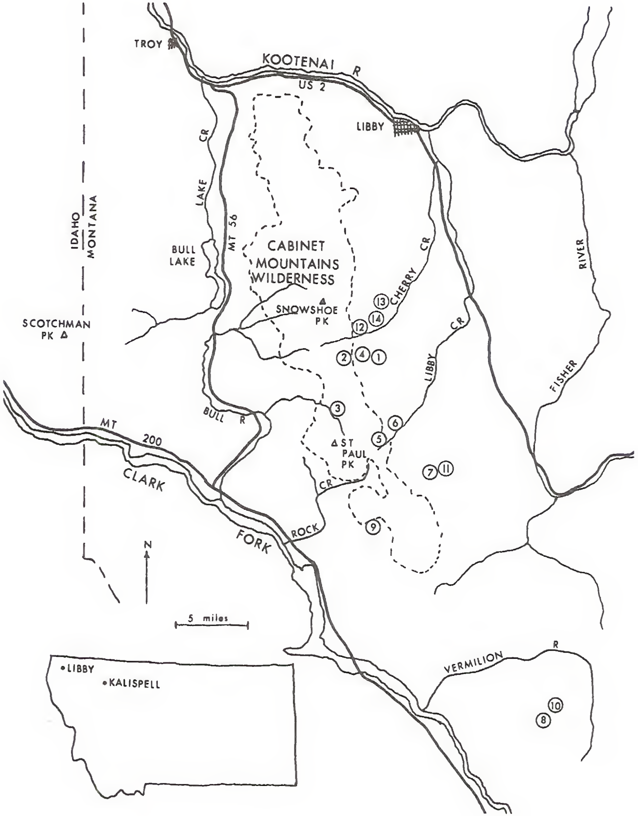

Figure 5. Location of grizzly bear track observations and captures in the Cabinet Mountains, 1983-1985 (Numbers refer to Table 6).

not in the vicinity. The first three entries in Table 6 were obtained from Martin (1983). The utility of this system decreases markedly with increasing numbers of individuals. Tracks from captured male grizzlies 680 and 14 could not be differentiated under this system because of similar size feet. Measurements of tracks from young bears may change over time as the animals grow and mature. Consideration of these factors is important in assessing these results. One track observation involved a female grizzly with a yearling or two-year-old at her side. This is the first observation of grizzly reproduction during this study.

Table 6. Grizzly bear track measurements (cm) collected in the Cabinet Mountains, 1983-1984.

Date	Map No.	Sign	Substrate	Front Foot Measurement A	B	C	D	Bear No.
4/14/83	1	Track	Mud		10.8	9.8	7.6	1
4/14/83	2	Track-Hair	Snow		16.5	16.5		2
6/24/83	3	Track-Hair	Mud	6.7	12.7	13.2	4.8	3
6/29/83	4	Capture		5.7	11.4	11.4	5.1	1
7/15/83	5	Track-Hair	Mud	7.0	12.4	12.1	4.1	3
6/19/84	6	Capture		7.6	14.6	12.7	4.8	4
6/26/84	7	Track	Mud	5.1	9.8	10.2	4.1	5
9/5/84	8	Track	Mud	8.3	15.2	15.6	5.1	6
9/14/84	9	Track	Mud	7.6	15.2	14.0	4.8	4
10/2/84	10	Track	Mud	7.0	13.3	13.0	4.4	3
5/8/85	11	Track	Mud	7.6	14.6	12.7	5.7	6
5/18/85	12	Track	Mud	7.9	15.6	13.7	4.4	4,6
5/18/85	13	Track	Snow	7.0	12.7	12.7	4.4	5
5/18/85	13	Track	Snow	5.4	10.2	10.5	4.1	7
6/19/85	14	Capture		7.9	15.2	13.0	4.1	6

Map No. - Refers to Figure 5.
Front Foot Measurements:
A - Pad Length
B - Pad Width
C - Foot Length
D - Claw Length
Bear No. - Grouping based on track size and location.

Black Bear Population Data

Black bear hunting in northwest Montana has shown a dramatic increase in popularity since the early 1970's. In 1971, Region 1 of the MDFWP recorded about 19,000 black bear hunter days and a harvest near 650 bears. By 1979, hunter days had increased to 55,000 and harvest increased to almost 1,000 bears (Figure 6). With this increase in harvest and hunting pressure, MDFWP biologists became concerned about whether black bear populations could sustain this increased harvest. Hunting districts which appeared to be receiving a large part of increased hunter days and harvest were districts 100, 101 and 103. In 1979 these 3 districts provided 16% of total statewide black bear hunter days and 23% of the statewide harvest. Hunter days increased 271% and harvest increased 114% from 1973 until 1979. Interviews with hunters and residents indicated a general decline in bear sightings and nuisance bear complaints. An average of 62% of the annual harvest during 1978-1980, occurred during the spring season and most of that occurred in May. Black bears appear most vulnerable to harvest in spring because snow cover forces animals searching for food into limited areas of early green-up. Since females and particularly females with cubs tend to emerge from dens later in the spring than males (Hugie 1982, Beecham 1980, Waddel and Brown 1984), curtailing the spring season during May might be most effective in decreasing overall harvest and affording protection to reproductively active females. These factors prompted MDFWP biologists to reduce the spring season in districts 100, 101, and 103 to 2 weeks in late April beginning in 1981. After three years of curtailed harvest, the spring season was lengthened to four weeks in 1984.

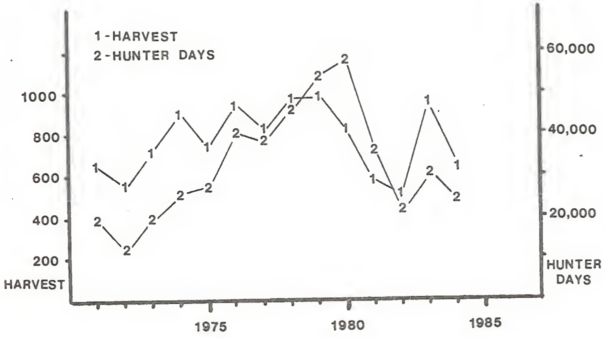

Figure 6. Black bear harvest and hunter days in MDFWP Region 1, 1971-1984.

Trapping activities have occurred in MDFWP hunting districts 103 and 121 (Fig. 7). These districts provide an opportunity to compare the effects of differing harvest levels on population statistics (Table 7). In 1976, collection of teeth from harvested black bears had begun in order to obtain information on age structure.Median age of the harvest in district 103 varied from 2-4 years-old except in 1984 when it increased sharply to 6 years-old (Table 7). This sharp increase may have been related to a MDFWP request for voluntary tooth collection. Many hunters that bagged larger bears may have been more interested to know the ages of their kills than hunters who harvested smaller bears. Subadults (< 5 years old) averaged 69% of the harvest for the period 1976-1985. Only during 1984 did percent subadults in the harvest dip below 50 percent. Mandatory tooth collection from harvested bears began in 1985. Best sample sizes and hence least biased data are from that year. Hunter harvest data from the 1985 mandatory tooth collection indicated a harvest of 101 bears in district 103 and 93 bears in district 121 (Table 8). Seasonal distrbution of the harvest showed nonsignificant differences (p=.314) with 47% of the harvest in district 103 occurring in spring while district 121 had 54% of it's harvest during spring. Sex ratios of the harvest varied from 70% males in spring to 56% males during fall in district 103, and 71% males during spring to 63% males during fall in district 121. None of the differences were significant (p>. 129). Adult-subadult ratios in district 103 indicated a signicantly greater percentage of adults (70%) in the spring harvest over the fall harvest (26%, p=.000). Subadults were the majority of the harvest during both seasons in district 121. Median age of the total harvest was 4 years-old in each district. Median age of the spring harvest was higher than the fall harvest in both districts with most of the differences occurring in the male segment of the harvest. Median age of the harvest in district 103 was generally greater than that in district 121 within season and sex classification.

Table 7. Hunting season, percent females, percent subadults, and median age of the harvest in MDFWP hunting districts 103 and 121, 1976-1985.

YEAR	HUNTING DISTRICT	SEASON	PERCENT FEMALES	PERCENT SUBADULTS	MEDIAN AGE	FEMALE MEDIAN AGE	N
1976	103	04/01-11/28	--	75	2	--	28
1977	103	04/01-06/30 09/01-11/27	47	88	2	2	17
1978	103	04/15-05/31 09/09-11/26	58	64	4	4.5	28
1979	103	04/15-05/31 09/06-11/30	--	58	3	--	12
1980	103	04/15-05/31 09/06-11/30	33	89	2	2	27
1981	103	04/15-04/30 09/04-11/29	--	80	4	--	10
1982	103	04/15-04/30 09/04-11/28	40	81	2	1.5	28
	121	04/15-05/31 09/04-11/28	13	60	4	5	15
1983	103	04/15-04/30 09/10-11/27	44	72	2	2	25
	121	04/15-05/31 09/10-11/27	50	33	5.5	6	6
1984	103	04/15-05/15 09/08-11/25	38	38	6	4	47
	121	04/15-05/31 09/08-11/25	33	30	9	11.5	30
1985	103	04/15-05/15 09/07-12/01	37	53	4	4	99
	121	04/15-05/31 09/07-12/01	33	69	4	3	87

Table 8. Sex, age, and season of kill for hunter harvested bears in districts 103 and 121 during 1985.

	District 103		District 121	
Total Harvest	101		93	
Median Age	4		4	
	Spring	Fall	Spring	Fall
Harvest	47 %	53 %	52 %	48 %
Males	70 %	56 %	70 %	64 %
Females	30 %	44 %	30 %	36 %
Adults	70 %	26 %	43 %	39 %
Subadults	30 %	74 %	57 %	61 %
Male Adults	55 %	8 %	37 %	22 %
Male Subadults	15 %	49 %	33 %	41 %
Female Adults	15 %	19 %	7 %	17 %
Female Subadults	15 %	25 %	24 %	20 %
Median Age	7	2	5	3
Male Median Age	8	2	5	3.5
Female Median Age	4.5	4	3	3

A total of 127 individual black bears were captured from 1983-1985 (Appendix Table 18). This total was stratified into samples from hunting districts 103 and 121. Districts 103 and 121 have had different black bear hunting seasons since 1981 when district 103's spring season was reduced from 6 weeks to 2 weeks. In 1984 the spring season in district 103 was increased to 4 weeeks while district 121 has remained at 6 weeks since 1978. Trapping information provided an opportunity to compare age/sex data between areas. Ages from the 1984 and 1985 sample were backdated to 1983 ages and pooled. Recaptures of bears marked in previous years were eliminated. Summarized population data from both hunting districts are shown in Table 9. Males predominated in trapped samples from both districts 103 (56 %) and 121 (76 %). Sex ratios differed significantly from a 50:50 ratio in 121 ($p<.000$), but not in 103 ($p=.054$). Sex ratios from the two districts were also significantly different from one another ($p=.021$). Median age for the 103 and 121 samples was 5 years-old. A comparison of the medians revealed no significant difference ($p=.138$). Median age of males and females within districts did not differ significantly ($p>.113$). Subadults constituted 38 % and 50 % of the trapped samples for 103 and 121, respectively. These values did not differ significantly ($p=.191$). Color of captured bears was also compared. While color proportions of all bears from each district did not differ significantly ($p=.074$), a greater proportion of brown female bears was noted in district 121 when compared with males in the same district ($p=.026$) and with females in district 103 ($p=.016$).

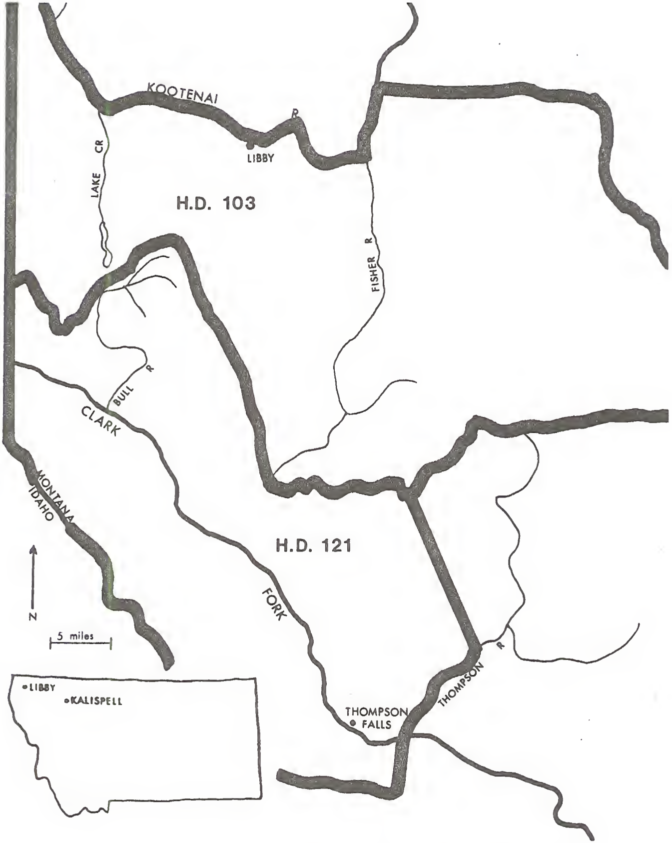

Figure 7. Map of black bear hunting districts 103 and 121.

Table 9. Black bear population statistics from captures in hunting districts 103 and 121, 1983-1985.

	District 103 Lightly Hunted N = 73	District 121 Moderately Hunted N = 54
Male	56 %	76 %
Female	44 %	24 %
Adults	62 %	50 %
Subadults	38 %	50 %
Male Adults	34 %	35 %
Male Subadults	22 %	41 %
Female Adults	27 %	15 %
Female Subadults	16 %	9 %
Median Age	5	4.5
Male Median Age	5	4
Female Median Age	6	5
Black	66 %	50 %
Brown	34 %	50 %
Black Male	38 %	44 %
Brown Male	18 %	31 %
Black Female	27 %	6 %
Brown Female	16 %	19 %

Black bear population data from district 103 is probably not representative of the entire district. Black bear captures were made while attempting to capture grizzly bears. District 103 captures came from areas lightly hunted. District 121 captures came from an area of moderate hunting pressure and are probably indicative of all district 121. Hunter questionaire data suggest that more restrictive spring seasons in districts 100, 101, and 103 may have shifted more hunting pressure to district 121. Hunter days in district 121 increased 68% and harvest increased 213% from 1981 (initiation of restricted spring seasons in 100, 101, 103) until 1983. Comparisons of district 103 (lightly hunted) and 121 (moderately hunted) should be viewed in this mannner.

