

YELLOWSTONE GRIZZLY BEAR INVESTIGATIONS

ANNUAL REPORT OF THE INTERAGENCY STUDY TEAM 1975

National Park Service
U.S. Forest Service
Montana Fish and Game Department
U.S. Fish and Wildlife Service
Idaho Fish and Game Department
Wyoming Game and Fish Commission

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STUDY TEAM - 1975

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ABSTRACT

The Interagency Grizzly Bear Study Team provides immediate and long range information needed by various management agencies on the grizzly bear (*Ursus arcotos horribilis*). The study area centers around Yellowstone National Park and includes portions of Idaho, Montana, and Wyoming. Data on grizzly bear distribution, numbers, and age ratios were gathered through a monitoring system, direct observation, and with the aid of time lapse cameras. Radio telemetry techniques were used to determine bear movements and habitat use. Habitat was evaluated by inventory of vegetation resources on selected areas of known or suspected grizzly bear occurrence.

It was apparent that bears were not using open areas to the extent that they had in previous years. Only 36 grizzly bears were sighted during fixed wing flights compared to 60 in 1973 and 125 in 1974. Four sows with cubs and three sows with yearlings were observed. No grizzly bear mortalities were recorded in 1975. Distribution maps were brought up to date with 128 sightings from all sources. Habitat use as reflected by radio locations indicated a high use of timbered areas during 1974. Five instrumented bears were tracked to their den sites. All known den sites have been marked and will be examined closely after the bears have left.

Plant community descriptions and habitat typing were completed for an additional 60 square miles, bringing the total area described to date to 180 square miles. One confirmed incident of a grizzly bear preying on livestock was investigated and two other incidents were reported.

Ten grizzly bears were instrumented and radio-tracked for various lengths of time. Five transmitters malfunctioned or were removed by the bears before denning. Home ranges used by bears during the period they were tracked varied from seven to 125 square miles.

INTRODUCTION

The Interagency Grizzly Bear Study Team, initiated in 1973, consists of research biologists from the National Park Service, Fish and Wildlife Service, Forest Service, and since 1974 the states of Wyoming, Montana, and Idaho. This Team research effort provides immediate and long range information needed by various management agencies on the grizzly bear (*Ursus arcotos horribilis*) that inhabit the Yellowstone system. With increasing demands on most resources in the area, it is apparent that current quantitative data on grizzly bears is urgently required for management decisions.

Basic research on grizzlies was carried on for several years within Yellowstone Park proper (Craighead, et al, 1974). However, changes in management operations by the Park Service - mainly the closing of garbage dumps - have markedly changed some habitat parameters. Thus, current research efforts are needed to define and evaluate grizzly bear population dynamics. Objectives of the study are to determine the status and trend of the grizzly bear population, the use of habitat by bears, and the effects of land management practices on the bear population.

THE STUDY AREA

The study area is contained within the following boundaries: Beginning at the junction of 45°20' N. latitude and 111°40' W. longitude, south to 44° N. latitude, then east to 111°10' W. longitude, then south to 43°35' N. latitude, then east to 110°05' W. longitude, then north to 43°46' N. latitude, then east to 109°25' W. longitude, then north to 45°20' N. latitude, then west to 112°40' W. longitude the point of beginning (Fig. 1).

Most of the area within this boundary either contains or has the potential of containing viable grizzly bear populations. Research efforts will be largely contained in this area, although monitoring for distribution will extend beyond the boundaries. The boundaries also contain some tracts such as metropolitan and agricultural areas that are not suitable grizzly bear habitat.

The area is over 70 percent covered with a forest canopy. Many portions of the area are roadless or have only limited vehicle access, thus relegating much of the research travel to horseback, backpacking, or aerial reconnaissance.

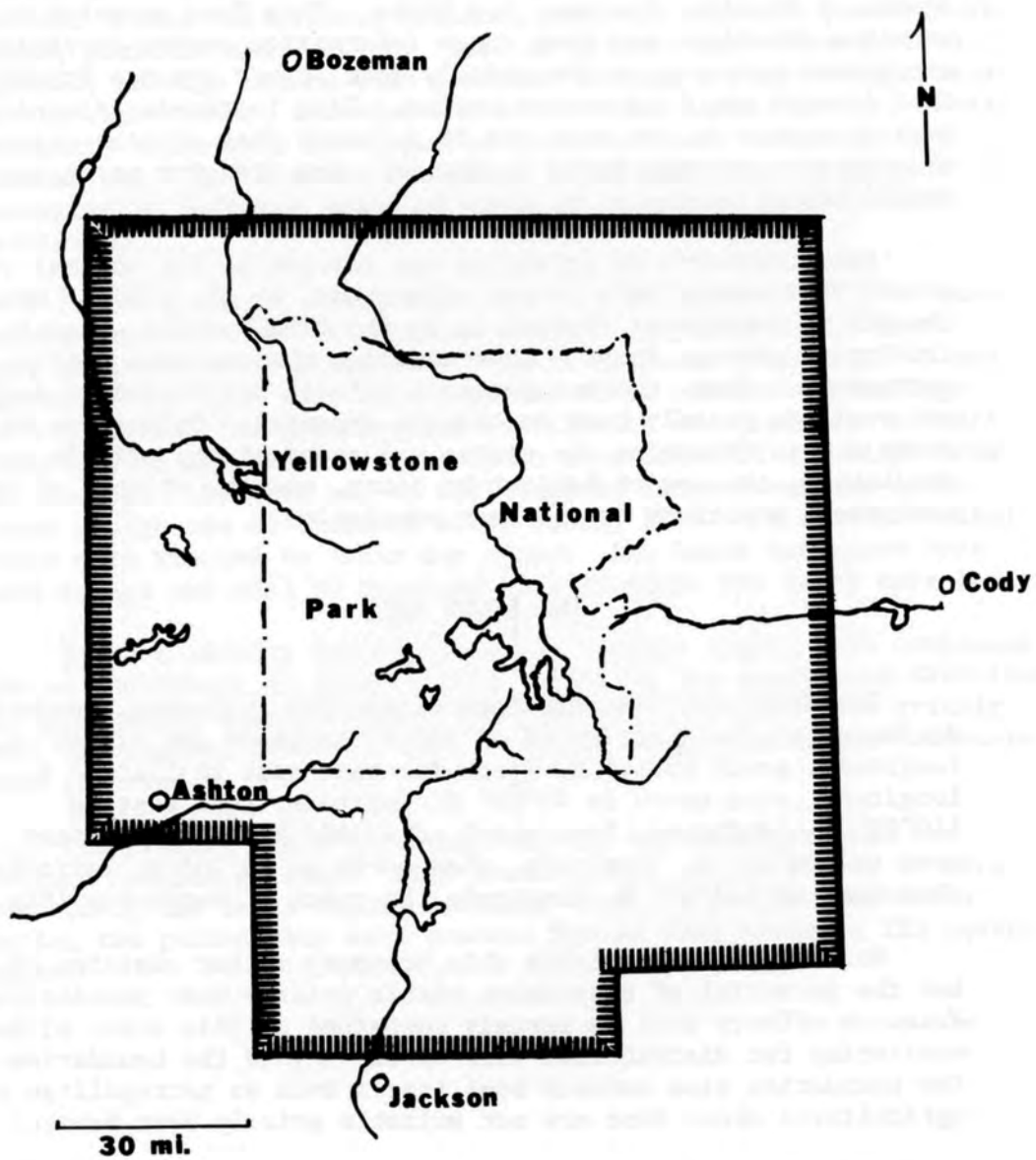


Fig. 1 Interagency Study Area.

PHYSIOGRAPHY

The study area is made up essentially of a very large, high elevation basin and the mountain ranges which encircle it. The area lies largely between 7,000 and 8,000 feet in elevation. Elevational extremes range from 13,766 feet on Grand Teton Peak to 5,282 feet around Gardiner, Montana.

The area is widely underlain by sedimentary strata. These strata have undergone considerable uplifting and faulting. Volcanic activity within the more recent geologic past elevated surrounding mountains and covered most of the area with lava and ash layers. Present geothermal activity within the area is a persisting indicator of recent geologic instability. Former glacial activity is much in evidence in many of the surrounding high relief areas especially on the north and east sides. Deep, steep-walled canyons crisscross the area. Some large, high plateaus add to the relief of the basin proper.

The basic geology of the area was extensively studied and described by Hague in 1899. Intensive investigations into the geology of portions of the area are currently in progress.

VEGETATION

The area is characterized by considerable floral diversity. Over a thousand plant species occur within the system (McDougall & Baggley, 1956). Much of the area is forest, interspersed with marshes, meadows, steppes, and shrub steppes. This is due in part to the diverse topography with its inherent microclimates which foster a range of vegetative communities from cold-desert to alpine.

Periodic wildfires have played a key role in the development and occurrence of many plant communities in the system. They have prevented much of the area from reaching vegetative climax status. Though fire suppression by man over the past 80 years is now allowing many areas to reach or approach climatic climax (Houston, 1973), many of the forest habitat types are presently in seral stands of lodgepole pine (*Pinus contorta*) because of these fires.

Forest Vegetation. - Recent studies on the forested areas within the system have described four major vegetative series with their respective habitat types (Pfister, et al, 1974; Cooper, 1975). These are the Douglas-fir (*Pseudotsuga menziesii*) series, the spruce (*Picea*) series, the sub-alpine fir (*Abies lasiocarpa*) series, and the lodgepole pine series.