Relating these study area comparisons to the effects of hunting would tend to indicate that as hunting pressure increases, median age of the population decreases and subadult ratios increase. Both of these changes appear more pronounced in males. Similar relationships for the effects of increased harvest have been shown by Beecham (1980) in Idaho, Waddell and Brown (1984) in Arizona, Hugie (1982) in Maine, Kohn (1982) in Wisconsin, and Modafferi (1982) in Alaska.

Comparisons of the trapped sample with the 1985 hunter harvest showed no significant differences in the sex ratio within each district ($p > .207$). Further comparisons of median age of the trapped and harvested samples from each hunting district showed no significant differences ($p > .169$).

Capture and radiotracking data were examined to determine reproductive parameters for females in the study area. Fifty-six captures of 45 different female bears from 1983-1985 were used. Thirteen of these females were radio-tracked during portions of the time period. Reproductive condition (estrous and lactation) and measurements (mammae size) of these animals were recorded at capture. Mammae length of 12 mm or greater appeared to be associated with females having successfully produced at least one litter of cubs. Signs of estrous were noted in one 3 year-old and two 4 year-olds. Lactation was observed in one 4 year-old, but radio tracking information indicated she did not successfully raise cubs. Mammae measurements of 12 mm or greater were observed in one 6 year-old female, however two 7 year-olds and an 8 year-old did not fit this criteria. Radio-tracking and capture data would appear to indicate that while 3-5 year-old females may be capable of reproduction, first succesful litters do not usually occur till a female is 6-7 years of age. Data is insufficient at this point to determine a reproductive interval but average litter size appears to be 1.4-1.6 (Brown et al. 1984, 1985, 1986).

Population and density estimates have been made through aerial surveys. In the falls of 1983-85, MDFWP biologists conducted helicopter surveys of shrubfields on about 810 square km of the Cabinet Mountains. Total black bear counts were 250, 128, and 94 in 1983-85, respectively (Brown et al. 1984, 1985, and In Prep.). Observed densities varied from 1 bear per 3.2 square km to 1 bear per 8.6 square km (Table 10). Marked black bears were available in the survey area during 1984 and 1985 for Lincoln index population estimation. Only 16.7% of the 60 marked bears were seen during 1984 and 13.0% of 46 marked bears were seen in 1985. A density of 1 bear per 1.1 square km was calculated from each of the Lincoln index populaton estimates. Density estimates from fall survey flights of shrubfield areas may overestimate average annual density do to concentration of bears at these sites to forage for berries. Therefore a density estimate intermediate to the observed and Lincoln index values may be more indicative of a district's overall density. Black bear densities in the Cabinet Mountains may range from 1 bear per 2.6 square km to 1 bear per 3.9 square km. This value is similar to other black bear density estimates for the northwest U. S. (Jonkel and Cowan 1971, Poelker and Hartwell 1973, Beecham 1980).

Table 10. Numbers of observed black bears and density estimates from fall helicopter shrubfield surveys in the Cabinet Mountains, 1983-85.

	Total	Females	Cubs	Adults	Subadults	Observed Density (km2)	Index Density (km2)
1983	250	36	59	131	24	1/3.2	--
1984	128	5	7	100	16	1/6.3	1/1.1
1985	94	12	19	55	8	1/8.6	1/1.1

Scale weights were obtained from 124 captures of black bears during spring 1983-1985. Scale weights ranged from 9.1-129.5 kg. A weight regression based on chest girth and total body length was generated similar to McLellan's (1981) regression for grizzly bears. The regression is as follows:

W=.0000662 LG-squared
W-predicted weight (Kg)
L-total body length (cm)
G-chest girth (cm)
R-squared =.953
p<.001

The same regression expressed in the English system:

W=.00239 LG-squared
W-predicted weight (lbs)
L-total body length (in)
G-chest girth (in)

Home Range and Movements

Grizzly Bear

Annual home ranges of grizzlies 678, 680, and 14 during 1985 are shown in Figs 8-10. Specific and general locations were obtained, but only the specific locations were used to generate the home range. All general locations fell within the bounds defined by minimum home range techniques utilizing specific locations. Number of locations and annual home range sizes for all bears monitored are shown in Table 11.

Table 11. Number of radio locations and minimum home range size of instrumented grizzly bears in the Cabinet Mountains 1983-1985.

Bear No. (Year)	Number of Radio Locations Specific	General	Minimum Home Range Size (km^2)
678 (1983)	28	7	430
678 (1984)	33	25	334
678 (1985)	62	24	206
678 (composite)	123	56	771
680 (1984)	54	24	1290
680 (1985)	58	17	1507
680 (composite)	112	41	1997
14 (1985 part)	41	5	608

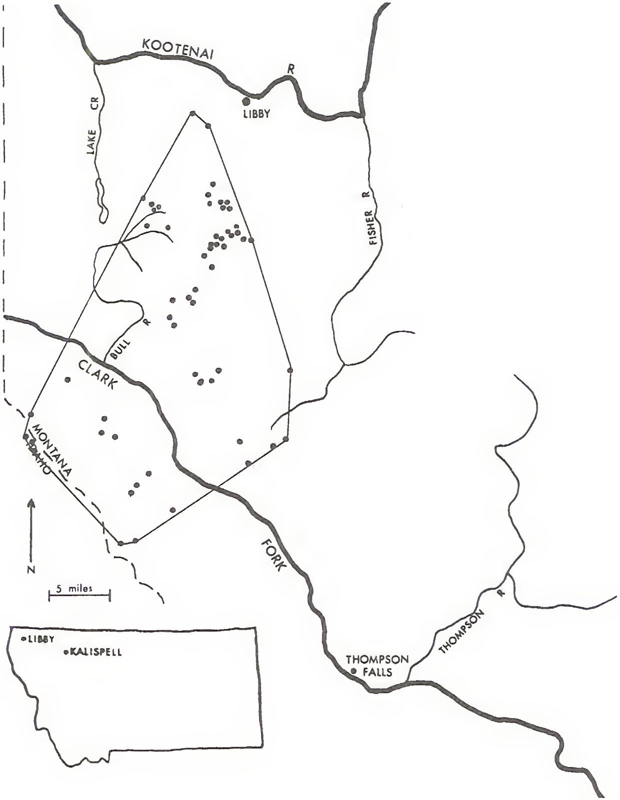

Figure 8. Minimum home range polygon of male 680 grizzly bear in the Cabinet Mountains, 1985.

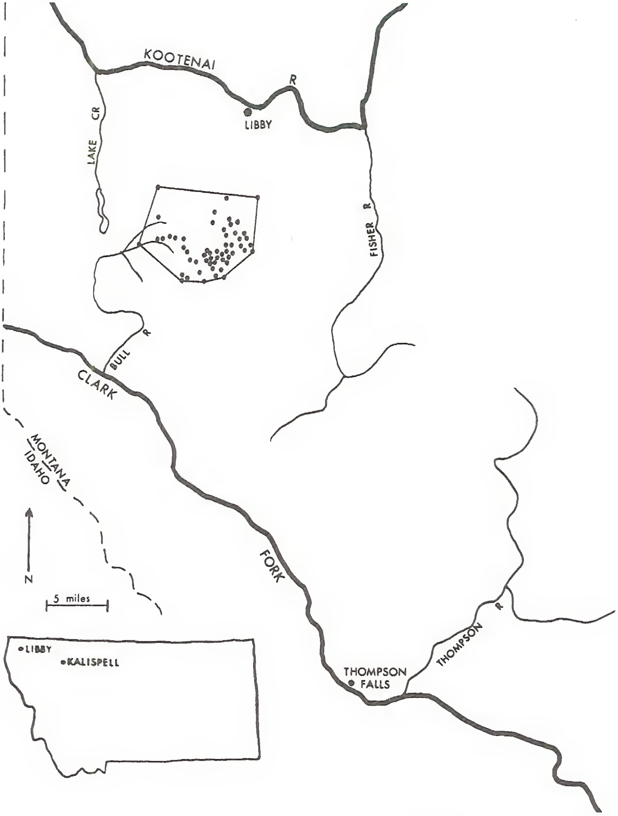

Figure 9. Minimum home range polygon of Female grizzly bear 678 in the Cabinet Mountains, 1985.

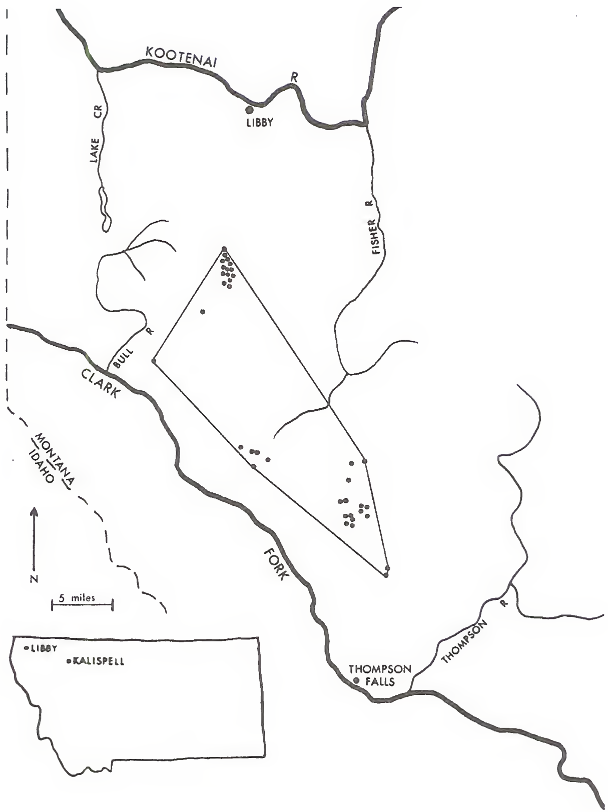

Figure 10. Minimum home range polygon of male grizzly bear 14 in the Cabinet Mountains, 1985.

Home range of female grizzly 678 was smaller during 1985 (206 square km) than either of the two preceeding years. This smaller home range is located largely in the core of the wilderness. Grizzly 678 exited her den between 8 and 10 April and remained on the west side of the main Cabinets for about 3 weeks. In early May she crossed the range to the east side where she spent the remainder of the spring. Grizzlies 678 and 680 were located together for eight successive days during late May. She was also located with grizzly 14 for two successive days during early July. This time frame is similar to courtship observed during 1983 and 1984. While she crossed the main Cabinet divide several times during the summer and fall she did not move south to the Vermilion River drainage during the fall of 1985, as she had during 1983 and 1984. This lack of southerly movement was largely responsible for the smaller observed annual home range. Composite home range of all years for grizzly 678 was 771 square km (Fig. 11).

Annual home range of male grizzly 680 during 1985 was 1507 square km. This was comparable to his 1984 home range of 1290 square km. Grizzly 680 left his winter den south of the Clark Fork River on 8 April. He immediately crossed the Clark Fork in the vicinity of Noxon Rapids Dam and returned to the main Cabinets. He spent most of the spring on the east side of the main Cabinets and consorted with grizzly 678 during late May. Grizzly 680 moved extensively through the northern Cabinets in June and July. In late July he moved south to the Vermilion River drainage where he remained for about one month. In late August grizzly 680 returned to the central Cabinets for one month before moving south again and crossing the Clark Fork River. He was monitored south of the Clark Fork through 31 October when he cast his collar. The animal was first thought to have denned, but the site was visited during the early spring and the collar was recovered. The animal cast his collar in the upper reaches of the Coeur d'Alene drainage in Idaho. The location of the 680's 1985-1986 den is unknown. The composite home range of grizzly 680 for 1984-1985 was 1997 square km (Fig. 11).

Male grizzly 14 was captured on 19 June and monitored till 21 September when he was killed by two bowhunters. His home range during that time period was 608 square km. Grizzly 14 was captured on the east side of the main Cabinets and remained on the east side for about 3 weeks. In mid-July grizzly 14 moved south to the Vermilion River. He spent most of August and September in the upper Vermilion and occasionally moved into the West Fork of the Thompson River. In mid-September grizzly 14 returned to the lower Vermilion drainage where he was killed.

Minimum home range sizes of grizzly bears from the Northern Continental Divide Ecosystem (NCDGBE) vary from 75-735 square km for adult females and 192-3029 square km for adult males (Rockwell et al. 1978, Mace and Jonkel 1980, Schallenberger and Jonkel 1980, McLellan 1982, Aune and Stivers 1982 and 1983, Servheen 1983, Aune et al. 1984). All instrumented grizzlies in the Cabinet Mountains fall within this range.

Movements by grizzly 680 demonstrate that grizzlies can move between the East and West Cabinets and the north end of the Bitterroot range south of the Clark Fork. However, there have

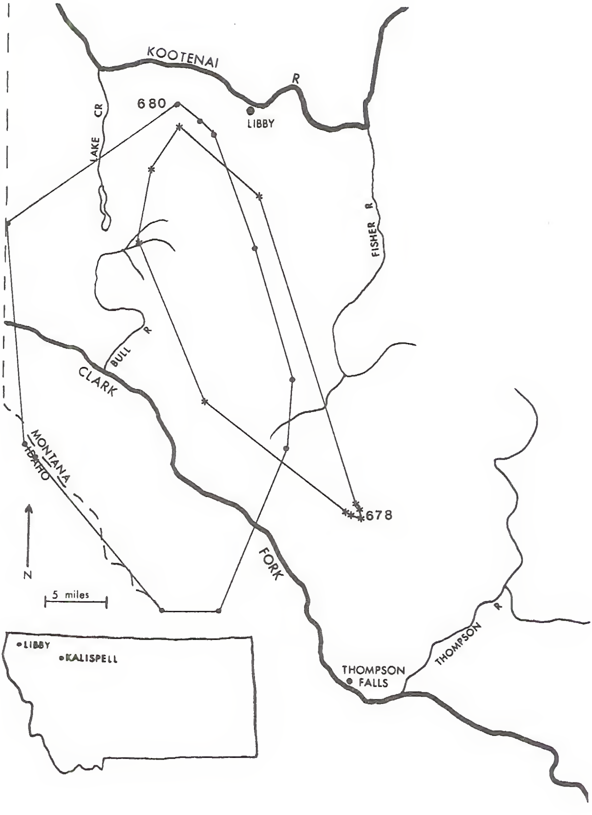

Figure 11. Composite minimum home range polygons of grizzly bears 678 (female) and 680 (male) in the Cabinet Mountains, 1983-1985.

been few verified sightings of grizzlies south of the Clark Fork in the last 10 years. This may in part be due to a lack of active solicitation of sighting reports of grizzlies. This movement also gives some hope of possible movement between the Cabinets and the Yaak.

Twenty-four hour monitoring of grizzly bears provided information on times of the day that bears were active. Fourteen sessions of 24 hour monitoring have been conducted. Eight of these were characterized by largely diurnal activity, 3 by nocturnal activity, and 3 by crepuscular activity. Most of the diurnal activity patterns occurred in the remote areas, while most nocturnal and crepuscular patterns were in close proximity to human activity (hunter camps, logging activity). These types of data will continue to be gathered.

Black Bear

Nine additional black bears were collared in 1985 (2 males and 7 females). Six black bears collared in 1983 and 1984 (1 male and 5 females) were also monitored. Minimum annual home ranges of all black bears are shown in Table 12. Annual male minimum home ranges varied from 16.8-145.4 square km (mean = 66.9 square km). Annual female minimum home ranges varied from 6.1-66.8 square km (mean = 16.4 square km). On the basis of radio locations and recaptures, bears trapped on either side of the main Cabinets tended to remain on that side and not cross the main divide (Fig. 12-14). Five female black bears showed a decrease in mean home range size from 21 square km in 1984 to 14 square km in 1985, though this decrease was not statistically significant ($p=.378$). Other Montana studies have reported male home ranges of 6-82 square km (Aune and Stivers 1982 and 1982, Rosgaard and Simmons 1982). Amstrup and Beecham (1976) reported female home ranges of 17-130 square km and male home ranges of 109-115 square km for black bears in west-central Idaho. Female black bear home ranges in the Cabinet Mountains appeared somewhat smaller than these reports.

Monitoring indicated the approximate times of den entry and exit. Six male bears provided nine entry dates that ranged from the second week of October to the first week of November. Fourteen female bears provided 20 entry dates that ranged from first to the third week of October. Four male bears provided five den exit dates that varied from the second to the third week of April. Six female bears provided seven exit dates that varied from the third week of April to the second week of May. May dates of den exit were usually females with cubs. Time of denning appeared earlier than dates reported in west-central Idaho (Amstup and Beecham 1976, Reynolds and Beecham 1980) and northcentral Montana (Aune and Stivers 1983), but similar to reported dates from northwestern Montana (Jonkel and Cowan 1971).

Table 12. Sex, age, and home range size of black bears radio-tracked in the Cabinet Mountains, 1983-1985.

Bear	Sex	Age	Year	Locations	Home Range km^2
84	F	4	1983	12	6.7
84	F	5	1984	51	8.1
84	F		Composite	63	13.1
88	M	5	1983	16	16.8
88	M	6	1984	20	17.4
88	M	7	1985	48	126.4
88	M		Composite	84	149.9
90	M	12	1983	20	126.1
90	M	13	1984	35	57.5
90	M		Composite	55	254.1
264	M	10	1983	18	21.5
366	M	10	1983	10	24.9
686	F	15	1984	29	11.9
686	F	16	1985	39	13.1
686	F		Composite	68	16.2
702	F	21	1984	27	8.3
702	F	22	1985	37	6.1
702	F		Composite	64	9.4
726	F	6	1984	27	10.1
726	F	7	1985	42	8.2
726	F		Composite	69	12.1
736	F	7	1984	22	8
736	F	8	1985	43	10.9
736	F		Composite	65	14.9
800	F	19	1984	19	66.8
800	F	20	1985	20	31.8
800	F		Composite	39	81.4
5	F	7	1985	29	14.6
7	F	7	1985	42	19.6
10	F	14	1985	32	11.7
11	F	8	1985	55	9.8
13	F	10	1985	45	15.6
26	F	11	1985	22	17
266	M	12	1985	43	65.8
758	F	13	1985	45	32.6
764	M	17	1985	34	145.4

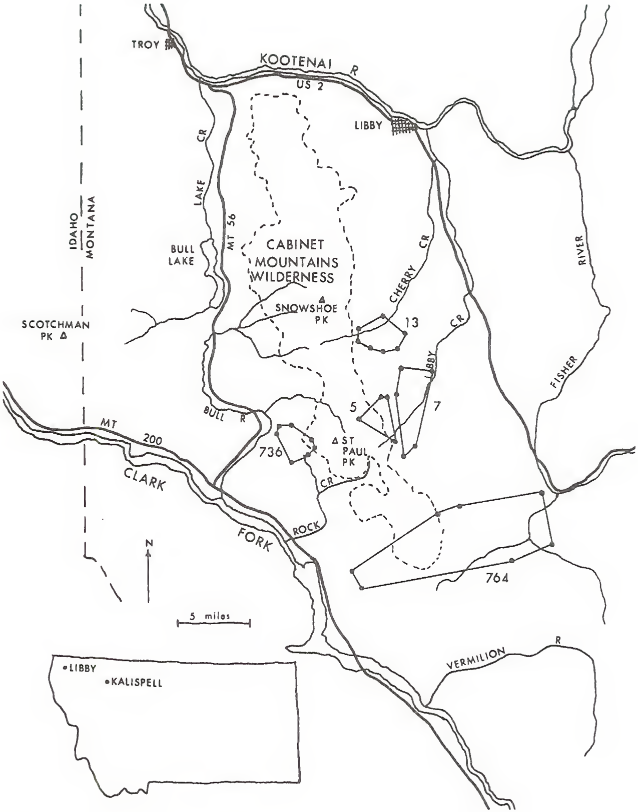

Figure 12. Minimum home range polygons of black bears 5 (female), 7 (female), 13 (female), 736 (female), and 764 (male) in the Cabinet Mountains, 1985.

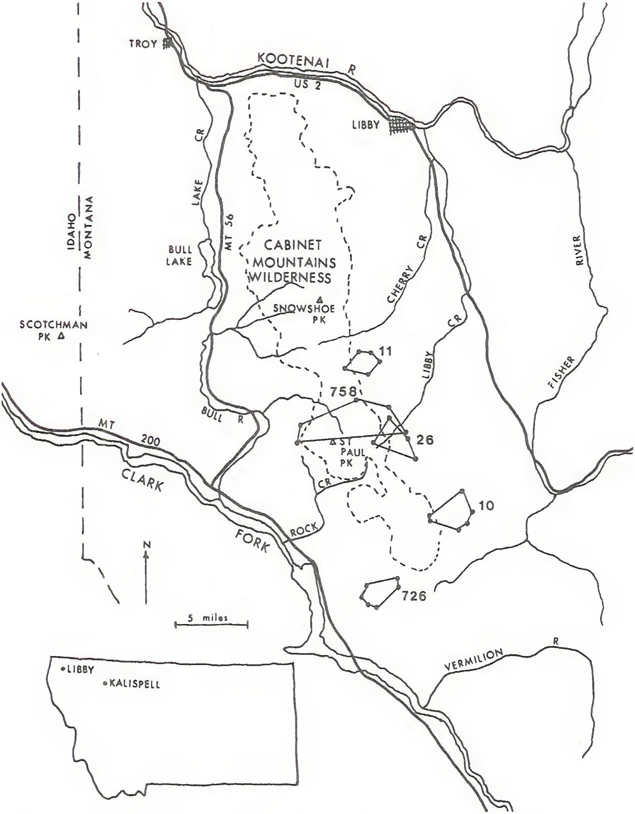

Figure 13. Minimum home range polygons of black bears 10 (female), 11 (female), 26 (female), 726 (female), and 758 (female) in the Cabinet Mountains, 1985.

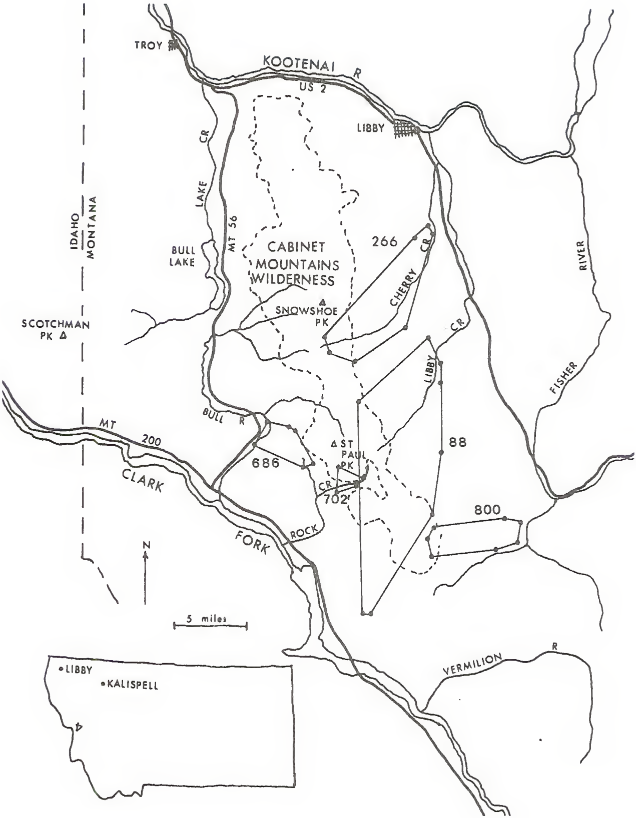

Figure 14. Minimum home range polygons of black bears 88 (male), 266 (male), 686 (female), 702 (female), and 800 (female) in the Cabinet Mountains, 1985.

Habitat Characteristics

Grizzly Bear

Habitat information from radio locations of the three collared grizzlies was pooled and summarized by season. Only specifiic radio locations were used to generate data for characteristics of habitat used by grizzlies. Sample sizes for each season were: spring-80, summer-70, and fall-126.

Mean elevation of grizzly bear locations in spring was 1457 m (Fig. 15). Mean elevaton of summer locations increased to 1604 m, then decreased to a mean of 1510 m during fall. Although differences among seasonal means were not statistically significant, examination of the standard deviations indicated more concentrated use of higher elevations during summer. This could be associated with bears following green-up to higher elevations as snow cover recedes. Several of the spring, upper elevation locations were accompanied by evidence of breeding activity. The wide range of elevation in spring locations may have been influenced by this activity. Analysis of degree of slope at radio locations indicated that fall use occurred on significantly less steep slopes than either spring or summer. There was no significant variation in use of slope between spring and summer (Fig. 16).

Classification of locations by aspect indicated heaviest use on south and southeast slopes during spring (Fig. 17). Southerly aspects would shed snow most rapidly in spring. Summer use appears to shift to other slopes, while fall use appears fairly balanced among all aspects.

Grizzly bear radio locations were also classified by vegetative characteristics. Figure 18 shows grizzly use of habitat types (Pfister et al. 1977) by season. The greatest proportions of spring, summer, and fall locations were in the ABLA-MEFE and TSHE-CLUN habitat types. The ABLA-CLUN type also received heavy use during spring, while the ABLA-XETE type received heavy use during summer and fall. The greatest diversity of habitat type use occurred during the fall with use recorded in 19 types.

Habitat types by definition do not always present a clear picture of likely habitat use. Though use may occur within a given type, radio locations were often at sites in early successional stages. Grizzly bear habitat component mapping was designed to represent more accurately the kinds of sites that are used by bears in specific areas (Servheen and Lee 1979). Habitat components identified on the KNF were described by Madel (1982). Excerpted descriptions of these components are presented in Appendix Table 17. Classifications of grizzly bear radio locations by component are shown in Figure 19. Habitat components with the greatest proportions of spring locations were mixed shrubfield snowchutes, closed timber, and graminoid sidehill parks (40%, 16%, and 15% respectively). Mixed shrubfield snowchutes also had the highest proportion of radio locations during summer (46%) with mixed shrubfield burns (19%) and alder shrubfields (14%) increasing in importance. Fall use appeared to shift toward more timbered types with the greatest

Figure 15. Mean elevation, standard deviation, and range of grizzly bear radio locations in the Cabinet Mountains, 1983-1985.

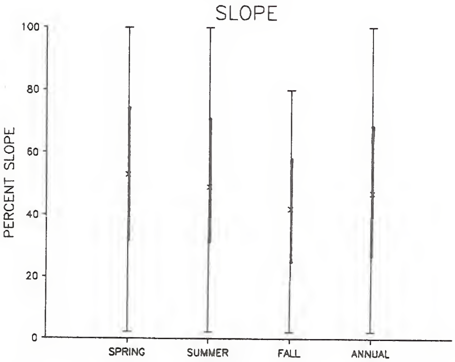

Figure 16. Mean slope, standard deviation, and range of grizzly bear radio locations in the Cabinet Mountains, 1983-1985.

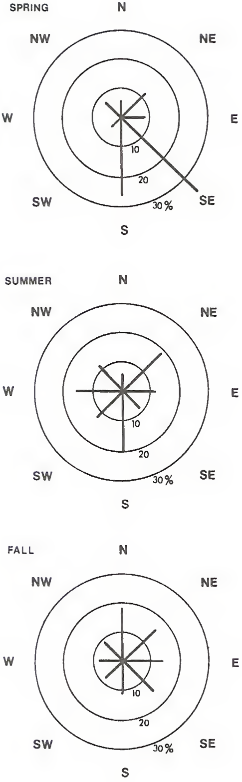

Figure 17. Relative percentages of grizzly bear radio locations classified by aspect in the Cabinet Mountains, 1983-1985.