Major forest habitat types that occur within these series are as follows:

The Douglas-fir series is represented mainly by two major habitat types: D-f/pine grass (*Calamagrostis rubescens*) and D-f/snowberry (*Symphoricarpos albus*) habitat types. These types generally occur on the warmer, drier sites within the system.

The spruce series is represented mainly by three major habitat types: Spruce/ninebark (*Physocarpus malvaceus*), spruce/sweetscented bedstraw (*Galium triflorum*), and spruce/twinflower (*Linnaea borealis*) habitat types. These habitat types are generally found in the cooler, more moist sites such as north and east slopes and along some stream bottoms.

The subalpine fir series has the largest number of major forest habitat types within the system. It is represented by the following: AF/sweetscented bedstraw, AF/twinflower, AF/pine grass, AF/globe huckleberry (*Vaccinium globulare*), AF/grouse whortleberry (*V. scoparium*), AF whitebark pine (*Pinus albicaulis*)/grouse whortleberry, and WBP-AF/-- habitat types.

These habitat types encompass much of the high elevation forest and timberline vegetation. Some of these habitat types, however, may occur at mid and lower elevations where topographic features create the required environment.

The Lodgepole pine series is represented by one habitat type. Lodgepole pine/bitterbrush (*Purshia tridentata*) is the only presently described lodgepole pine habitat type for the system and is most abundant in the West Yellowstone area. Though much of the tree overstory of the area is Lodgepole pine, it is generally a seral stage or community type of some of the other major series.

Other forest series and habitat types occur within the system but are limited or of minor importance in their distribution. The probability also exists that other important forest habitat types may be described for the system as more intensive vegetative inventories are carried out.

Non-forest Vegetation. - Non-forest habitat types and communities within the system have not been studied or described as extensively as have the forested areas. Major groups of meadow and steppe vegetation, however, do occur interspersed throughout the system.

The meadow areas vary greatly in size and also somewhat in vegetative composition due in large part to moisture gradients and topographic orientation, the more mesic ones being populated with grasses, sedges, rushes, and mesic forbs. The sedges and rushes are reduced or lacking and the forb complement changes on the xeric sites. Alpine and subalpine meadows occur at the higher elevations around timberline.

Tentative habitat types have been delineated for the grasslands and shrublands below the alpine zone in western Montana by Mueggler and Handl (1974). The more common of these types occurring in the Montana portion of the study areas are the *Festuca idahoensis*/*Agropyron spicatum*, *Festuca idahoensis*/*Agropyron caninum*, and the *Artemisia tridentata*/*F. idahoensis*.

The alpine, marsh, and riparian communities have been even more neglected. Further quantitative information is needed on these complex communities to properly evaluate their role in providing grizzly bear forage during the drier portions of the summer and fall.

Common and scientific names of plants follow Hitchcock, et al, 1973 and Asherin, 1973, for applicable portions and Davis, 1952; Booth, 1950; and Booth and Wright, 1959, for others.

HISTORY

Grizzly bears were a part of the Yellowstone area long before the arrival of European man. During the fur trapping era, grizzly bears were prevalent throughout the western plains, the Rocky Mountains, and the Great Basin regions. They were frequently killed for food by the mountain men (Haines, 1955). This was quite often at great risk to the hunter armed only with a muzzle loader.

Considerable sport hunting of grizzly bears took place in the areas on the east and southeast sides of the newly formed Yellowstone Park during the 1870's and 1880's. Grizzly bears were still reported as quite prevalent further east in the Pryor Mountains, Bighorn Mountains, and the Greybull River country during this period (Rainsford, 1897 and Rogers, 1897).

Miners and mining towns came and went leaving their impact on the land and the grizzly. Around the turn of the century, livestock men and other settlers began to fill up the areas surrounding Yellowstone Park. Conflicts increased between man and grizzly bears as human populations expanded. Grizzly bears were

removed from their habitats until all that remained essentially was the rugged Yellowstone area.

This area, until recent years, remained a virtual wilderness. Although forested, it was too inaccessible for logging and the timber was of the type and quality that was not in much demand. Climate and terrain prevented any extensive agriculture. Hunters and stockmen were the main users of the area, and neither made many apparent major critical changes in the grizzly bear habitat.

More recently, since 1960, changes in logging needs and practices have opened up access to many formerly inaccessible areas. Increased recreational demands and developments have opened still more. How this will ultimately affect the grizzly bears and their habitat remains to be seen.

CLIMATE

Winters are long and cold, with summers short and cool. The mean annual temperature as indicated for Mammoth, Montana, was 39.8°F. (U.S. Department of Commerce Weather Bureau, 1930-59). Temperatures average about 5°F. higher at Mammoth than for most other portions of the area. January is generally the coldest month averaging 18.0°F., with July the warmest averaging 62.8°F.

The indicated average precipitation varies considerably over the study area. Annual precipitation ranges from about 13.7 inches in the northeast to 38.26 inches in the southwest. A rain shadow effect causes xeric conditions in the Yellowstone Valley and the eastern edge of the study area. Most precipitation occurs as snow with areas above 7,000 feet receiving an average in excess of 150 inches. Actual on-the-ground snow depths will vary from a few inches at the lower elevations to several feet at the high elevations and on protected slopes.

FAUNA

Populations of large ungulates share the area with grizzly bears. These animals at times become a food source for the bears, especially as carrion during the spring months.

Bison (*Bison bison*) occur in several areas within Yellowstone Park. Elk (*Cervus canadensis*) are probably the most abundant and widely distributed large ungulates on the study area. Both mule deer (*Odocoileus hemionus*) and white-tailed deer (*O. virginianus*) are present. Moose (*Alces alces*) are found as individuals or small groups in some parts of the area. A few Bighorn sheep

(*Ovis canadensis*) populations are found in the northern and eastern parts. A small herd of antelope (*Antilocapra americana*) range in the Gardiner area. Mountain goats (*Oreamnos americanus*) occur in some of the high crags.

Populations of larger carnivores also inhabit the study area. Black bear (*Ursus americanus*) and coyotes (*Canis latrans*) are prevalent throughout the area. Cougars (*Felis concolor*) are present, but numbers are quite low. Bobcats (*Lynx rufus*) are present as are badgers (*Taxidea taxus*) and marten (*Martes martes*). Many other species of small mammals are found throughout the study area.

Beaver (*Castor canadensis*), otter (*Lutra canadensis*), and mink (*Mustella vison*) occur in some of the streams. Porcupines (*Erethizon dorsatum*) are fairly widely distributed.

Pocket gophers (*Thomomys* spp.) are abundant in many meadow areas and are at times sought out by grizzly bears for food.

Mice as well as tree and ground squirrels are also quite abundant.

PROCEDURES

POPULATION TRENDS AND DISTRIBUTION

Data on grizzly bear distribution, numbers, and age ratios were gathered through a monitoring system, direct observation by Team members, and with the aid of time lapse camera systems.

A monitoring system was used to supplement data obtained by field personnel on distribution. Cooperation was received from local residents and field personnel from various agencies in reporting all current sightings. Observations from these sources were recorded and verified as far as possible by Team members or other agency personnel of known reliability. Observations of tracks, scats, beds, and other signs have also been compiled.

Direct observations were made by reconnaissance teams from the air and during the course of other field work. Reconnaissance teams were assigned to the southern, eastern, and northern portions of the study area during the 1975 field season. The primary objective of these teams was to search for grizzly bear and

signs. Approximately 900 miles of trail (both Government maintained and game trails) were traveled on foot in Yellowstone Park and the Gallatin, Shoshone, and Targhee National Forests within the study area. All bears sighted were recorded on a standard form along with the following data: Date, time of day, topography, and general vegetational type.

All grizzly bear tracks encountered by the reconnaissance team were measured following criteria listed by Edwards and Green (1959). Grizzly bear tracks were differentiated from black bear tracks when possible using criteria listed by Greer and Craig (1971). Track measurements were used as an indication of more than one bear in an area. In the case of similar measurements, only one bear was recorded. All track measurements were recorded on a form printed on the back of the standard observation form.

Scats over two inches in diameter were considered to be those of grizzly bear and were collected whenever encountered. All scats were taken to the Montana Fish and Game Department Laboratory for analysis.

Aerial surveys were made as often as weather permitted during periods when grizzly bears were active in open areas. The primary purpose of aerial surveys was to obtain the largest sample of grizzly bear sightings possible. Predetermined routes that allowed a maximum amount of time over open areas were followed on each flight. All flights were made with a Piper Supercub. As many bears as possible were photographed with a 16-mm camera to provide permanent records for possible separation of individuals.

Time lapse camera systems set over baits were used in areas where bears were suspected but could not be observed. Camera systems used were of the eight-millimeter movie camera type described by Diem et al (1973). A small bait was hung between two trees and high enough above the ground so that a bear could not reach it. The camera system was then focused on the area beneath the bait. A small quantity of commercial horse or dog food pellets was scattered beneath the bait so that the bear would stay in range of the camera for more than one photograph. The camera systems were set to take a single frame picture at two- and three-minute intervals. Some cameras were set over bear traps and horse or sheep baits on the ground. A 50-foot roll of film lasted 10 to 14 days depending on day length.