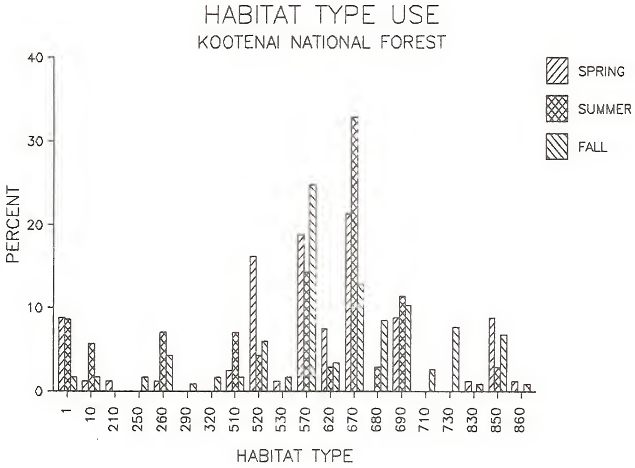

Figure 18. Relative percentages of grizzly bear radio locations classified by habitat type in the Cabinet Mountains, 1983-1985. See Appendix Table 19 for a key to coded habitat types.

proportions of locations in closed timber and timbered shrubfields (33% and 22% respectively). Mixed shrubfield snowchutes and mixed shrubfield cutting units also received significant use during fall.

The USFS has mapped the study area by land types (USFS 1984). This classification system integrates soil, vegetation, geology, and climate to produce mappable units. Grizzly bear radio locations were stratified by landtype (Fig. 20). Alpine landtypes (400 series) had the greatest proportion of radio locations during all seasons. Moreover, Glacially Scoured Trough Wall (landtype 401) received the most use through all the seasons. This landtype has steep valley walls which typically contain numerous avalanche chutes that are often used by grizzly bears.

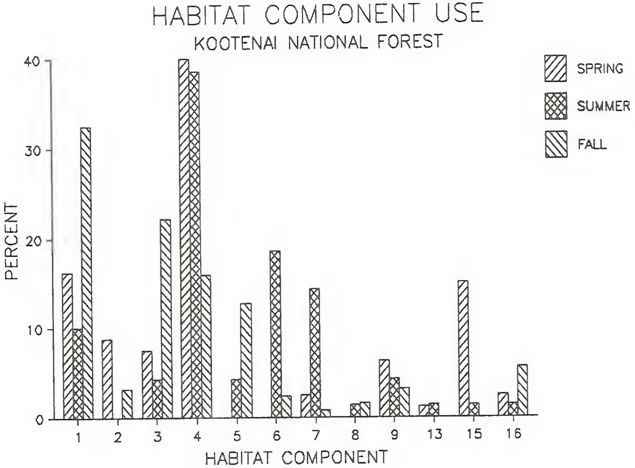

Figure 19. Relative percentages of grizzly bear radio locations classified by habitat component in the Cabinet Mountains 1983-1985. See Appendix Table 20 for a key to coded habitat components.

Under the National Forest Management Act prescriptions or allocations were developed for the National Forest lands to guide multiple use planning. Grizzly bear locations were seasonally stratified by allocation (Fig. 21). Wilderness, proposed wilderness, and non-motorized recreation areas had the greatest proportion of radio locations through all seasons. These allocations accounted for greater than 70% of all radio locations. Eighteen percent of all radio locations occurred in allocations supportive of grizzlies or other wildlife (e.g. Grizzly/Timber, Big Game Winter Range, Old-growth, Big Game Summer Range/Timber). Most locations falling in supportive allocations and non-supportive allocations occurred during fall. Use of wilderness and proposed wilderness was high during both spring and summer, but decreased markedly between summer and fall.

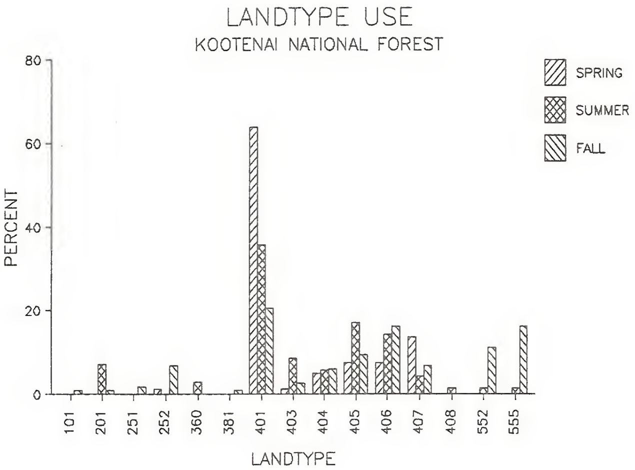

Figure 20. Relative percentages of grizzly bear radio locations classified by landtype in the Cabinet Mountains, 1983-1985. See Appendix Table 21 for the name of coded landtypes.

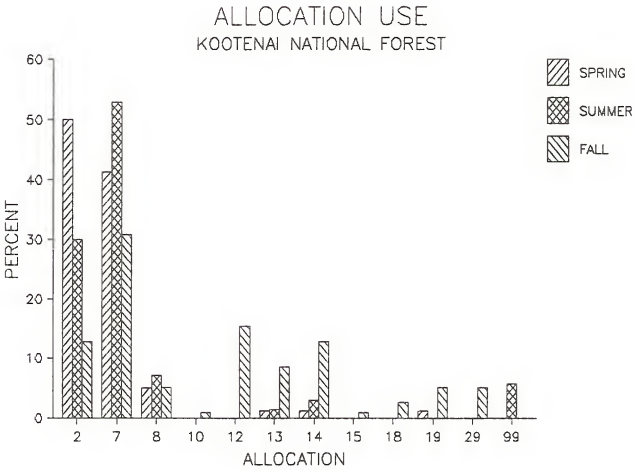

Figure 21. Relative percentages of grizzly bear radio locations classified by USFS allocation in the Cabinet Mountains, 1983-1985. See Appendix Table 22 for a key to coded allocations.

Road management and disturbance effects on wildlife are important aspects of grizzly bear management. Distance measures from radio locations of bears to the nearest road or trail is one method of evaluating the effects of disturbance. For the purposes of this evaluation, closed roads were considered equivalent to trails. Mean distance from radio locations to roads was not significantly different among seasons (Fig. 22). Annual mean distance between radio locations and open roads was 2405 m (N=276, S.D.=1521 m). Mean distance from radio locations to trails did differ significantly among seasons. Mean distance from summer locations to trails was significantly different from both spring and fall. Annual mean distance between locations and trails was 839 m (N=276, S.D.=729). The difference between mean distance from locations to open roads and trails was significant ($p < .001$) on an annual basis and during all seasons. This difference in distance from locations to open roads and trails provides supportive evidence for the value of the road closure program. Mean distance from locations to perennial water showed several differences among seasons. Mean distance from water during spring was not statistically diferent from summer, but differed from fall. Fall mean distance to water did not differ from summer (Fig. 22). Annual mean distance from locations to water was 593 m (N=276, S.D.=546 m).

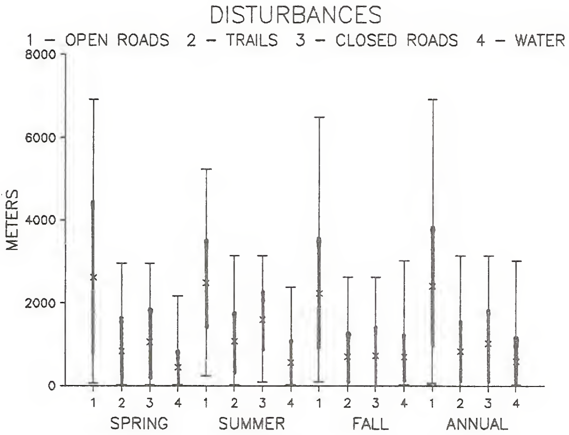

Figure 22. Mean distance between grizzly bear radio locations and open roads, trails, closed roads, and perennial water. Standard deviation and range also indicated.

Further testing of the relations between roads and grizzly bear distribution was conducted on data from the Bear Creek drainage. This drainage has a 4 km segment of road that is open only from 1 July to 15 October. Mean distance from radio locations to the road prior to 1 July was 694 m (N=12, S.D.=473). Mean distance from radio locations to the road after 1 July was 1057 m (N=12, S.D.=484). This difference did approach statistical significance (p=.076). Arguments could be made that bears were following plant phenology to higher elevations during July and would therefore be further from the road. A separate analysis was conducted on locations from Bear Creek during June and July only. Mean distance from radio locations to the road was 745 m (N=10, S.D.=459 during June and 942 m during July (N=9, S.D.=455). Though this difference was not statistically significant (p=.353), mean elevation and mean slope of radio locations during June and July were not consistent with the hypothesis that bears were following plant phenology to higher elevations. Mean elevation of radio locations decreased from 1438 m in June to 1426 m in July. Mean slope of radio locations decreased from 44 % during June to 40 % during July.

Food habits data from scat analysis was summarized by category on a monthly basis (Figure 23). This data was from scats collected during 1983-1985. Graminoids dominated the diet (90% importance) during May with a minor amount of forbs. A mixture of grass and sedge comprised the graminoid fraction while Angelica was the dominant forb. Graminoids were still the dominant category during June, but forbs increased markedly. Grass and sedge comprised over 50 % importance while forbs increased to over 35 %. Heracleum was the dominant forb with a minor amount of Erythronium. Forbs became the leading category during July (50 %) with graminoids, shrubs, and insects (ants) making up the remainder. The other category was made up largely of debris, dirt, and wood and appeared to be associated with feeding on insects. Heracleum was again the major forb. August and September food habits were fairly similar with shrubs (Vaccinium) comprising over 75 % importance. Grass and sedge made up most of the remainder while forbs nearly disappeared from the diet. October diets were almost entirely grass and sedge. An annual summary of the analysis is presented in Table 13.

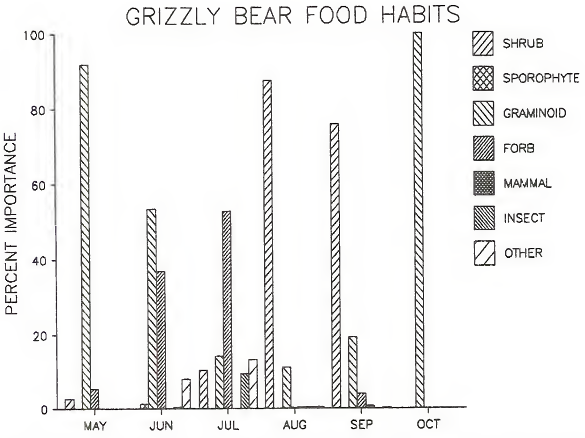

Figure 23. Relative percentages of food categories identified in grizzly bear scats collected in the Cabinet Mountains, 1983-1985. N = 56.

Table 13. Item, part, frequency, volume, composition, and importance of foods identified by analysis of grizzly bear scats collected in the Cabinet Mountains, 1983-1985. N = 56.

ITEM	PART	FREQ	% FREQ	VOLUME	% VOLUME	% COMP	IMPT	% IMPT
Ribes	Fr,Sd	1	1.79	25	.45	25.00	.01	.03
Vaccinium	Lv,St,Fr,Sd	3	5.36	175	3.13	58.33	.17	7.13
Amelanchier alnifolia	Lv,St,Fr,Sd	7	12.50	270	4.82	38.57	.60	25.66
Sorbus scopulina	Fr,Sd	1	1.79	30	.54	30.00	.01	.03
Vaccinium globulare	Lv,St,Fr,Sd	20	35.71	1525	27.23	76.25	9.73	32.59
Rhamnus purshiana	Lv,St,Fr,Sd	1	1.79	30	.54	30.00	.01	.03
Total Shrub		27	48.21	2055	36.70	76.11	17.69	35.98
Equisetum	Lv,St	2	3.57	65	1.16	32.50	.04	.14
Total Sporophytes		2	3.57	65	1.16	32.50	.04	.08
Bromus	Lv,St,Fl	1	1.79	40	.71	40.00	.01	.04
Carex	Lv,St,Fr,Sd,Rt,Fl	3	5.36	230	4.11	76.67	.22	9.37
Poa	Lv,St,Fl	4	7.14	145	2.59	36.25	.18	7.88
Grass	Lv,St	1	1.79	60	1.07	60.00	.02	.06
Grass/Sedge	Lv,St	31	55.36	1795	32.05	57.90	17.74	59.45
Total Graminoids		37	66.07	2270	40.54	61.35	26.78	54.47
Forb	Lv,St	2	3.57	60	1.07	30.00	.04	.13
Angelica	Lv,St	2	3.57	50	.89	25.00	.03	.11
Ligusticum	Lv,St	1	1.79	30	.54	30.00	.01	.03
Trifolium	Lv,St	1	1.79	15	.27	15.00	.00	.02
Umbelliferae	Lv,St	1	1.79	40	.71	40.00	.01	.04
Erythronium grandiflorum	Lv,St,Rt	1	1.79	75	1.34	75.00	.02	.08
Heracleum lanatum	Lv,St,Rt,Fl	7	12.50	520	9.29	74.29	1.16	49.42
Taraxacum officinale	Lv,St	1	1.79	10	.18	10.00	.00	.01
Total Forb		14	25.00	800	14.29	57.14	3.57	7.26
Odocoileus	Hr,Bn	2	3.57	80	1.43	40.00	.05	.17
Tamiasciuris	Hr	1	1.79	10	.18	10.00	.00	.01
Total Mammal		3	5.36	90	1.61	30.00	.09	.18
Ant		9	16.07	95	1.70	10.56	.27	.91
Total Insect		9	16.07	95	1.70	10.56	.27	.55

Table 13. Continued.

ITEM	PART	FREQ	% FREQ	VOLUME	% VOLUME	% COMP	IMPT	% IMPT
Cloth		1	1.79	20	.36	20.00	.01	.02
Total Garbage		1	1.79	20	.36	20.00	.01	.01
Trap Bait	Mt,Hr	2	3.57	20	.36	10.00	.01	.54
Dirt		10	17.86	175	3.13	17.50	.56	1.87
Needles		1	1.79	10	.18	10.00	.00	.01
Total Other		11	19.64	205	3.66	18.64	.72	1.46
					100.00			100.00

Fr - Fruit, Sd - Seed, Lv - Leaves, St - Stem, Fl - Flower, Rt - Root, Hr - Hair, Bn - Bone, Mt - Meat.

Comparisons of grizzly bear food habits from scat analysis with those of black bear (next section of this report) in the Cabinet Mountains were made at the categorical and species level. Spearman's Rank Correlations (rs) of annual food habit categories between grizzly and black bear indicated very similar diets (rs = .857, p = .014). Listing of the ten most important food items from each bear species (based on percent importance) produced seven duplicates. Duplicate items in this listing were: Grass/Sedge, <u>Heracleum lanatum</u>, <u>Vaccinium globulare</u>, <u>Poa</u>, <u>Vaccinium</u>, Dirt, and Ants. Items appearing on the list for grizzlies, but not for black bears were: <u>Amelanchier alnifolia</u>, <u>Carex</u>, and <u>Odocoileus</u>. Items appearing on the list for black bears, but not for grizzlies were: <u>Equisetum</u>, <u>Trifolium</u>, and <u>Taraxacum officinale</u>. One important difference in diets of grizzly and black bears was the occurrence of <u>Erythronium grandiflorum</u> in grizzly scats, but not in black bear scats. Examination of several feeding sites of grizzly bears indicated substantial digging activity directed towards the corms of this plant though few scats could be found.

Collection of habitat use information will continue through the 1986 field season. When sample sizes are sufficient, habitat selection will be determined through comparison of use and availability data.

Black Bear

Black bear habitat use information from 1985 has not been summarized. This information will be incorporated in the 1986 progress report. A summarization of 1983-1984 data was presented in Kasworm (1985).

Food habits data from 1983-1985 scat analysis was categorically summarized by month (Figure 24). Grass and sedge were over 80 % importance in the diet during May. Forbs, largely <u>Trifolium</u>, comprised most of the remainder. Importance of grass and sedge declined to 60 % during June, while forbs increased to 35 %. <u>Trifolium</u>, <u>Heracleum</u>, and <u>Taraxacum</u> were the principle genera. Forbs increased to 40 % importance during July. Shrubs also increased to 30 % importance. <u>Trifolium</u> and <u>Heracleum</u> comprised the majority of the forb component, while <u>Vaccinium</u> was the dominant shrub. Grass and sedge were still a minor component of the diet during July. Shrubs comprised greater than 80 % importance during August, September, and October. <u>Vaccinium</u> was the principle genera during August and September. <u>Cornus</u> and <u>Sorbus</u> were minor shrub components till October when <u>Sorbus</u> supplanted <u>Vaccinium</u> as the dominant genera. Insects, in the form of ants, reached their peaks in July and October. An annual summary of all dietary items is presented in Table 14.

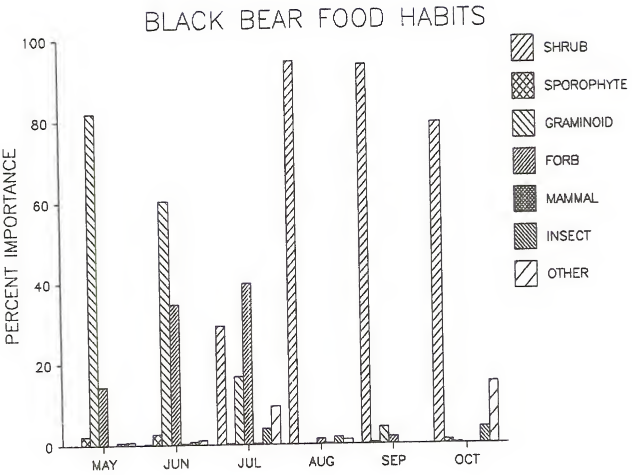

Figure 24. Relative percentages of food categories identified in black bear scats collected in the Cabinet Mountains, 1983-1985. N = 362.

Table 14. Item, part, frequency, volume, composition, and importance of foods identified by analysis of black bear scats collected in the Cabinet Mountains, 1983-1985. N = 362.

ITEM	PART	FREQ	% FREQ	VOLUME	% VOLUME	% COMP	IMPT	% IMPT
Ribes	Lv,St,Fr,Sd	1	.28	40	.11	40.00	.00	.00
Sorbus	Fr,Sd	3	.83	30	.08	10.00	.00	.00
Vaccinium	Lv,St,Fr,Sd,Fl	19	5.25	875	2.42	46.05	.13	.58
Amelanchier alnifolia	Lv,St,Fr,Sd	8	2.21	425	1.17	53.13	.03	.12
Cornus stolonifera	Lv,St,Fr,Sd	6	1.66	385	1.06	64.17	.02	.08
Crataegus douglasii	Fr,Sd	1	.28	75	.21	75.00	.00	.00
Shepherdia canadensis	Lv,St,Fr,Sd	3	.83	210	.58	70.00	.00	.02
Sorbus scopulina	Lv,St,Fr,Sd	9	2.49	735	2.03	81.67	.05	.23
Vaccinium globulare	Lv,St,Fr,Sd,Fl	52	14.36	4260	11.77	81.92	1.69	7.77
Rhamnus purshiana	Fr,Sd	1	.28	40	.11	40.00	.00	.00
Arctostaphylos uva-ursi	Lv,St,Fr,Sd	3	.83	150	.41	50.00	.00	.02
Berberis repens	Lv,St,Fr,Sd	2	.55	110	.30	55.00	.00	.01
Total Shrub		94	25.97	7335	20.26	78.03	5.26	12.90
Equisetum	Lv,St,Rt	40	11.05	2020	5.58	50.50	.62	2.84
Gtynocarpium	Lv,St	1	.28	100	.28	100.00	.00	.00
Mushroom		2	.55	130	.36	65.00	.00	.01
Total Sporophytes		43	11.88	2250	6.22	52.33	.74	1.81
Bromus	Lv,St,Fl	1	.28	100	.28	100.00	.00	.00
Carex	Lv,St,Fr,Sd,Fl	2	.55	65	.18	32.50	.00	.00
Dactylis	Lv,St,Fr,Sd	1	.28	30	.08	30.00	.00	.00
Poa	Lv,St,Fl	17	4.70	880	2.43	51.76	.11	.53
Phleum alpinum	Lv,St,Fl	2	.55	45	.12	22.50	.00	.00
Phleum pratense	Lv,St,Fl	1	.28	20	.06	20.00	.00	.00
Grass	Lv,St	2	.55	80	.22	40.00	.00	.01
Grass/Sedge	Lv,St,Rt	194	53.59	12719	35.14	65.56	18.83	86.60
Total Graminoids		216	59.67	13939	38.51	64.53	22.98	56.33
Forb	Lv,St,Rt	19	5.25	415	1.15	21.84	.06	.28
Angelica	Lv,St	14	3.87	690	1.91	49.29	.07	.31
Astragalus	Lv,St,Fr,Sd	1	.28	50	.14	50.00	.00	.00
Lathyrus	Lv,St	4	1.10	230	.64	57.50	.01	.03
Ligusticum	Lv,St	1	.28	50	.14	50.00	.00	.00
Osmorhiza	Lv,St	5	1.38	185	.51	37.00	.01	.03

Table 14. Continued.

ITEM	PART	FREQ	% FREQ	VOLUME	% VOLUME	% COMP	IMPT	% IMPT
Taraxacum	Lv,St	1	.28	20	.06	20.00	.00	.00
Trifolium	Lv,St	67	18.51	3490	9.64	52.09	1.78	7.42
Leguminosae	Lv,St	2	.55	25	.07	12.50	.00	.00
Umbelliferae	Lv,St	9	2.49	335	.93	37.22	.02	.10
Heracleum lanatum	Lv,St	38	10.50	2560	7.07	67.37	.74	3.09
Cirsium scariosum	Lv,St	1	.28	60	.17	60.00	.00	.00
Hydrophyllum capitatum	Lv,St,Fl	1	.28	30	.08	30.00	.00	.00
Taraxacum officinale	Lv,St,Fl	18	4.97	670	1.85	37.22	.09	.42
Oplopanax horridum	Lv,St,Fr,Sd	2	.55	105	.29	52.50	.00	.01
Total Forb		150	41.44	8915	24.63	59.43	10.20	25.02
Cervus	Hr,Bn	1	.28	30	.08	30.00	.00	.00
Odocoileus	Mt,Hr,Bn	12	3.31	460	1.27	38.33	.04	.19
Cattle	Hr,Bn	1	.28	75	.21	75.00	.00	.00
Ursus americanus	Hr,Bn	1	.28	40	.11	40.00	.00	.00
Small mammal	Hr,Bn	2	.55	70	.19	35.00	.00	.00
Tamiasciuris	Hr	1	.28	15	.04	15.00	.00	.00
Total Mammal		17	4.70	690	1.91	40.59	.09	.22
Ant		76	20.99	941	2.60	12.38	.55	2.27
Bee		4	1.10	50	.14	12.50	.00	.01
Total Insect		79	21.82	991	2.74	12.54	.60	1.46
Grouse	Fth	1	.28	40	.11	40.00	.00	.00
Total Birds		1	.28	40	.11	40.00	.00	.00
Wood		2	.55	20	.06	10.00	.00	.00
Trap Bait	Mt,Hr,Bn	17	4.70	525	1.45	30.88	.07	.31
Dirt		48	13.26	1105	3.05	23.02	.40	1.68
Rocks		6	1.66	103	.28	17.17	.00	.02
Needles		14	3.87	287	.79	20.50	.03	.13
Total Other		59	16.30	2040	5.64	34.58	.92	2.25
					100.00			100.00

Lv - Leaves, St - Stem, Fr - Fruit, Sd - Seed, Fl - Flower, Rt - Root, Hr - Hair, Bn - Bone, Mt - Meat, Fth - Feathers.

Management Recommendations

Grizzly Bear

The Cabinet Mountains Grizzly Bear Study has monitored three instrumented grizzlies on the Kootenai National Forest from 1983-1985. Forty percent of all radio locations have occurred within the wilderness. Of these locations, 70 percent were in nonforest components such as mixed shrub snowchutes, alder shrubfields, and sidehill parks. Fire suppression has reduced the amount of nonforest areas within the wilderness by promoting vegetation succession. Grizzly bear radio locations in the mixed shrub burn component account for only one percent of locations within wilderness, but constitute nine percent of locations in nonwilderness. All three instrumented grizzlies have spent most of the spring and summer in or near the wilderness, but have moved long distances out of the wilderness in late summer and fall to forage for berries. Both shooting incidents involving these animals have occurred during fall outside the wilderness. Over 80 percent of known grizzly mortalities in the Cabinet Mountains since 1950 have occurred outside the wilderness.

Fire policy on wilderness lands is detailed in the Cabinet Mountains Wilderness Fire Management Plan (USFS 1980). Implementation of this plan appears somewhat inconsistent. During 1985 a wilderness fire in the North Fork of the Bull River was suppressed. The decision to fight the fire was an administrative one. The fire was lightning caused and began at about 1750 m in elevation. The North Fork of the Bull River is on the west side of the Cabinet Mountains Wilderness at it's widest point. Above this area lie some of the tallest peaks in the Cabinet Range and are composed almost completely of bare rock. The decision to suppress this fire resulted in several retardant drops, the use of several helicopters to ferry people and supplies to the site, and over 100 people to put out a fire that burned less than 40 acres. If this fire would have been allowed to burn it would have undoubtedly created valuable habitat for wildlife such as the grizzly bear. Fire suppression may have the effect of reducing high quality habitat for grizzly bears and forcing them into other areas where they are more likely to come in conflict with humans. The moist habitats that are encountered in the wilderness require fairly dry conditions to support a fire. Therefore the prescription should reflect these conditions and the prescription should be followed in all but highly exceptional cases. The fire management plan should be extended to adjoining semi-primitive nonmotorized recreation allocations adjoining the wilderness (management area 2). These lands could be managed to provide a high quality, core habitat for grizzlies, reduce human conflicts, and aid in recovery of the species.

Security is another important aspect of grizzly bear habitat management. Data from this study indicate the value of the road closure system. Many of the areas used by instrumented grizzly bears outside the wilderness were behind road closures. The Bear Creek seasonal road closure provided an opportunity to test the value of this management tool, however the value of this drainage to grizzlies could be enhanced through a year long closure. This recommendation is based upon the following data:

1. Two out of six total grizzly bear captures have been made in Bear Creek.
2. Bear Creek has been one of the most heavily used drainages on the basis of radio locations.
3. All three instrumented bears have used Bear Creek as part of their core spring range.
4. On the basis of USFS mapping, Bear Creek has the greatest density of high quality spring and summer habitat components.
5. Radio locations of grizzly bears in the drainage indicate that bears move further away from the road when it opens on 1 July. Arguements that bears are following plant phenology up in elevation and therefore further away from the road are not supported by the elevation and slope of these locations before and after the opening of the road.
6. The location of the road and it's adverse affects on bear distribution, precludes some bear use of the rich riparian stream components in the drainage bottom. This area is particularly important to bears during July. Food habits data indicate that bears are consuming large amounts of forbs (mostly *Heracleum*) which are most abundant in the riparian stream component.

Improvement of habitat and security could give the existing population of grizzly bears a chance to recover through better reproduction and survival. However, a small population of a long-lived, slow reproducing species such as grizzly bears would take many years to reach levels outlined by the Grizzly Bear Recovery Plan (USFWS 1981). A second alternative would be to augment existing populations through transplants of animals. Two approaches to this alternative are available. The first would involve transplanting adults or subadults from other areas of similar habitat to the Cabinet Mountains. Success rates of transplants in the past have not been high (Thier and Sizemore 1981). However most transplants have involved adult bears with a history of problems (depredation, garbage conflicts). Transplants should involve bears from remote areas with no history of conflict. Use of particular sex and age groups could provide the best chance of success. A second approach to grizzly bear augmentation has been proposed. While this approach is experimental in nature, it is based upon success with other species. The technique of cross-fostering involves placing the young of one species with the parents of another. Cross-fostering has been successful with whooping cranes (Drewien and Bizeau 1977) and peregrine falcons (Fyfe 1977). Under this approach, grizzly bear cubs would be placed in the maternal dens of black bear females during March or April. If the female black bear would accept and raise the cub, grizzly populations could be augmented in this manner. Grizzly cubs could possibly be obtained from zoos. Fostering of orphaned black bear cubs to surrogate black bear females has proved successful (Alt and Beecham 1984, Alt 1984).