Numbers of unduplicated individuals observed were needed to compute cub/sow and yearling/sow ratios and minimum density estimates for selected areas. The minimum number of individuals

was determined by methods similar to those of Martinka (1971) where descriptions and locations of observed bears were used. In this study, all bear observations used for unduplicated samples were observed by members of the Study Team, the experienced pilots used by the Team, or one of the time lapse camera systems. Sixteen- or 35-mm photos were used to supplement and improve verbal descriptions. Color patterns alone appeared to be unreliable for separating individuals during late summer. During August most bears began to undergo a darkening of coat color similar to that mentioned by Pearson (1975). Unless an individual was observed frequently during August, it could appear to be quite different than during July. The 16-mm movie films taken from the air seemed to be the best aid in identification since the bear could be photographed from several angles in relation to the sun, and this helped to distinguish apparent colorations due to reflections from the guard hairs.

MOVEMENTS AND HABITAT USE

Radio telemetry techniques were used to determine bear movements and habitat use. Bears were trapped in culvert traps, fitted with radio transmitters, and released. Two bears were captured with a tranquilizer gun from a helicopter. A rudimentary premolar was removed from captured bears when possible. These teeth were then decalcified, sectioned, and stained; they were then examined for annuli following Lentfer et al (1967).

Transmitters were in the 164 MHz range. Some difficulty was experienced early in the summer with transmitter failure. Most of this was diagnosed as improper packaging. The most successful packaging technique was to attach the transmitter between two layers of conveyor belting, put it in a mold (Fig. 2), and pour urethane plastic around the entire unit, including the antenna, to give a finished product as in Fig. 3. The entire unit is then completely sealed from moisture and protected from mechanical damage. The unit is activated by a magnetic switch.

Initial efforts at radio tracking from the air were frustrating. Although instrumented bears were usually located, the range of initial reception was only three to five airline miles and required a time-consuming search pattern. Dissatisfaction with the system necessitated an evaluation of the components.

Three types of transmitters and two types of receivers were used. Although there were some differences in performance among the transmitters and between receivers, signals were weak with all combinations. Since our best transmitters and receivers represented the most efficient available, improvement of antenna systems appeared to be the most practical way to improve performance.



Fig. 2 Transmitter in mold with freshly poured uralane.

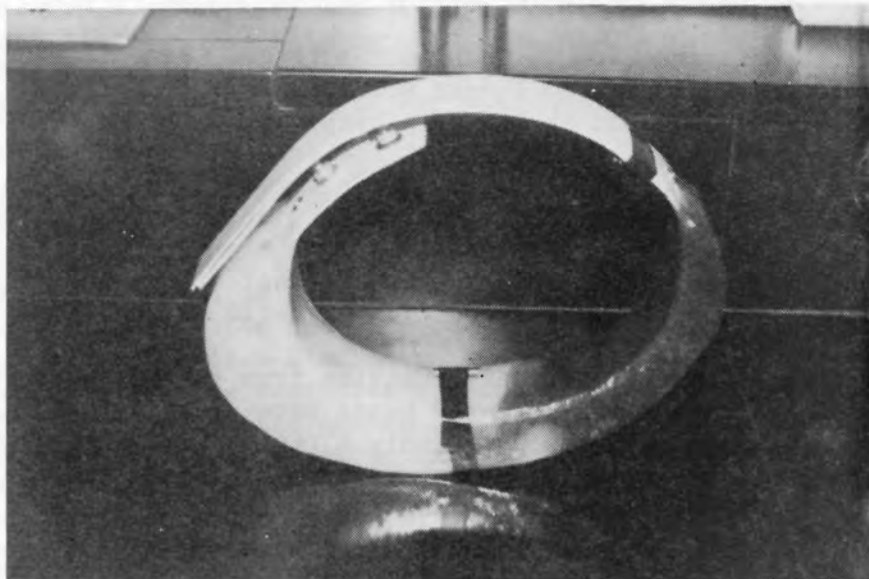


Fig. 3 A finished transmitter. The light material is rigid uralane, and the dark material is flexible uralane. Tape around the bottom holds the magnet which controls the switch.

When the decision was made to improve the antenna system, we were using a wing-mounted, high-gain whip antenna for initial contact and a rotatable, belly-mounted loop for tracking. Both antennas were equipped with amplifiers. The whip would usually pick up a weak signal at two to five airline miles after which the loop could be used. On occasion, the loop would not pick up the signal as soon as the whip, so signal strength and null from the airplane were used for approximate location until contact could be made with the loop.

Our first change was a substitution of a modified Yagi design for the loop. This antenna had four elements with a gamma match on the driver. This would receive clear signals at the same distance as the amplified whip in mountainous terrain, but maximum range was still only six airline miles.

Next, in cooperation with Mr. Dave Beaty of Telonics, Inc., Mesa, Arizona, we tried a two-element Yagi, a three-element Yagi with a ballun coil and beta loop matching configuration, both belly mounted and rotatable. A pair of stacked Yagi antennas was also mounted on wing struts.

The two-element Yagi was superior to the whip and the four-element modified Yagi, increasing range to approximately 10 airline miles and receiving a clearer signal. The three-element Yagi received a clear signal for approximately 20 miles in mountainous terrain. The stacked Yagi system (Fig. 4) gave a maximum range of 35 miles. The stacked system and the belly-mounted, three-element Yagi were relatively efficient at capturing signals that were not line of sight.

Most flights are now made with the three-element, belly-mounted Yagi only. The additional power provided by the stacked antennas is normally not required. If any bear is not located on a particular flight, the stacked antennas are used to aid the search on the next flight. One plane has had satisfactory results with two four-element Yagi antennas on the wing struts pointing away from the plane.

When an instrumented bear is located, the major habitat features that can be recognized from the air are recorded. This gives an index to major habitat types used by the bear throughout the year. Areas used by instrumented bears were the basis for measuring their habitat requirements. As soon as a movement pattern was established, a team was assigned to the area to evaluate the habitat as described below.



Fig. 4 Piper Supercub ready for radio-tracking. Stacked Yagi antennas are attached to wing struts. The rotatable Yagi antenna can be seen behind the left front wheel.

EVALUATION OF MOVEMENTS

The extent of movements of radioed individuals was found using a center of activity (Harrison 1958, White 1964). Relocation of each animal was plotted on a map, and a geometric center (center of activity) was calculated by superimposing the relocations on a grid system as described by Hayne (1949). Standard diameters for each animal were then calculated by using Harrison's (1958) formula:

$$SD = \sqrt{\sum D^2 / N}$$

where D is twice the distance from the center of activity to each relocation and N is the total number of relocations. The standard diameter describes the diameter of a circle with the center of activity as its center which contains 68.26 percent of all the relocations and 68.26 percent of the animal's activity during the period considered.

Ables (1969:111) describes biological centers of activity on discussing the home ranges of radio-instrumented red foxes. He states, "All distributions were heterogeneous, a result of fixes being clumped in one or more locations. This clumping . . . resulted from unequal intensity of habitat use. I term areas that received such high use 'Biological Centers of Activity.'" There is a similar clumping of fixes for radioed bears, and this term may help to define bear use on seasonal ranges.

HABITAT EVALUATION

General Investigations. - Habitat analysis must consider the biological, physical, and cultural features of the environment and their positive or negative influences on the grizzly bear. Cataloging of the biological features was begun with an inventory of the vegetation resources on selected areas of known or suspected grizzly bear occurrence.

Boundaries of vegetal communities were delineated on aerial photos. Within each community, canopy cover was estimated for each species of tree, shrub, and herb. Habitat-type designations (according to Pfister, et al, 1974), physiognomy, and general topographic features were recorded, as were remarks on rodent activities and grizzly bear sign.

Special Habitat Investigations. - Several studies on special habitat features believed to be important to grizzly bears were initiated or continued during 1975. Two investigations were

carried out through contracts with Montana State University. A study of distribution and seed production of whitebark pine was completed in 1975, with a final report expected in June 1976. The first phase of a food habit study was completed and a final report has been received. The second phase of food habit studies was begun with emphasis on the high mountain valley habitat type. Scats were gathered throughout the study and taken to the Montana Fish and Game Laboratory for analysis.

Efforts were continued on investigation of relationships between grizzly bears and spawning cutthroat trout (*Salmo clarki*) in streams tributary to Yellowstone Lake.

A two-man survey team spent the summer of 1975 on Yellowstone Lake. Their objectives were to locate and classify (as permanent or intermittent) all tributaries to Yellowstone Lake, determine the spawning status of as many tributaries as time permitted, determine the use of spawning cutthroat by grizzly bears on as many streams as possible, and obtain standard stream survey information on as many streams as possible.

Repeated trips were made by canoe around the shoreline of the lake. Mouths of tributaries not shown on USGS 1:62,500 maps were located as clearly as possible on the map using terrain features and pocket transit. All unnamed tributaries were numbered. Relative fish densities were visually estimated and classified as abundant, numerous, common, present, or rare.

Banks of tributaries were searched for signs of bear use such as tracks, scat, or fish remains. Waterflow measurements were taken near the mouths of tributaries using a Teledyne Gurley flow meter and tape measure. Chemical profile, including dissolved oxygen, carbon dioxide, phenolphthalein alkalinity, methyl orange alkalinity, total hardness, and pH were measured near the mouths of tributaries.

RESULTS

POPULATION PARAMETERS

Grizzly bear observations were below average in number during 1975. Only 36 grizzly bears were sighted during fixed wing flights compared to 60 in 1973 and 125 in 1974 (Table 1). Black bear observations from the air were also lower than in 1974 but higher than in 1973. With the poor showing of bear observations, no attempt was made to identify a sample of unduplicated individuals. Only four different sows with cubs and three different sows with yearlings were observed. This compares with 15 sows with cubs and 18 sows with yearlings observed in 1974.