Black Bear

Examination of the black bear population data from the Cabinet Mountains has lead to the development of two ways of regulating harvest in northwest Montana. The first involves monitoring sex-specific median age of the harvest through tooth collection. Stable populations appear best maintained by managing the harvest for a female median age 5-6 years old. This is 1-2 years above the age of first estrus in females since it appears that females in this study seldom successfully raise a first litter. Proportions of females in the harvest should not exceed 40%. Maintaining the median age of the total harvest near 5 years old could also accomplish this goal as males will predominate the harvest. Proportions of subadults in the harvest should not exceed 50 %. Use of these criteria in managing black bear harvest should allow a sufficient number of females to reach reproductive age and contribute toward the population, however this scheme necessitates the continuation of the mandatory tooth collection. Timing and length of the spring and fall seasons provide opportunities to accomplish these goals.

An additional method involves allowable harvest projections. A mean annual density of 1 bear per 3.5 square km was used to estimate populations in several hunting districts adjoining the Cabinet Mountains. Recommended rates of harvest for black bear vary from 10-20% (Erickson 1965, Poelker and Hartwell 1973, Waddell and Brown 1984, Kohn 1982). A conservative rate of 10% appears most applicable to northwest Montana because age of females at first successful reproduction is 5-6 years old and average litter size is 1.4-1.6 (Jonkel and Cowan 1971, Brown et al. 1984, 1985, 1986). Females in northwestern Montana appear to mature later and have smaller average litters than black bear in Michigan (Erickson et al. 1964), Washington (Poelker and Hartwell 1973), Idaho (Reynolds and Beecham 1980), or Wisconsin (Kohn 1982). A 10% harvest rate was applied to estimated populations of black bear in several hunting districts in northwest Montana. Populations were calculated from the black bear density estimates from the Cabinet Mountains and the area of each district (Table 15). Annual variations up to 20% may be tolerable, but extended deviation from these projections may necessitate a response in harvest management. Integration of both of these methods may provide the best management of the black bear resource.

Table 15. Area, allowable harvest projections, and black bear harvest for MDFWP hunting districts 100, 101, 103, 121, and 122, 1981-1984.

	Hunting District				
	100	101	103	121	122
Area (km²)	3486	2170	4222	3155	2163
Allowable Harvest	99	62	121	90	62
1981 Harvest	26	47	44	76	84
1982 Harvest	66	27	64	82	32
1983 Harvest	118	51	82	238	55
1984 Harvest	89	16	60	144	45

District 121 is a good example. Harvest has substantially exceeded a 10% harvest level for two successive years. Examination of harvested population parameters from district 121 give inconsistant indications. Proportions of females in the harvest were below 40% during spring and fall seasons. However median age of females in the harvest was 3 years-old during both seasons. This is far below the recommended level of 5-6 years-old. Sixty-six percent of all females harvested in the district during 1985 were less than 6 years-old. During the spring season, 79% of the females harvested were less than 5 years-old. Subadults in the harvest also exceeded recommended levels and constituted 58% of the total. It is therefore recommended that the spring black bear season in district 121 be shortened to a four weeks as in district 103. It is also recommended that all black bear seasons in northwest Montana be reevaluated on the basis of these harvest criteria.

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Appendix Table 16. Monthly average temperature (C), precipitation (cm), and deviation from the long term average at the Libby Ranger Station, 1985 (U.S. Dept. of Comm. 1986).

Month	Temperature (deviation)	Precipitation (deviation)
January	-4.4 (.8)	.53 (-6.02)
February	-2.2 (-1.6)	3.07 (-.92)
March	2.8 (.5)	1.85 (-1.25)
April	8.9 (1.7)	1.12 (-1.6)
May	13.3 (1.2)	1.52 (-2.29)
June	16.1 (.2)	4.14 (.2)
July	22.2 (2.9)	.48 (-1.53)
August	17.8 (-.8)	1.65 (-2.07)
September	11.7 (-2.1)	9.30 (6.28)
October	6.1 (-1.2)	7.80 (4.04)
November	-5.0 (-4.4)	5.72 (.21)
December	-5.0 (8.2)	1.14 (-5.13)
Annual	6.7 (-.6)	38.33 (-9.07)

Appendix Table 17. Description of habitat components. Excerpted from Madel (1982).

I. Closed Timber

Closed canopy timber are those sites with tree cover greater than 60 percent, and a variable but often sparse understory. Vegetation structure and composition are highly variable as influenced by environmental conditions of a site. The tree stratum consists primarily of conifers, except occasional quaking aspen stands (*Populus tremuloides*). Common forest habitat types and phases that constitute closed timber specifically in the Cabinet range are included in Appendix I. Old growth forests of western red cedar and western hemlock typically occur in the valley bottoms. Various forest communities of western hemlock, grand fir, Douglas fir, larch, and western white pine grow along a broad mid-elevational gradient. Subalpine fir and mountain hemlock make up the upper elevation closed timber types.

II. Open timber

This component includes open timbered sites with tree canopy cover 30 to 60 percent, and a sparse grass-forb understory. Coniferous tree species dominate the overstory. This is a relatively uncommon forest community in the main Cabinets and often exists as habitat type inclusions in closed timber. Open timber is commonly found on dry exposures, limiting undergrowth to few rhizomatous species. Related habitat types include Douglas fir/pinegrass, grand fir/beargrass, and the whitebark pine/subalpine fir.

III. Timbered shrubfield

These are open canopy timbered sites with tree cover 30 to 60 percent, and a shrub dominated understory. Vegetation composition and structure again is variable, but contingent on topo-edaphic conditions of the site. The overstory consists of conifers and except for more xeric aspects, the shrub stratum is well developed. The forb layer is characteristically sparse due to limited light penetration through the tree and shrub canopies. Timbered shrubfields are extensive in the Cabinet Range and occur within the same elevational range as closed timber, although most prevalent in the subalpine zone. Component sites commonly delineated are associated with two major habitat types, subalpine fir/ beargrass/huckleberry and subalpine fir/menziesia, both of which under favorable environmental conditions produce a number of key fruiting shrub species. Subalpine fir/ beargrass /huckleberry generally occupies ridgetops and downslope extensions of southerly aspects. The shrub canopy is low and scattered, consisting primarily of globe huckleberry (*Vaccinium globulare*) and grouse whortleberry (*Vaccinium scoparium*). Beargrass (*Xerophyllum tenax*) and elk sedge (*Carex geyeri*) compose the graminoid-forb layer as either a dense matte or sparse clumps. Subalpine fir/menziesia is an extremely widespread upper elevation habitat type in the Cabinets on all aspects, merging with subalpine fir/beargrass/huckleberry on warmer slopes. Huckleberry and mountain ash (Sorbus scopulina) canopy coverage is variable, but often suppressed by more vigorous shrubs, especially menziesia. Many productive timbered shrubfields at higher elevations are the result of selective regeneration cuts and occasionally shelterwood or thinning systems where solid scarification is minimal. When ground mapping, subjective decisions are made whether or not a timbered shrubfield site classifies as a foraging component. Generally if important fruiting shrub species occupy 40 percent or more of the total shrub canopy it's identified as such and mapped. At lower elevations in the Douglas fir, grand fir, and western hemlock series, buffalo berry (Shepherdia canadensis) and service berry (Amelanchier alnifolia), two key bear food shrub species, occur separately in certain areas. Buffalo berry is common on the east side of the Cabinets predominating in moist timbered stands, while service berry occurs as a scattered shrub layer on dry benches and gradual slopes underneath a partial canopy.

IV. Shrubfields

As a general class, shrubfields are shrub dominated sites with a sparse tree cover of 30 percent or less. It's the most widespread nonforested habitat component occurring in the Cabinet Range. Species composition and vegetation structure are extremely variable, creating a number of diverse shrub communities. Shrubfields alternately produce an abundance of key bear foods throughout the growing season, which documented grizzly sign and observations have correlated. Because of its importance as a foraging component, shrubfields have been separated into three distinct shrubfield types: Mixed shrubfields, which are further identified by site history; alder (Alnus) shrubfields; huckleberry (Vaccinium) shrubfields. Shrubfield types and subtypes are treated and mapped as separate habitat components.

A. Mixed shrub-species shrubfields

Includes shrubfields with a co-dominanat shrub stratum and graminoid-forb understory. Topo-edaphic conditions and habitat disturbance patterns and site influence shrubfield composition. Mixed shrubfields are long-lived seral communities and are the result of avalanches, wildfires, slope seepage, or various timber harvest prescriptions.

1. Mixed shrubfield/snowchute: These are shrub dominated communities resulting from, and often maintained by, sudden slides on steep timbered drainages, frequently originating on open slabrock areas and running downslope to the creek bottoms. These sites exist as narrow-linear openings in the forest canopy, or as extensive, broad chutes covering an entire mid-montane slope.

Shrubfield/snowchute communities are vertically stratified, with a tall deciduous shrub canopy (2-3 meters), an understory shrub stratum (2 meters or less), and a variable layer of forbs and perennial graminoids. Dominanat woody associates in the high shrub strata include mountain maple (Acer glabrum), alder (Alnus sinuata), mountain ash, and willow (Salix sp.). Each species is more prevalent on certain sites than others. Lower shrubs are thimbleberry (Rubus parviflorus), elderberry (Sambucus racemosa), and snowberry (Symphoricarpos albus). The stems of maple, alder, and ash lie prostrate at the base with the lower limbs directed downslope, the tips springing erect after heavy snow cover melts in the spring (Daubenmire 1968). This morphological adption allows tall shrubs to survive occasional heavy snow slides, while regenerating conifers are lost in avalanch paths. The herbaceous layer is often well developed and abundant in key bear foods, particularly in the lower portions of snowchutes that occur in the more mesic western hemlock/beadlily, subalpine fir/beadlily and subalpine fir/menziesia habitat types. Phenological development of grasses and forbs is relatively early on south facing aspects prior to and during the leafing out of shrubs. Forbs continue to emerge and grow through the summer months on cooler slopes and in many small canopy openings. The more common forbs include lady fern (Athyrium felix-femina), bracken fern (Pteridium aquilinium), glacier lily (Erythronium grandiflorum), spring beauty (Claytonia lanceolata), starry solomon's seal (Smilacina stellata), twisted stalk (Streptopus amplexifolius), false hellebore (Veratrum virde), meadow rue (Thalictrum occidentale), angelica (Angelica dawsonii), and cow parsnip (Heracleum lanatum).

2. Mixed Shrubfield/Cutting Unit: These are open sites which have been harvested and are currently dominated by a shrub canopy. Community structure and composition is highly variable depending on timber harvest method, site treatment, habitat type-typographic position, and time span since site disturbance. A large portion of the harvested sites along the east face of the main Cabinet Range occur in the western hemlock/beadlily habitat type, a relatively closed-timber zone low in bear foods productivity. The understory vegetation prior to tree canopy removal either has few existing bear foods or is altogether depauperate, providing only a minor rhizome-root stock from which key fruiting shrubs and forbs can resprout. Clearcuts in the western hemlock types and other sites that have been moderately scarified are quickly invaded by opportunistic species through seed dispersal or seeds retained in the soil-duff. Alder, red raspberry (Rubus idaeus), thimbleberry (Rubus parviflorus), sticky currant (Ribes viscosissimum), elderberry, and ceanothus (Ceanonthus spp.) are common shrubs growing in disturbed units. Black cottonwood seedlings (Populus trichocarpa) are common in low to mid-elevation clearcuts. Associated opportunistic forbs include fireweed (Epilobium angustifolium), pearly everlasting (Anaphalis margariticae), goldenrod (Solidago spp.), and aster (Aster spp.). on severely scarified soils, graminoids may be one of the few plant groups to occur in abundance for a number of years following disturbance.

Harvested units not scarified and /or those that have been broadcast burned often regenerate with a more vigorous shrub canopy composed of species typically found in adjacent undisturbed timbered stands. Key fruiting shrub species that vegetatively reproduce, resprout quickly from rhizomes or root crowns and often dominate the shrub stratum for a number of years following timber harvest. Shrub response is most conspicuous in the forested subalpine fir zone. In the lower, mesic subalpine fir/beadlily and menziesia habitat types, unscarified clearcuts develop a dense mixture of shrubs including mountain ash, globe huckleberry, menziesia, thimbleberry, Utah honeysuckle (Lonicera utahensis), and willow (Salix spp.). Units that have been burned in the upper subalpine fir/ beargrass h.t. on south to west aspects are dominated by Vaccinium spp., and are mapped as huckleberry shrubfields (See component definition). Zager (1980) provides an excellent correlation between various post harvest treatments and vegetation response in relationship to grizzly bear foods.

3. Mixed Shrubfield/Burn: These are mixed shrubfield communities that have developed following wildfire. Burns in general are uncommon in the Cabinet Mountains due to effective fire suppression during the past 40-70 years. Where mixed shrubfield/burns do occur they are restricted to xeric sites, especially steep southern exposures, which were originally ignited by lightning and then burned off quickly. Small spot burns are evident at the mouths of a number of drainages along the east face of the Cabinets. The entire south side of Berray Mountain, located above the East Fork Bull River exit, occupies one of the largest recent shrubfield burns. Certain sites have been noted as being environmentally positioned in fire prone areas, and the resulting seral shrubfields are maintained in a productive state.

The shrub stratum is 1.5 to 2.5 m in height and horizontally scattered, with exposed rocky shelves and a sparse bunchgrass understory. Serviceberry, willow, mountain maple, and mountain ash are the dominate shrub species on these burned sites. Unfortunately, a majority of the existing mixed shrubfield/burns are in a decadent condition, with minimal annual berry crops. Recent burns show invigorated shrub growth and produce large quantities of serviceberry, ash, and occasionally huckleberry fruit (Refer to Huckleberry shrubfield pp 10), which grizzlies feed on extensively in the late summer and fall. These shrubfields are also of high value to bears because they are often isolated form human disturbance, and provide an irregular timbered edge for efficient food/cover utilization.

B. Alder Shrubfield

This is a tall shrub community dominated by alder, almost to the exclusion of all other shrub species. It may develop as a result of snow movement, wildfire, or timber harvest but is often restricted to mesic sites, especially in seepage areas on steep slopes with shallow rocky soils. Alder shrubfields are maintained in this seral condition for many years by the repeated disturbance of snowslides and intense competition form high shrubs and forbs. This component is locally abundant in the West Cabinets in the lower subalpine fir zone, while in the East Cabinet Range it's restricted to higher elevations and typically associated with drainage forbfields at the base of cirque headwalls.