It was apparent that bears were not using open areas to the extent that they had in previous years. This was confirmed by locations of radio-instrumented bears throughout the field season. Out of 148 locations of instrumented bears, only six were accompanied by sight observations; and in only one case was it judged that the bear would have been observed if it had not been wearing a radio.

Although all of the observation and radio tracking flights were made during daylight hours, we do not believe that open areas were being extensively used by the bears at night. Intensive efforts to study food habits in the Pelican and Hayden Valleys (Graham, 1976) resulted in the collection of only 18 bear scats and observation of only 55 individual digging excavations attributable to bears. These two valleys are normally used intensively by grizzly bears.

The low number of bear observations can probably be attributed to the environmental conditions during the field season. The spring and summer of 1975 were cool and wet. This resulted in a luxuriant growth of herbaceous vegetation in the widespread lodgepole pine types which are usually dry and relatively poor in herbaceous understory production. Mealey (1975) stated that distribution of bears was primarily influenced by plant moisture conditions with bears concentrated on sites with succulent herbs. The widespread availability of herbaceous material which remained succulent throughout the summer probably enabled the bears to find abundant forage without leaving cover. It is also possible that repeated aerial flights have conditioned bears to seek cover before they can be sighted.

Time Lapse Cameras. - Time lapse cameras were set out in 58 locations throughout the study area in 1975. A total of 725 camera

Table 1 SUMMARY OF AIRCRAFT FLIGHT REPORTS - 1973 to 1975

Month	Hours Flown	No. Flights	Bears Observed		Bears/Flight		Bears/Hour	
			Black	Grizzly	Black	Grizzly	Black	Grizzly
April								
1974	10	3	1	0	.33	-	.1	-
1975	13	4	0	3	-	.75	-	.31
May								
1973	12	3	3	17	1.00	1.41	.25	1.40
1974	21	7	19	14	2.71	2.00	.90	.67
1975	25	9	9	5	1.00	.56	.36	.20
June								
1973	19	5	18	10	3.60	2.00	.95	.50
1974	36	10	34	18	3.40	1.80	.94	.50
1975	10	4	4	8	1.00	2.00	.40	.80
July								
1973	14	5	4	23	.80	4.60	.29	1.60
1974	31	11	18	45	1.64	4.10	.58	1.44
1975	38	12	37	17	3.08	1.40	.97	.45
August								
1973	9	3	0	0	-	-	-	-
1974	20	7	5	39	.71	5.57	.25	1.97
1975	36	10	1	2	.10	.20	.03	.06
Sept.								
1973	10	3	0	2	-	.66	-	.20
1974	17	6	2	1	.33	.17	.12	.06
1975	39	11	1	0	.09	-	.05	-
Oct.								
1973	12	4	0	8	-	2.00	-	.67
1974	15	6	0	8	-	1.33	-	.54
1975	19	7	0	1	-	.14	-	.05
TOTALS								
1973	76	23	18	60	.78	2.60	.30	.79
1974	150	50	79	125	1.58	2.50	.52	.83
1975	180	57	52	36	.91	.63	.29	.20

days were recorded. Camera malfunctions were experienced at an additional five locations. Results are summarized in Table 2.

Table 2

Summary of Bears Recorded at
Time Lapse Camera Locations

<u>Bait</u>	<u>No. Locations</u>	<u>No. Bears</u>		
		<u>Grizzly</u>	<u>Black</u>	<u>Unidentified</u>
Fish	21	3 <u>1/</u>	4	1
Chicken or Turkey	16	2 <u>2/</u>	3	0
Bacon and Honey	6	0	0	0
Horse	9	3 <u>3/</u>	0	0
Sheep	2	0	0	0
Spawning Stream	1	19 <u>4/</u>	0	1
Trap Site	<u>3</u>	<u>2</u>	<u>2</u>	<u>0</u>
Totals	58	29	9	2

1/ Believed to be the same bear on three different days.

2/ One bear did not seem to be attracted to bait.

3/ Sow with two yearlings on three different days.

4/ Sow with three yearlings recorded four times.

The data summarized in Table 2 concur with the other types of observational data in indicating an abundance of natural food during the 1975 field season. The one camera location that monitored a natural food source (spawning stream) rather than a bait accounted for 65 percent of the bears recorded. The grizzly bear that came to the hanging fish bait only showed a passing interest in the bait but spent 20 minutes picking up pieces of dog food scattered under the bait and returned twice at three-day intervals, apparently checking the area for more dog food. One of the grizzly bears recorded at a location with fowl bait did not appear interested in the bait but seemed to be incidentally grazing within range of the camera. This bear was within 40 feet of the bait but did not investigate it, indicating that at least some bears prefer succulent herbage to carrion.

A sow with two yearlings that was attracted to one camera set over a dead pony took three days to clean up the bait with the help of coyotes and raccoons. She did not cover or guard the carcass in the manner typical of grizzly bears. She and the yearlings would feed on the pony for 30 to 45 minutes and then leave for the day. Once again, this indicates that grizzly bears were not experiencing any food shortage in 1975.

Other than supporting the fact that bears were relatively unobservable in 1975, the time lapse cameras did not furnish much in the way of positive data. Only three locations recorded bears where they had not been observed in prior years although all three locations were in areas strongly suspected to support bears.

Mortality. - There were no known mortalities of grizzly bears in the study area during 1975.

DISTRIBUTION

Distribution maps in our 1974 Annual Report were incomplete; revised maps of 1974 sightings and tracks are shown in Figures 5 and 6, respectively. Cumulative sightings for 1970 through 1974 are shown in Figure 7. For 1975, locations of 128 reported sightings from all sources that either have been verified, or that are judged to have a high probability of being valid, are shown in Figure 8. Forty of these sightings were from aircraft and involved 55 bears. The 88 ground sightings were of 120 bears.

Locations of scats and of other sign (tracks, digging, carrion caches, etc.) for 1975 are plotted in Figures 9 and 10, respectively. Clumpings of observations to the south of Yellowstone Lake in Yellowstone National Park, and to the north of Hebgen Lake in the Gallatin National Forest, result in large measure from concentrated study efforts in these areas and do not necessarily reflect areas of higher grizzly density than surrounding areas.

Despite some apparent weaknesses in this monitoring method, these plottings are thought to portray a fair approximation of current grizzly range. The 1975 plottings differ from those of previous years (see 1974 Annual Report) in that in 1975 fewer observations of bears or their sign have been reported from the Targhee National Forest and more have been reported from the Bridger-Teton National Forest. No special significance can be attached to either of these seeming anomalies because of the limited data and time span involved.

HABITAT USE

Habitat use, as reflected by radio locations, is summarized in Table 3. Because locations were made from aircraft, habitats are necessarily classified into broad categories. Nevertheless, all but one of the 139 radio locations were in the timber, attesting to the significant role of timber in grizzly bear habitat. This is not to suggest that openings are unimportant; wet or dry meadows, shrublands, or rockslides were usually in close proximity to the timbered radio locations.

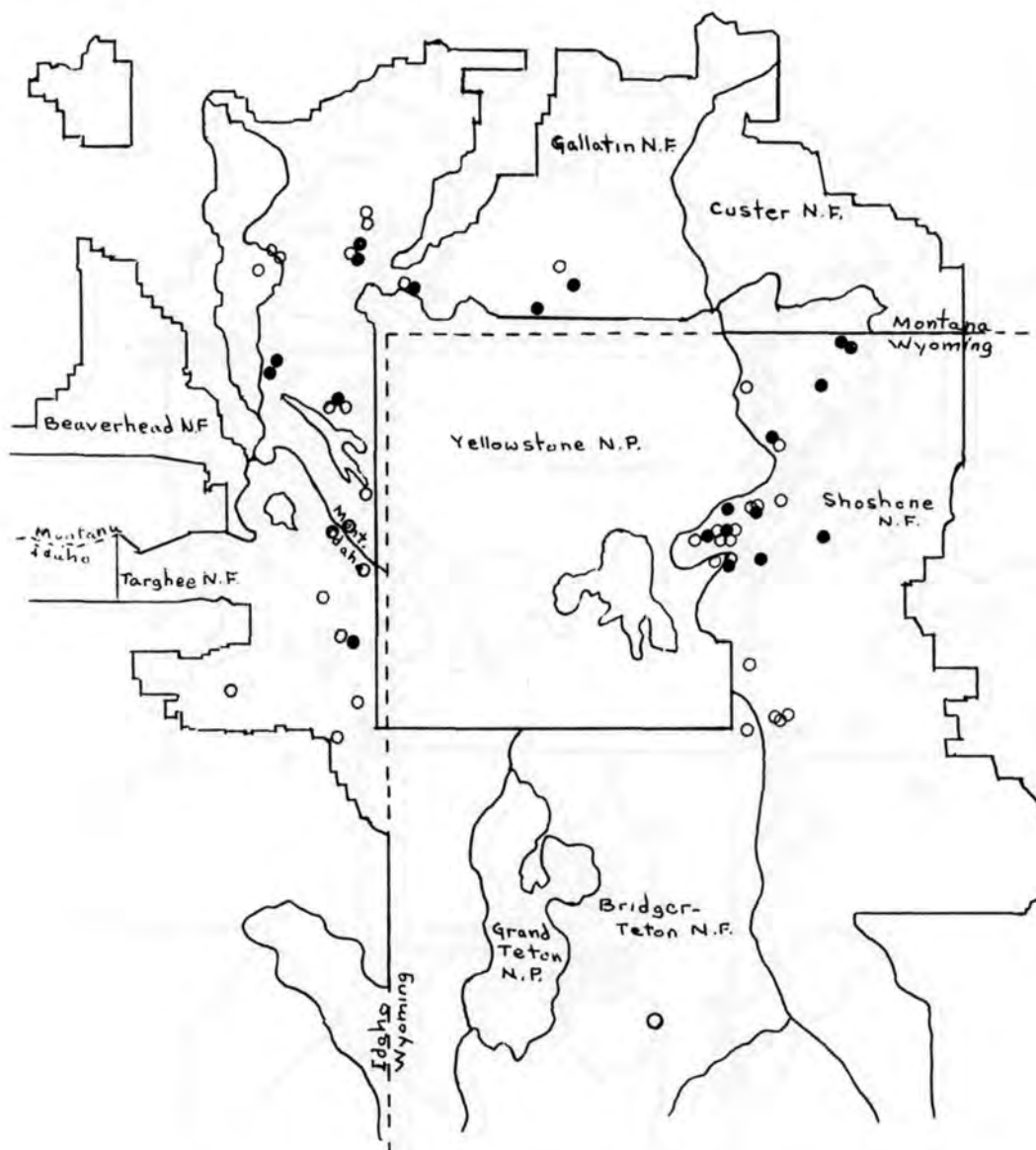


Fig. 5 Distribution of reported grizzly bear sightings outside of Yellowstone National Park in 1974 (revised). Open circles designate lone bears; darkened circles designate two or more bears, usually sows with young.