The shrub stratum is composed of a dominant vertical alder layer, averaging 4 m in height, and a herbaceous understory. Individual shrubs sprout numerous stems making stands extremely dense and almost impenetrable. Utah honeysuckle, mountain ash, and thimbleberry are minor shrub species that occasionally become established in small canopy openings. Surprisingly, even under low light conditions, the water saturated soils produce large quantities of lush forbs and graminoids from late May through the summer months depending on aspect and elevation of the site. Common species include glacier lily, spring beauty, montia (Montia spp.), sweet cicely, angelica, false hellebore, arrowleaf groundsel (Senecio triangularis), monkshood (Aconitum columianum), and a variable fern canopy composed of bracken and lady fern.

C. Huckleberry Shrubfields

Seral shrubfields dominated by Vaccinium species are located throughout the Cabinet Range, but are normally restricted to ridgetops and mid to high elevation south/west facing slopes where subalpine fir/beargrass habitat types occur. This open, low structured shrubfield is created and at times maintained by wildfire, although timber harvest and/or snowslides may have the same developmental effect. Due to effective fire suppression in primitive areas, the majority of huckleberry fields are transitional and progressing towards timbered shrubfield communities. Old burns exist as small two to ten acre openings along ridgelines where environmental conditions are harsh, with small regenerating conifers slowly encroaching on these sites. More recent burns support extensive stands of huckleberry, which are vigorous in growth and fruit production (an excellent example being the burned over basin of the East Fork McKay Cr.).

Vegetation composition is similar to that found in the climax subalpine fir/beargrass/globe huckleberry understory but typically more developed. The shrub canopy is low, 1 m or less, and dominated by globe huckleberry and grouse whortleberry, which grow in association with beargrass (a rhizomatous forb that occurs in dense clumps underneath and around shrubs. Minor species such as mountain lover (Pachistima myrsinites), mountain ash, and menziesia are localized and scattered in the shrub canopy. The few common forbs and grasses include arnica (Arnica latifolia), yarrow (Achilles millifolium), and elk sedge, in the southern portions of the East Cabinets, grouse whortleberry forms dense low lying mats are dry gravelly ridges.

Timber harvested units in the subalpine fir types show variable shrub-forb responses. Clearcuts not scarified, especially those broadcast burned or on southern aspects have responded favorably, resulting in a thick and productive huckleberry stratum.

V. Riparian Streambottom

Low to high gradient streambottom habitat is identified by riparian plant associations which reflect the influence of increased soil moisture along hydrologically active zones. Considerable variation in vegetation composition, structure, and even between plant communities exist, with some sites being open, some timbered, and still others forming a diverse mosaic of small irregular meadows, shrubfields, and forested blocks. The development and extent of vegetatively diverse riparian habitat is strongly dependent on timber canopy closure and stream channel gradient. Creek and river bottoms of relatively level topography have high water tables, causing water backup and stream meandering. These riparian zones are broad, heterogenous, and extremely productive. The Bull River Valley, which dissects the East and West Cabinets is excellent low gradient habitat, composed of black cottonwood, spruce (Picea spp), and cedar timber types intersperced by small wet meadows, large wet hay meadows, forb dominated streambanks, and riparian shrubfields. As discussed previously, a majority of streambottoms occur in the western red cedar/devil's club or western hemlock/beadlily habitat types, and have a closed forest canopy with a limited understory. In this climax state, such sites are of little value as foraging habitat. Where the overstory has been removed naturally or artificially by wildfire, snowslides, or past spruce-salvage operations, the undergrowth has responded favorably and developed a lush graminoid-forb stratum. Old and recent beaver activity has also had the same ecological effect in many Cabinet drainages, producing hundreds of acres of high quality riparian habitat and adding diversity to already prolific low gradient stretches. Riparian zones along high gradient streambottoms are narrowly restricted to streambanks with a visible and abrupt transition with adjacent well drained forest types. Regardless of the gradient, most open stream corridors are dominated by herbaceous meadows and riparian shrubfields. Common shrubs include alder, red-osier dogwood (Cornus stonifera), willow, twin-berry (Lonicera involucrata), and buckthorn (Rhamnus alnifolia). Forbs and graminoids are extremely abundant, often forming a layer of 1-2 meters tall consisting of fern species (Polypodiaceae, horsetails (Equisetum spp), licorice root (Ligusticum canbyi), angelica, cow parsnip, meadow rue, monkshood, etc.

VI. Marsh

Marshes are open sedge (Cyperaceae) dominated communities that are perenially moist, often containing standing or slow moving water, and located in slightly concave depressions along level, poorly drained valley bottoms or in u-shaped stream channels. Marshes exist as either unbroken monotypic communities or as infringing zones around open shallow lakes and ponds. Ecotone boundaries are well defined and commonly bordered by continuous western hemlock forest, occasionally having a narrow spirea shrub ring (Spirea douglasii) on slightly better drained soils. Marsh vegetation forms .5-1 m sedge layer composed of

Carex spp. and bullrushes (*Scirpus*). Alder may grow as scattered clumps through the community. Few forbs are found in association with marsh habitat.

VII. Wet Meadow

These are mesic graminoid dominated communities located along flat low elevation watersheds, and in slightly concave depressions of varying sizes at high elevations. Low elevation wet meadows in the Cabinets are limited to wide river and creek bottoms, and are delineated as portions of surrounding riparian habitat. Most of these sites have been cleared for haying purposes and are dominated by domestic grasses and various sedges. High elevation wet meadows are distinct physiographic climax communities that commonly occur in upper basins throughout the East and West Cabinets. Persistent snow retention and cool temperatures retard phenological development of high meadows until mid-late July, and drainage from snow fields and vertical basin headwalls tends to keep soils well saturated through the growing season.

Floristic composition varies between and within open meadows, forming distinct graminoid associations depending on slight differences in soil moisture. Sites with standing or running water typically have short uniform sedge communities composed of sedges and rushes, with horsetail shoots intermixed. On slightly drier soils, dense stands of bluejoint reedgrass (*Calamagrostis canadensis*) occur as irregular islands between sedge groups, or as exclusive "Caca" meadows with seed stalks reaching up to 2 m in height. Forb growth is marginal, with sitka valerian (*Valeriana sitchensis*), arrowleaf groundsel, and licorice root commonly encountered along perimeter ecotones. Alder and willow shrub stringers occasionally grow through and around certain meadow communities, while low lying mats of alpine laurel (*Kalmia polifolia*) and mountain heather (*Cassiope mertensiana*) are associated with other sites.

VIII. Dry Meadows

These are open graminoid dominated sites with level or gradual sloping topography, most commonly occurring at low elevations. Dry meadow openings are created through timber harvest operations, livestock grazing and wildfire. Soils are ephemerally moist in the spring but dry out rapidly later on and remain in a relatively xeric condition through the summer and fall. A number of large, heavily scarified clearcuts along the east side of the East Cabinet Range and in the Bull River Valley are dominated by scattered opportunistic graminoid-forb communities. On adjacent private lands exist cleared meadows that are maintained by livestock grazing and are composed primarily of domestic perennial grasses and various forbs. Dry meadows also develop as short-lived seral communities following intensive fire on certain sites. In 1979, approximately 1700 acres of closed hemlock and Douglas fir forest was burned in the Granite-Deep Creek area, and has since then developed a robust layer of grasses and fire adapted forbs. Other disturbed sites, including roads and old skid trails that have seeded in well with introduced grasses timothy (*Phleum pratense*), and orchard grass (*Dactylis glomerata*)) were considered as dry meadow components due to the similarity of plant associations. Dry Meadow vegetation composition is variable depending on the severity of soil disturbance and topographic position of the site, and unless maintained, most sites slowly reestablish shrub or regenerating conifer canopies.

IX. Drainage Forbfields

These are open high elevation herbaceous fields with gradual to steep topography. Forbfields exist as small irregular components where sufficient soils have accumulated at the base of rock headwalls, along moraine deposits, or near alpine ridgetops with semipermanent snowfields. Snowmelt draining off rock and percolating through shallow stony soils provides an endless supply of water through the growing season. Of the mesic components delineated, drainage fields are latest in phenological development, a number of forb species continuing to grow and flower into September and October. The forb layer may either be low, near ground level or .5 M tall and very dense. Dominant plant species growing on most sites are glacier lily, arrow leaf groundsel, angelica, sitka valerian, lousewort (*Pedicularis* spp.), sky-pilot (*Polemonium pulcherrimum*), and columbine (*Aquilegia flavescens*). Forbfields are often associated with alder shrubfields and talus, forming a component mosaic over upper basin slopes.

X. Snowchutes

Open forb dominated snowchutes are the result of recent massive snow slides that remove both tree and shrub cover. The majority of existing avalanche paths in the Cabinet Mountains are dominated by tall shrub communities (mixed shrubfiels/snowchute and alder shrubfield) having been maintained over thousands of years. Few large slides are released in timbered zones annually, with only five snowchutes documented in the East Cabinet Range over the past five years (A. Bratkovich 1982 pers. comm.) Thus snowchutes in early successional herbaceous stages are uncommon, and govern a site for a few short growing seasons prior to shrubfield development. Where this component does exist, it commonly occurs as long narrow chutes or small 2-10 acre patches at the toe ends of shrubfield/snowchutes. The lush forb stratum is similar in composition to that growing under the shrubfield canopy, but considerably more robust and dense in structure. Succulent key bear foods are abundant and include glacier lily, spring beauty, angelica, cow parsnip and false hellebore.

XI. Sidehill Park Habitat

Sidehill parks are open graminoid and/or forb dominated communities on moderate to steep slopes from mid-montane to high elevations. They are the result of local topographic, edaphic, and climatic influences, which in combination limit tree growth and form parks of variable floristic composition. Sidehill parks are distinguished from meadow habitat by being inclined with convex topography, and having dissimilar plant communities.

Sidehill park habitat is subdivided and delineated as two component types based on differences in vegetative composition and structure.

A. Graminoid Sidehill Parks

Open graminoid parks are located throughout the Cabinet Range and are variable in structure and size depending on local environmental factors. Where shallow soil conditions exist over slabrock or in association with exposed benches of bedrock sidehill park openings are relatively small and irregularly shaped. These are found in all aspects in the Douglas fir and subalpine fir zones along high ridges and upper slopes, and may remain pereniально moist, or more commonly become dry through the summer months. Ecotone boundaries on such sites are often abrupt with shrubfield or timber communities, forming a diverse mosaic of vegetation types. Xerophytic parks are dominated by bunchgrasses, particularly bluebunch wheatgrass (Agropyron spicatum) and Idaho fescue (Festuca idahoensis), with a number of forb species emerging and flowering from storage organs early in the season while ample soil moisture exists. Biscuit root, glacier lily, spring beauty, buckwheat-umbrella plant (Eriogonum flavum, E. heracloides), alumroot (Heuchera cylindrica), and indian paintbrush (Castilleja spp.) are common sidehill park forbs. Sedges are more prevalent on sites that receive slow but continuous drainage from higher terrain and often occur as terraced benches, occasionally approaching a wet meadow condition (and should be classified as such).

In certain drainages at somewhat lower elevations in the Douglas Fir type, large graminoid parklands occur over well developed soils on south and southwestern slopes. Here the topography channels air flow so that strong winds both remove protective snowpack of southerly slopes and dry soils out deeply later in the summer months (Daubenmire 1968). Areas adjacent to the East Cabinet Range, including tributary drainages of the Fisher River such as Horse Mtn.-Miller Creek and the lower Silverbutte, but also the lower west flanks of Lake Creek exhibit these topo-edaphic climax communities. Vegetation composition is similar to that of dry graminoid-slabrock parks but more extensive and often more productive. Bunchgrasses and other grass-sedge species are vigorous in growth. Additional forbs commonly growing in lower sidehill parks to those previously mentioned include balsamroot (Balsamorhiza sagittata), lupine (Lupinus spp), yarrow, penstemon (Penstemon spp), and pussy-toes (Antennaria racemosa). Douglas fir and ponderosa pine (Pinus ponderosa) are frequently scattered among park openings, both as large mature conifers and seedlings.

B. Beargrass Sidehill Parks

Beargrass, or Indian basket-grass is a grass-like perennial forb that grows in dense rhizomatous clumps. It's found in association with a number of forest habitat communities, and at higher elevations dominates and constitutes certain sidehill park habitat. Beargrass parks are generally located on shallow, well drained soils of south to westerly aspects, existing as large homogenous openings along upper slopes and ridges, or as small irregular patches on basin headwalls adjacent to lakes, wet meadows, and shrubfields. Ecotone edges with subalpine timber are gradual, with conifer seedlings often scattered through park components. Ground coverage exhibited by beargrass varies depending upon soil development and moisture conditions of the site. Some parks may from dense fields of beargrass to the near exclusion of other vegetation. Concomitant plant species include graminoids, glacier lily, alpine knotweed (Polygonum phytolaccaefolium), penstemon, and hawkweed (Hieracium spp). Huckleberry grouse whortleberry, mountain lover, and mountain ash may be present on certain sites.

XII. Slabrock

Slabrock habitat characterizes open sites of exposed blocks of scoured-glaciated bedrock, occurring at high elevations on steep to gentle topography. As previously defined (See Graminoid Sidehill Parks), graminoid dominated communities are closely associated with slabrock where adequate soil development over and between joint blocks support vegetative growth. Other components, such as wet meadows and huckleberry shrubfields are also located as variable sized strips following soil that has accumulated in depressions. In subalpine basins and on ridgetops, slabrock community mosaics are extensive across gradual convex terrain, providing a high degree of habitat diversity, isolation, and abundance of key bear foods. The upper basins of Ross Creek in the West Cabinets and the numerous small cirques around the Chicago-St. Paul Peaks area in the East Cabinets exhibit large slabrock complexes.

Because of the difficulty in separating and mapping slabrock habitat as discrete units, sites are delineated by the associated vegetative component and secondarily identified as slabrock base (i.e. graminoid sidehill park/slabrock). Slabrock alone has little to no vegetative cover. Seasonal use and importance of slabrock mosaics are determined from the existing vegetation type and development of key bear food.