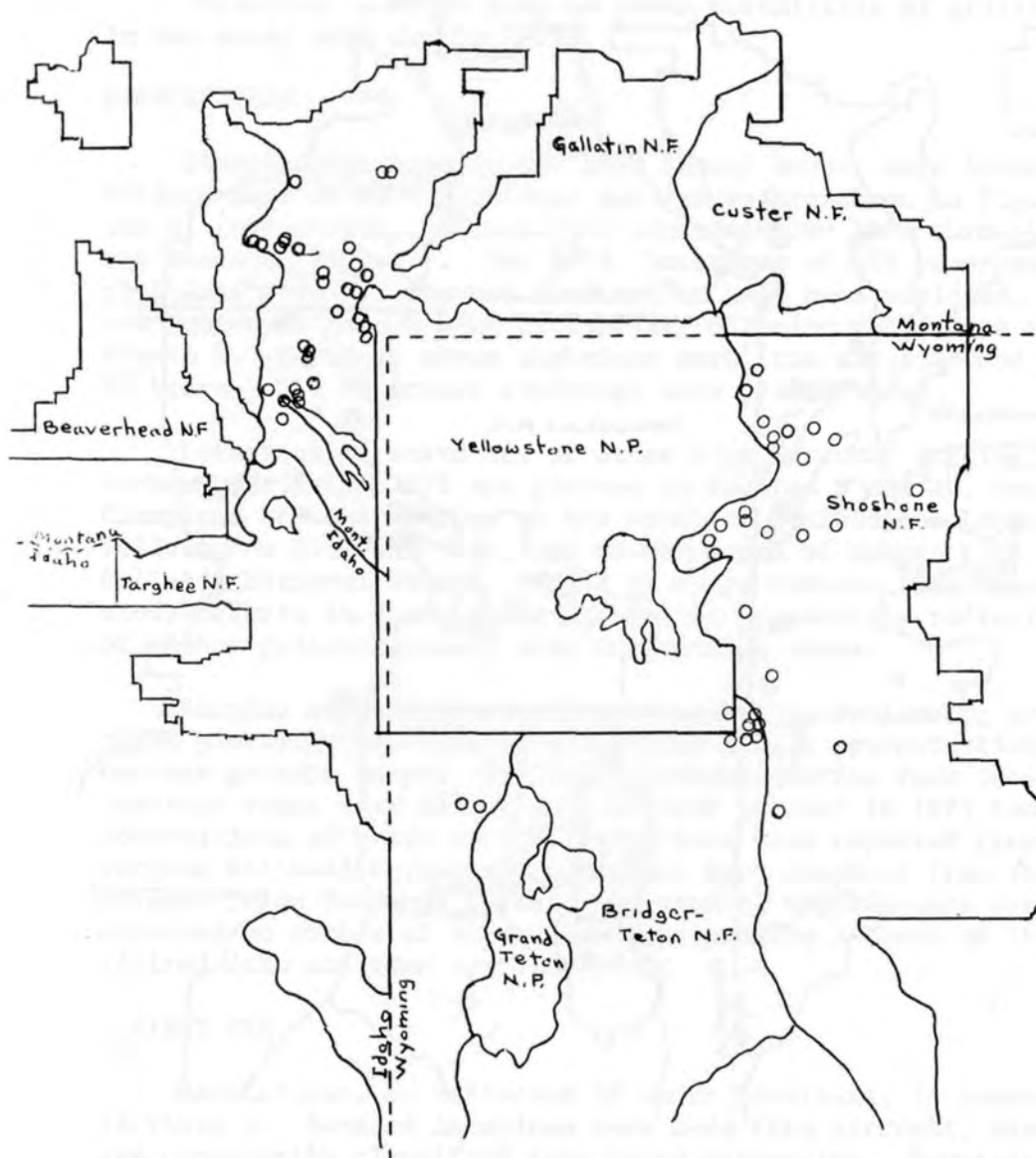


Fig. 6 Distribution of reported grizzly bear tracks outside of Yellowstone National Park in 1974 (revised).

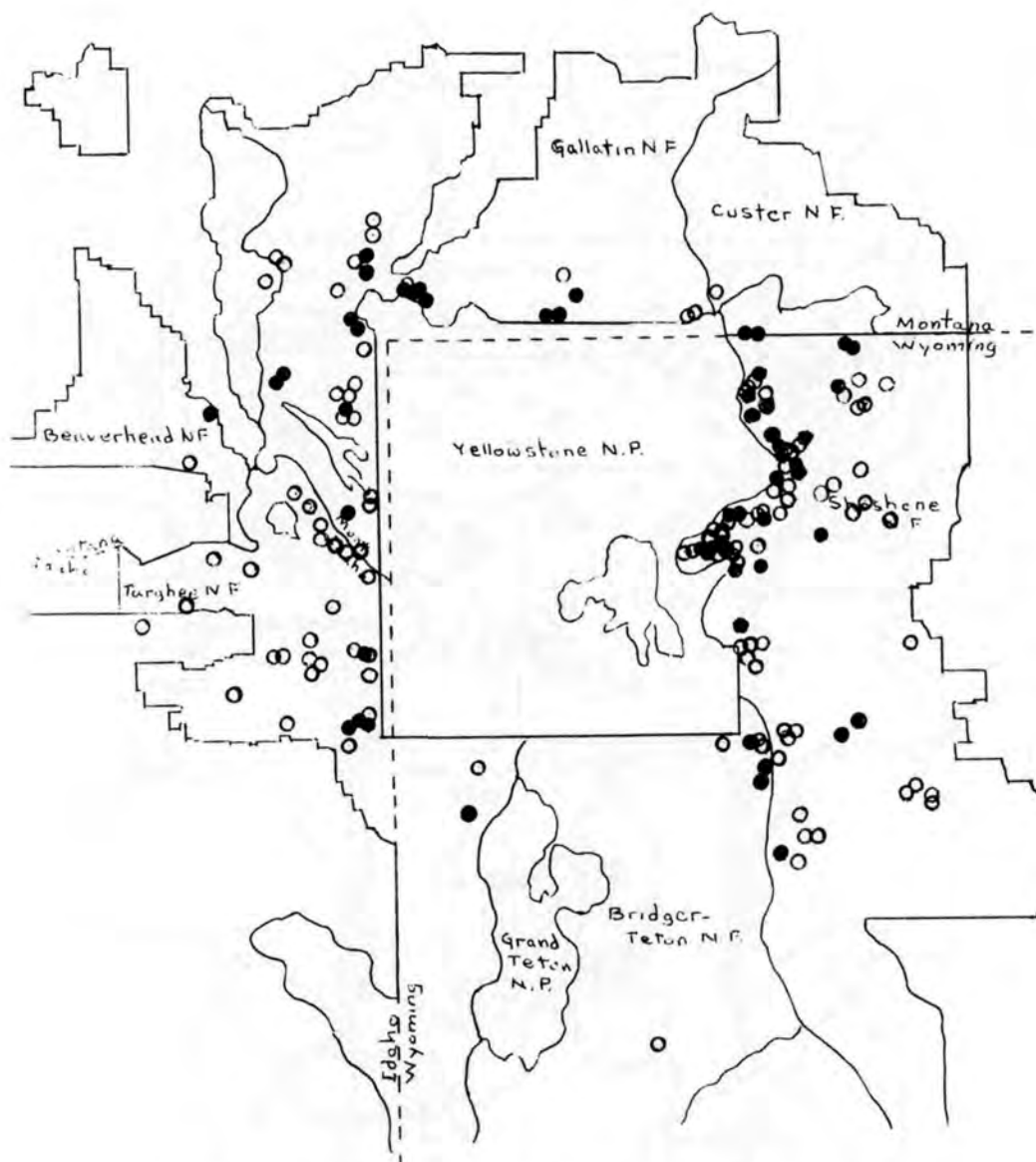


Fig. 7 Cumulative distribution of reported grizzly bear sightings outside of Yellowstone National Park for 1970 through 1974. Open circles designate lone bears; darkened circles designate two or more bears, usually sows with young.