XIII. Talus/Scree/Rock

This component represents very steep to moderate slopes and benches of loose rock fragments of variable size. Unstable scree and talus slopes occur over a broad elevational range with little soil development. Fields of large angular blocks of rock are common in small cirque basins on gradual slopes and benches. Vegetation is sparse, but rock fields often border and drain into wet meadows, drainage forbfields, and alder shrubfields. These and large fragment talus slopes are used as feeding and reproduction habitat by a number of small mammals that grizzly may occasionally prey upon.

Table 18. Capture date, sex, age, ear tag, weight, location, hunting district, and color of black bears captured in the Cabinet Mountains, 1983-1985.

Date	Sex	Age	Ear tag Color	Ear Tag Number	Weight (kg)	Location	Hunting District	Hide Color
50683	F	4	red,red	84,85	59	w.fisher	103	brown
50783	M	15	red,red	86,87	*93	w.fisher	103	brown
51183	M	5	red,red	88,89	84	ramsey	103	brown
51383	M	12	red,red	90,91	132	deep	103	black
51583	F	7	red,red	92,93	*43	bramlet	103	black
51583	M	7	red,red	94,95	*107	w.fisher	103	brown
51683	M	13	red,red	98,351	*95	deep	103	black
51683	M	2	red,red	96,97	41	ramsey	103	black
51883	F	4	red,red	352,353	48	w.fisher	103	brown
51983	F	2	red,red	354,355	32	bramlet	103	black
51983	F	6	red,red	356,357	55	w.fisher	103	black
52083	M	6	red,red	358,359	80	bear	103	brown
52183	M	2	red,red	360,361	59	snowshoe	103	black
52383	M	9	red,red	261,262	*86	snowshoe	103	black
52383	M	10	red,red	263,264	*107	bear	103	brown
52583	F	3	red,red	362,363	41	bull	121	brown
52883	M	4	red,red	364,365	66	bull	121	brown
52983	M	10	red,red	366,367	*95	snake	121	black
52983	M	3	red,red	368,369	*34	s.f.bull	121	black
52983	M	3	red,red	370,371	*43	bull	121	brown
60283	F	3	red,red	372,373	50	s.f.bull	121	brown
60283	M	10	red,red	265,266	*91	bear	103	brown
60383	M	5	red,red	374,375	57	s.f.bull	121	black
60483	F	3	red,red	272,273	39	bull	121	brown
60483	M	4	red,red	267,268	52	libby	103	black
60583	M	9	red,red	269,270	*82	cable	103	brown
60783	M	6	red,red	274,275	*59	standard	103	black
61083	M	5	red,red	14,15	59	w.fisher	103	black
61583	M	7	red,red	257,258	100	libby	103	black
61683	M	5	red,red	259,260	*50	w.fisher	103	black
61783	M	12	red,red	253,254	*91	libby	103	black
61783	F	6	red,red	255,256	50	libby	103	brown
62183	M	8	red,red	651,652	*89	bear	103	black

Table 18. Continued.

Date	Sex	Age	Ear tag Color	Ear Tag Number	Weight (kg)	Location	Hunting District	Hide Color
62383	M	1	red,red	654,664 653,663	*11	libby	103	brown
62383	M	4	red,red	655,656	55	bear	103	black
62483	M	7	red,red	657,658	*86	bear	103	black
62783	M	2	red,red	659,660	*30	libby	103	black
62983	F	11	red,red	661,662	*20	ramsey	103	black
70483	F	5	red,red	665,666	*23	ramsey	103	black
70483	M	6	red,red	667,668	*68	ramsey	103	brown
43084	M	3	red,red	646,647	50	swamp	121	black
50584	M	3	red,red	628,629	48	bull	121	black
50984	F	4	red,red	372,373	43	bull	121	brown
51084	M	3	red,red	626,627	43	bull	121	black
51084	M	8	red,red	648,649	100	blue	121	brown
51184	M	15	red,red	630,631	95	e.f.bull	121	brown
51184	M	6	red,red	650,669	82	blue	121	brown
51484	M	7	red,red	632,633	118	dry	121	black
51584	M	7	red,red	672,673	77	swamp	121	brown
51584	M	6	red,red	634,635	111	bull	121	black
51584	M	7	red,red	636,637	73	chippewa	121	black
51784	M	6	red,red	638,639	68	bull	121	black
51984	M	16	red,red	640,641	*91	e.f.bull	121	black
52084	M	3	red,red	642,643	32	gin	121	black
52184	M	4	red,red	670,671	61	blue	121	black
52184	M	5	red,red	717,718	50	e.f.bull	121	brown
52184	M	3	red,red	644,645	43	s.f.bull	121	brown
52284	M	8	red,red	719,720	*66	e.f.bull	121	brown
52384	F	2	red,red	721,722	21	n.f.bull	121	black
52484	M	6	red,red	676,677	100	bull	121	black
52584	M	9	red,red	678,679	102	copper	121	black
52684	M	3	red,red	680,681	34	n.f.bull	121	black
52684	M	10	red,red	682,683	109	s.f.bull	121	brown
52684	M	3	red,red	684,685	43	chippewa	121	brown
52684	F	15	red,red	686,687	48	copper	121	black
52684	F	1	red,red	723,724	19	copper	121	brown

Table 18. Continued.

Date	Sex	Age	Ear tag Color	Ear Tag Number	Weight (kg)	Location	Hunting District	Hide Color
52784	M	12	red,red	674,675	*139	blue	121	brown
52884	F	21	red,red	701,702	43	e.f.rock	121	brown
52884	F	12	red,red	725,750	61	dry	121	brown
52984	F	6	red,red	726,727	48	swamp	121	brown
53084	F	6	red,red	728,729	45	e.f.bull	121	brown
53184	M	7	red,red	705,706	84	swamp	121	brown
53184	M	3	red,red	732,733	30	e.f.bull	121	black
53184	M	3	red,red	730,731	34	bull	121	brown
60684	M	2	red,red	703,704	27	e.f.rock	121	black
60784	M	2	red,red	709,710	36	swamp	121	brown
60884	M	11	red,red	265,266	91	bear	103	brown
61084	M	3	red,red	707,708	32	e.f.rock	121	black
61084	M	3	red,red	711,712	*23	e.f.rock	121	brown
61084	M	11	red,red	734,735	114	libby	103	black
61284	M	1	red,red	715,716	11	e.f.bull	121	black
61284	M	3	red,red	713,714	30	snake	121	black
61284	F	6	red,red	751,752	43	trapper	103	black
61384	F	14	red,red	753,754	66	libby	103	brown
61484	M	10	red,red	269,270	98	poorman	103	brown
61584	M	11	red,red	755,756	89	trapper	103	black
61884	F	12	red,red	757,758	*57	poorman	103	black
61884	F	7	red,red	736,737	55	w.f.rock	121	brown
61884	F	5	red,red	759,760	*50	trapper	103	black
61984	F	3	red,red	761,762	*30	poorman	103	brown
62084	M	10	red,red	738,739	98	snake	121	black
62184	F	8	red,red	765,766	68	bear	103	black
62284	M	6	red,red	259,260	70	w.fisher	103	black
62284	F	15	red,red	740,741	66	e.f.rock	121	black
62484	M	16	red,red	763,764	102	trapper	103	black
62584	M	3	red,red	795,796	25	poorman	103	black
62584	M	3	red,red	659,660	45	e.f.rock	121	black
62884	F	9	red,red	799,800	59	trapper	103	black
70184	M	5	red,red	14,15	57	e.f.rock	121	black
70284	F	11	red,red	767,768	52	trapper	103	black

Table 18. Continued.

Date	Sex	Age	Ear tag Color	Ear Tag Number	Weight (kg)	Location	Hunting District	Hide Color
70484	M	1	red,red	742,743	11	w.f.rock	121	brown
90984	M	22	red,red	769,770	*134	grouse	121	black
92784	F	7	red,red	744,745	61	w.fisher	103	brown
100184	M	2	red,red	746,747	43	w.fisher	103	brown
100384	M	3	red,red	748,749	61	w.fisher	103	black
100584	M	7	red,red	274,275	100	w.fisher	103	black
100584	M	2	red,red	771,772	48	w.fisher	103	black
100984	M	4	red,red	777,778	66	silverbutte	103	black
101184	M	2	red,red	775,776	50	w.fisher	103	brown
101184	F	11	red,red	779,780	82	swamp	121	brown
101584	M	8	red,red	94,95	118	w.fisher	103	brown
50985	M	7	red,red	88,89	95	libby	103	brown
51085	M	16	red,red	630,631	114	bear	103	brown
51085	M	9	red,red	257,258	102	libby	103	black
51285	M	4	red,red	732,733	45	libby	103	black
51585	F	4	wht,wht	1,1	41	ramsey	103	black
51685	F	13	red,red	757,758	59	ramsey	103	black
51685	M	12	red,red	265,266	100	cherry	103	brown
51685	M	9	red,red	657,658	130	bear	103	black
51685	F	8	wht,wht	11,11	64	bear	103	black
51985	F	5	wht,wht	2,2	50	howard	103	brown
52085	M	7	wht,wht	3,3	82	trapper	103	black
52385	M	6	red,red	655,656	57	bear	103	black
52385	F	4	wht,wht	12,12	45	snowshoe	103	black
52285	F	7	red,red	751,752	45	trapper	103	black
52485	M	17	red,wht	87,4	127	w.fisher	103	brown
52485	M	11	red,red	261,262	95	snowshoe	103	black
52485	F	10	wht,wht	13,13	70	cherry	103	brown
52685	F	7	wht,wht	5,5	52	ramsey	103	black
52785	M	10	red,red	651,652	98	bear	103	black
52785	M	8	red,red	274,275	80	howard	103	black
60185	M	4	wht,wht	6,6	39	libby	103	brown
60385	F	4	red,red	761,762	41	poorman	103	brown
60685	F	7	wht,wht	7,7	59	libby	103	black

Table 18. Continued.

Date	Sex	Age	Ear tag Color	Ear Tag Number	Weight (kg)	Location	Hunting District	Hide Color
60885	M	17	red,wht	764,8	111	trapper	103	black
60985	M	15	red,red	98,351	105	snowshoe	103	black
61085	M	4	red,red	646,647	52	trapper	103	black
61085	M	7	wht,wht	9,9	57	trapper	103	brown
61685	M	4	red,red	795,796	*36	w.fisher	103	black
61785	M	5	red,red	777,778	57	trapper	103	black
62085	M	4	wht,wht	21,21	55	ramsey	103	black
62185	F	3	wht,wht	15,15	34	cable	103	brown
62185	M	9	red,red	94,95	102	w.fisher	103	brown
62285	F	14	wht,wht	10,10	61	trapper	103	black
62685	M	7	red,red	259,260	77	w.fisher	103	black
62785	M	7	wht,wht	16,16	89	cherry	103	black
62985	F	9	wht,wht	17,17	59	snowshoe	103	brown
62985	M	11	red,red	269,270	100	ramsey	103	brown
62985	F	12	wht,wht	22,22	70	w.fisher	103	black
70785	F	3	wht,wht	23,23	30	libby	103	brown
71085	F	12	wht,wht	24,24	50	w.fisher	103	black
71285	M	4	red,red	680,681	52	cable	103	black
71285	F	2	wht,wht	25,25	18	ramsey	103	black
71285	F	11	wht,wht	26,26	55	libby	103	brown
71485	M	4	wht,wht	27,27	43	w.fisher	103	black
71585	F	8	red,red	744,745	48	w.fisher	103	brown
71685	M	12	wht,wht	28,28	102	w.fisher	103	black
120985	M	.5	wht,wht	18,18	17	doak	100	brown

* Weight - Estimate based on regression of girth and length.

Appendix Table 19. Key to codes of habitat types.

Code	Habitat Type
001	Rock
010	Scree
210	Psuedotsuga menziesii / Agropyron spicatum
250	Pseudotsuga menziesii / Vaccinium caespitosum
260	Pseudotsuga menziesii / Physocarpus malvaceus
290	Psuedotsuga menziesii / Linnaea borealis
320	Pseudotsuga menziesii / Calamagrostis rubescens
510	Abies grandis / Xerophyllum tenax
520	Abies grandis / Clintonia uniflora
530	Thuja plicata / Clintonia uniflora
570	Tsuga heterophylla / Clintonia uniflora
620	Abies lasiocarpa / Clintonia uniflora
670	Abies lasiocarpa / Menziesia ferruginea
680	Tsuga mertensiana / Menziesia ferruginea
690	Abies lasiocarpa / Xerophyllum tenax
710	Tsuga mertensiana / Xerophyllum tenax
730	Abies lasiocarpa / Vaccinium scoparium
830	Abies lasiocarpa / Luzula hitchcockii
850	Pinus albicaulis / Abies lasiocarpa
860	Larix lyallii / Abies lasiocarpa

Appendix Table 20. Key to codes for habitat components.

Code	Habitat Component
1	Closed Timber
2	Open Timber
3	Timbered Shrubfield
4	Mixed Shrubfield Snowchute
5	Mixed Shrubfield Cutting Unit
6	Mixed Shrubfield Burn
7	Alder Shrubfield
8	Huckleberry Shrubfield
9	Riparian Streambottom
13	Drainage Forbfield
15	Graminoid Sidehill Park
16	Beargrass Sidehill Park

Appendix Table 21. Key to codes for landtypes.

Code	Landtype
101	Recent Alluvium
201	Rocky, Very Steep, Southerly
251	Rocky, Very Steep, Northerly
252	Very Steep, Northerly
360	Strongly Scoured Lands, 50% Rock
381	Shallow Incised Parallel Drainages
401	Alpine Glacial Walls
403	Alpine Cirque Headwalls
404	Deep Alpine Till on Mountain Slopes
405	Strongly Frost-Churned Alpine Ridges
406	Frost-Churned Alpine Slopes
407	Deep Alpine Valley Till, Concave
408	Very Steep Glaciated Spurs
552	Deep Residual Lands
555	Residual Ridge Tops and Noses, Northerly

Appendix Table 22. Key to codes for allocations.

Code	Allocation
2	Semi-primitive, Nonmotorized Recreation
7	Existing Wilderness
8	Designated Wilderness
10	Big Game Winter Range
12	Big Game Summer Range / Timber
13	Old-growth Forest
14	Grizzly / Timber
15	Timber Optimization
18	Timber / Regeneration Problems
19	Timber / Steep Slopes
29	Roadless Recreation
99	Private Ownership