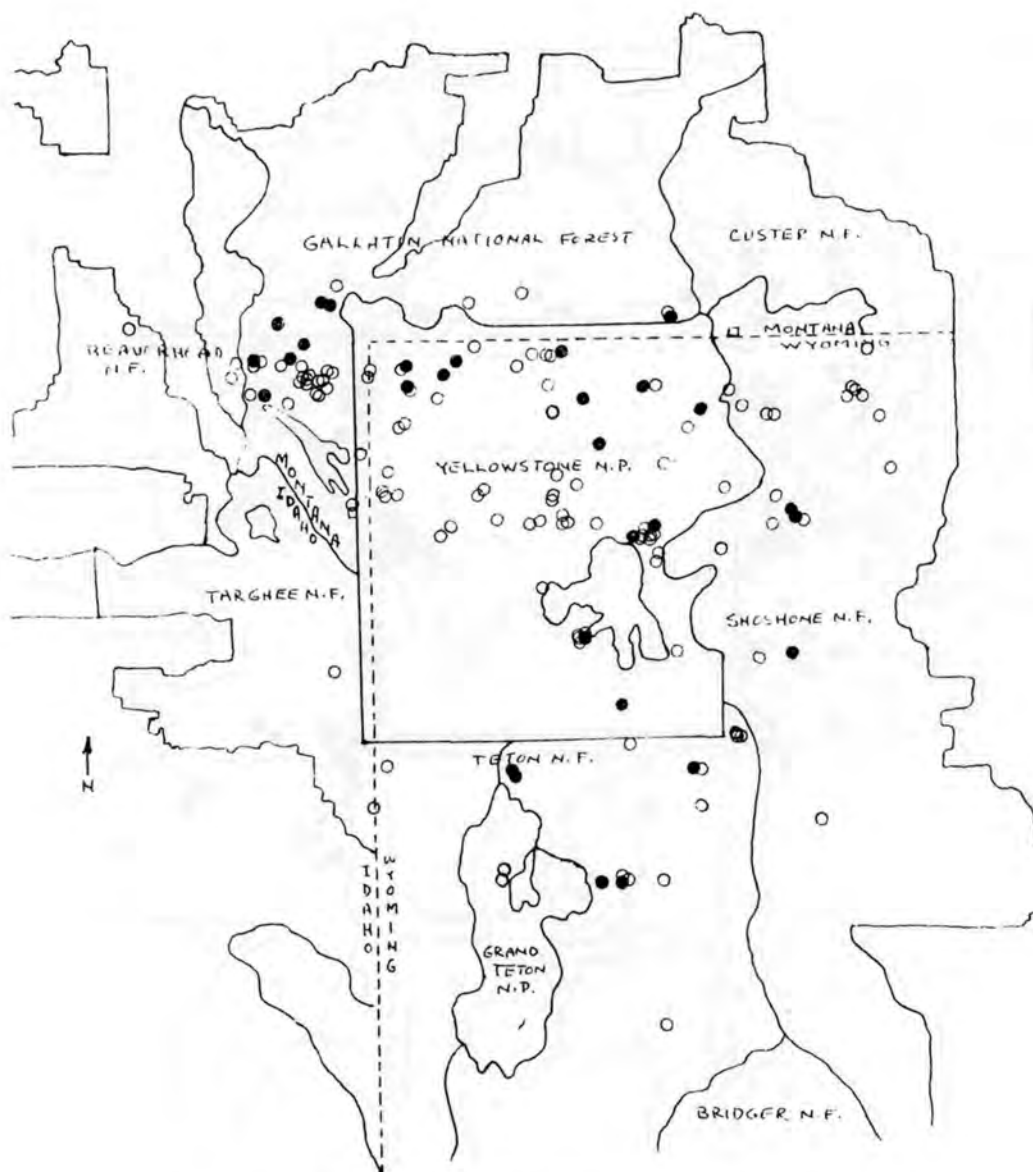


Fig. 8 Distribution of reported grizzly bear sightings in 1975. Open circles designate lone bears; darkened circles designate sows with young.

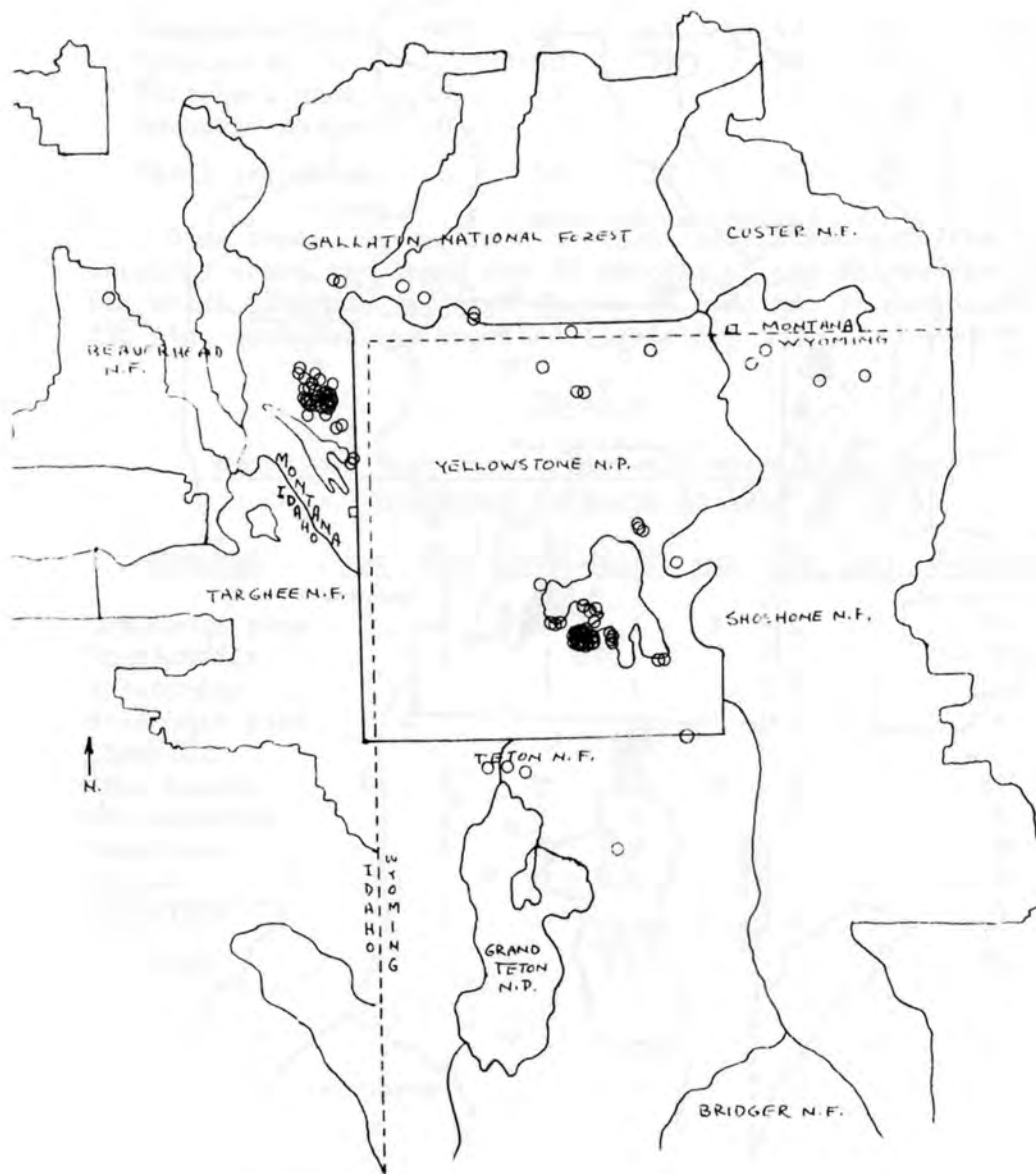


Fig. 9 Distribution of reported grizzly bear scat observed in 1975.

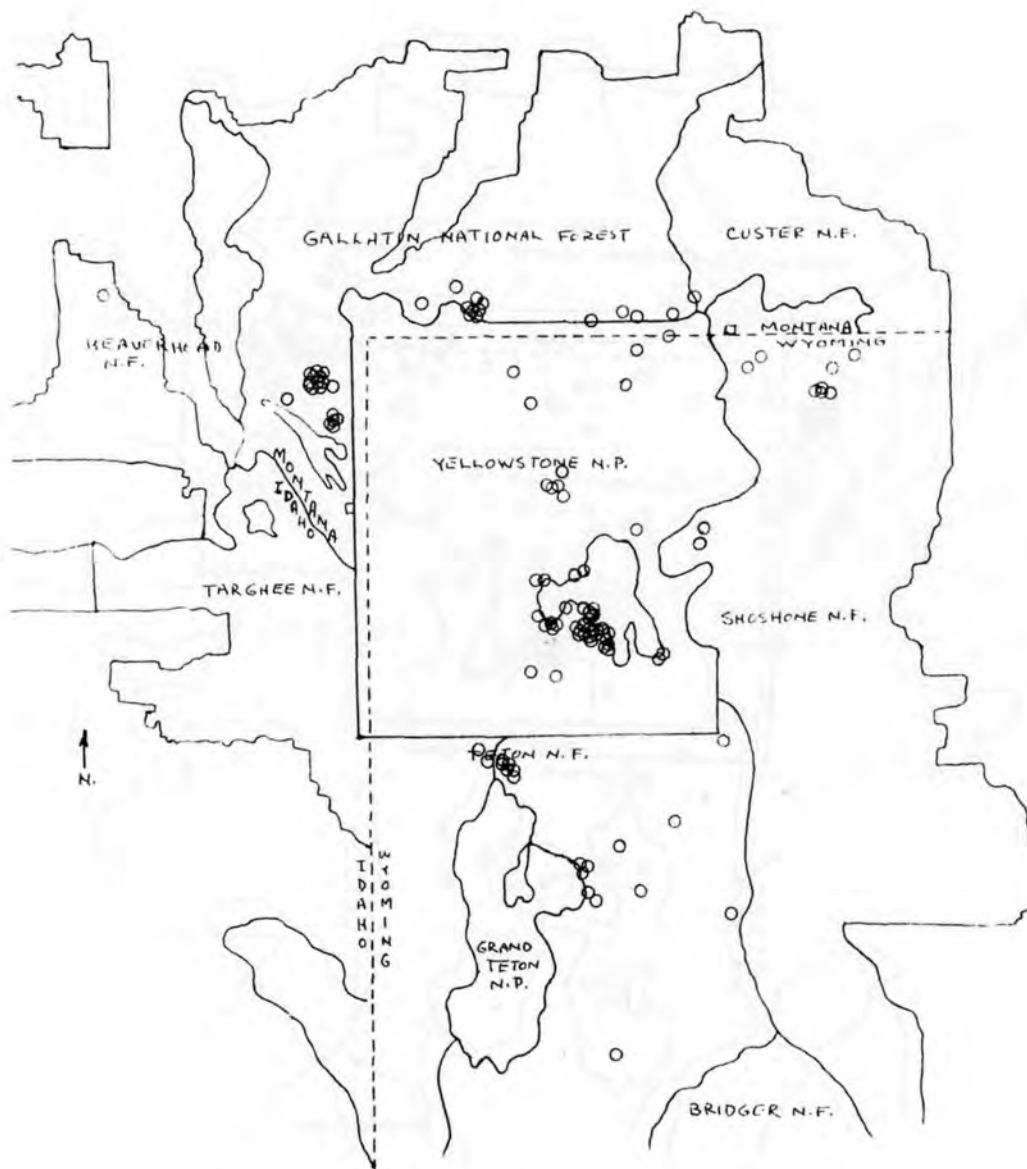


Fig. 10 Distribution of reported grizzly bear sign observed in 1975.

Table 3

Percentage of Grizzly Bear Radio Locations
Occurring in Various Habitats in 1975

<u>Habitat</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
Lodgepole pine	60	57	41	42	11	50
Spruce-fir		40	59	58	83	43
Whitebark pine	20	3			6	7
Mountain meadow	20					
Total locations	5	30	39	33	18	14

Open areas, in contrast to their near absence in the radio location data, accounted for 70 percent of the 96 reported sightings for which habitat was noted (Table 4), and for 34 percent of the 220 sign observations reported (Table 5).

Table 4

Number of Sightings of Grizzly Bears Occurring
in Various Habitats in 1975

<u>Habitat</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Subtotal</u>	<u>%</u>
Lodgepole pine	1	1	6	7	3	1		19	20
Douglas-fir		2						2	2
Spruce-fir				1		2	1	4	4
Whitebark pine				2		1	1	4	4
Clearcut									
Mtn. meadow	4	1	8	22	9	2	2	48	50
Streambottom		1	3	2				6	6
Sagebrush		4	2	2				8	8
Willow			1	1				2	2
Rockslide		1				2		3	3
Total								96	

Table 5

Number of Observations of Grizzly Bear Sign
in Various Habitats in 1975

<u>Habitat</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Subtotal</u>	<u>%</u>
Lodgepole pine		4	25	43	29	3	1	105	48
Douglas-fir	1	1	3	2				7	3
Spruce-fir			3	11	9	5	2	30	14
Whitebark pine				2			1	3	1
Clearcut			3					3	1
Mtn. meadow			8	38	7	2		55	25
Streambottom			2					2	1
Sagebrush		3	1	1				5	2
Willow	1		4	3	2			10	5
Rockslide									
Total								220	

These contrasting results stem largely from the limitations of the several methods. Sightings are biased towards open areas where visibility is greatest and movement most easily detected. Observations of sign are biased because of the disproportionate time spent by observers in each of the habitats, the differing abilities of observers to detect sign, and the unequal durability of various kinds of sign. Radio locations seem to avoid these biases but, as we use them, have other limitations. Locations are determined only during daylight, but the bear is to some extent nocturnal. Also, the sampling time is short: Assuming a one-minute radio fix on each of three flights per week, the bear's location is known for about 0.03 percent of the time (about one minute/3,360 minutes).

The monthly elevational distribution of reported observations of bears and bear sign (Table 6) is in general agreement with that of radio locations (Table 7). Although the two distributions differ in some details, both show a wide elevational range in practically every month, as well as a tendency for the mean elevation to remain high well into the fall.

Table 6

Monthly Elevational Distribution of Reported
Observations of Grizzly Bears and Bear Sign,
Combined, During 1975

<u>Month</u>	<u>Number Observed</u>	<u>Mean Elevation</u>	<u>Range</u> (feet)	<u>Median</u>	<u>Mode</u>
April	9	7600	6800-9200	7400	7200
May	17	7200	6000-8000	7200	7200, 7800, 8000
June	58	7600	5600-9600	7800	7800
July	70	8100	6400-9600	8100	7800
Aug	23	7900	6800-10,300	7800	7800
Sept	17	8400	6400-10,300	8400	8400
Oct	13	8000	6800-9900	8000	6800, 8000
Nov	3	7400	6800-7900	7600	-

Table 7

Elevations of Grizzly Bear Radio Locations
by Month During 1975
(Elevations in feet)

<u>Month</u>	<u>Mean Elevation</u>	<u>Range</u>	<u>Mode</u>
July	8300	7400-9200	-
August	7800	6600-9600	7800 & 8000
September	8000	6600-9200	8300 & 8400
October	8200	7100-9400	8400
November	8500	7600-9200	8400 & 8500
December	8100	7400-9300	7400

Five instrumented bears were tracked to their dens. Elevation and exposure of den sites as observed from the air are shown in Table 8:

Table 8

Elevation and Exposure of Den Sites
of Instrumented Bears in 1975

<u>Bear No.</u>	<u>Sex</u>	<u>Exposure</u>	<u>Elevation</u>
4	Female	NW	7500
5	Male	NE	8500
7	Male	N	7400
8	Female	N	9000
10	Female	N	9000

Streamers were dropped at all den sites so that they can be located from the ground after the bears leave. A more detailed analysis of den site characteristics will be made during the 1976 field season.

HABITAT EVALUATION

General Investigations. - Plant community descriptions and habitat typing were completed for an additional 60 square miles, bringing the total area described to date to approximately 180 square miles. Voucher specimens of plant materials were prepared and placed in the herbarium as a reference collection. Progress was made in assembling data on, and mapping of, other biological, physical, and cultural features of the study area.

Yellowstone Lake Investigations. - All tributary streams were located and described during 1974. In 1975 more emphasis was placed on obtaining additional information on spawning runs, bear use, and stream characteristics.

Adult trout were observed in 32 streams, 10 of which were not known to have spawning runs in 1974. A total of 63 streams are known to have had spawning runs in one or both years. Ten spawning streams were found to support grizzly bear fishing activity during 1975 as indicated by a conspicuous bear trail along the stream banks, tracks, fish parts, and sometimes bear scats containing fish parts. Evidence found on six additional streams suggested a high probability of grizzly bear fishing activity but was not conclusive.

Eleven streams are known to have been fished by grizzly bears during either 1974 or 1975, or both years. Fishing was for cut-throat trout in all streams examined except Pelican Creek. During 1974 grizzly bears fished for longnose suckers (*Catostomus catostomus*) in Pelican Creek.

Seventy-four fish counts were taken on 29 tributaries. The highest density recorded was 170 trout per 100 feet of stream on July 1. Five tributaries had densities of one trout per foot or greater. Highest densities were observed during late June and early July on most streams. Trout densities varied in streams known to be fished by grizzlies, and some streams with high densities did not show evidence of fishing activity.

Streams flowing into Yellowstone Lake vary in size and physical characteristics. The largest, the Yellowstone River, had a volume flow of several hundred cubic feet per second (cfs) during summer, and the smallest spawning stream investigated had a flow of 0.2 cfs. Small streams of two to three cfs were most common. Ten of the 11 streams known to have been fished by grizzly bear had volume flows of less than five cfs during the times they were known to be fished. The exception, Pelican Creek, had a volume flow of approximately 53 cfs when fished. The attraction of Pelican Creek was longnose suckers which could be trapped in shallow areas near stream banks.

Availability of trout to bears appears dependent on two factors: (1) trout density, and (2) physical characteristics of the stream such as volume flow, depth, width, pool to riffle ratio, and cover. Bears are most successful when fishing small, shallow streams or shallow areas in larger streams. Bears have also been observed catching trout beneath undercut banks in small pools after chasing them from the riffle areas.

Seven of the 11 spawning streams fished by bears were five miles or more from the nearest road. Four of these have campsites near their mouths but seem relatively undisturbed by people. Three of the four streams close to human activity are crossed by park roads that are heavily traveled during summer, and one stream flows near a sewage plant where park personnel are often present. Development and human activity are limited to a small area near the mouth of these four streams, leaving most of each stream undisturbed. In each case, bears can come and go without confrontation with people.

Three streams in the West Thumb area appear to be good bear fishing streams, but access without human confrontation would be difficult. No indication of bear activity was found during two years

of study. It is possible that presence of people discourages grizzly bears from using these streams.

GRIZZLY BEAR/LIVESTOCK RELATIONS

An historical perspective of grizzly bear/livestock relations was sought through various sources, particularly in Idaho, where the Targhee National Forest provided personnel to assist with this effort. Work will continue in 1976 to resolve conflicting reports and to expand the investigations.

Livestock grazing allotments on the national forest within the study area are shown in Fig. 11. Grazing areas wholly on interspersed private lands are not shown.

One confirmed incident of a grizzly bear preying on livestock was reported in 1975. A grizzly bear killed two sheep in sec. 35, T. 9 N., R. 5 E. of the Targhee National Forest on September 15, 1975. A U. S. Fish and Wildlife Service trapper confirmed the presence of grizzly tracks at the kill site. An attempt to live-trap the bear for radio collaring and subsequent monitoring failed.

Two other incidents, although unconfirmed, are listed as possible grizzly bear predation attacks:

1. On July 13, four sheep were killed by a bear on South Boone Creek on the Targhee National Forest near the Idaho-Wyoming State line. The herder claims to have shot at the bear and missed. Investigation failed to yield any evidence as to whether a black bear or a grizzly bear was responsible for the sheep losses.
2. A reputedly reliable observer reported that at about 9 p.m. on August 17, residents of a summer home area heard a cow in distress. The observer found a partly eaten yearling the next morning that had been covered with debris, and the track of a grizzly with a front foot pad of about six and one-half inches. The covered kill was in sec. 7, T. 45 N., R. 113 W., near the boundary of the Bridger-Teton National Forest in Wyoming. The report reached our attention much too late to permit a meaningful investigation.

SCAT COLLECTION

Routine scat collections are intended to monitor grizzly bear food habits over the duration of the study. A detailed analysis

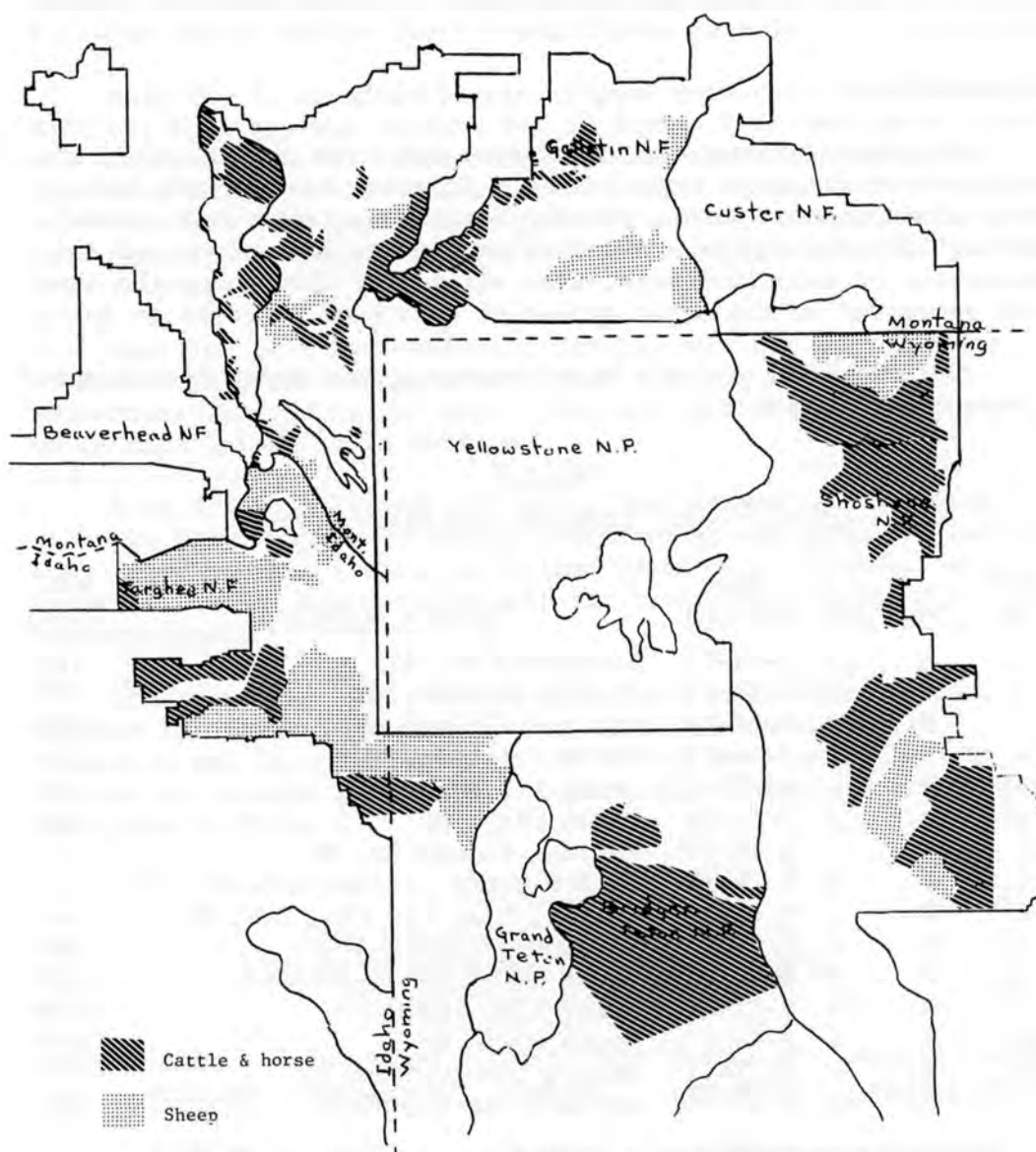


Fig. 11 Grazing allotments on national forests within the study area.

of food habits within Yellowstone Park during 1973 and 1974 has been presented by Mealey (1975). Results of scat collections during the 1975 field season do not differ significantly from Mealey's.

MOVEMENTS

Tagging operations extended from May until mid-December when it appeared all bears were denned. Trapping success was lower than anticipated. Eleven grizzly bears were captured 15 times during 264 trap nights. Abundant carrion in some areas and the abundance of succulent vegetation all summer throughout the area are suspected as the major causes of a lack of interest in baits.

Ten of the 11 grizzly bears captured were radio instrumented as seen in Table 9:

Table 9
Grizzly Bears Captured and Marked, 1975

<u>Bear</u> <u>No.</u>	<u>Sex</u>	<u>Age</u>	<u>Date</u> <u>radioed</u>	<u>Capture Location</u>	<u>Wt.</u> <u>(lbs)</u>
1	M	11	5-21-75	Lodgepole Cr, WY	310
2	M	4	5-23-75	Teepee Cr (NE), MT	290
3	F	Ad	7-11-75	Cap & Ball Park, WY	290*
[4 ₁ /	F	3	7-19-75	Cabin Cr Basin, MT	210
[4 ₂ /	F	-	12-14-75	Gully Cr, MT retrap	300
(5 ₂ /	M	7	7-25-75	Cooke City, MT	360*
(5	M	-	8-15-75	Retrap, Slough Cr, MT	-
[6 ₃ /	F	4	7-29-75	Flat Mtn Arm, Yellowstone NP, WY	225
[6 ₄ /	F	-	8-3-75	Retrap, Flat Mtn Arm, YNP, WY	-
7	M	4	8-3-75	Cooke City, MT	300*
8 ₄ /	F	9	8-19-75	Cooke City, MT	255*
9 ₄ /	M	14	8-21-75	Cooke City, MT	610*
[10	F	4	9-9-75	Cooke City, MT	350*
[10 ₅ /	F	-	9-17-75	Retrap, Cooke City, MT	-
- 5/	F	1½	7-17-75	Cabin Cr Basin, MT	50

* Actual Scale Weight (other weights estimated).

1/ Tranquilized from helicopter and reinstrumented.

2/ Transplanted by Montana F&G to Buffalo Fork Creek, Montana.

3/ Cast first radio - retrapped and reinstrumented.

4/ Transplanted by Montana F&G to Pyramid Peak area, Montana.

5/ No serial number issued - ear tagged only - too small for radio.

One yearling was considered too small for instrumentation. Bear No. 1, an 11-year-old male, was located once in an eight-day period, and Bear No. 2, a four-year-old male, was located once in a 14-day period before their transmitters failed.

Bear No. 3, an adult female trapped near the Crandall Ranger Station, Wyoming, was tracked for 12 days. This bear moved from the Crandall area to within about one and one-half miles east of the Lower Falls of the Yellowstone River, a distance of 40 airline miles through some extremely rugged terrain. She apparently cast her transmitter there. The still functioning transmitter has not been recovered.

Bear No. 6, a four-year-old female, cast her collar three to four days after being instrumented, and was retrapped and reinstrumented within two days. She was then tracked over a period of 28 days before radio failure.

Bear No. 9, a 14-year-old male, was trapped and instrumented at Cooke City, Montana. He was relocated by the Montana Fish and Game Department to a site 31 airline miles from the point of capture. He was never relocated; the transmitter evidently malfunctioned.

The remaining five radioed bears were radio-tracked from capture to denning. Radio-tracking data are summarized in Tables 10 and 11. Movements of individual bears are shown in Figures 12 through 17. Dates for locations listed on the figures are given in Table 12.

Table 10
Home and Seasonal Range Data
Five Radio-Instrumented Grizzly Bears
1975 - Summer to Denning

<u>Bear No.</u>	<u>Date radioed</u>	<u>No. of 1/ locations</u>	<u>Date 2/ denned</u>	<u>Length of time/days</u>	<u>Approx. area^{3/} used in mi²</u>
4	7-19-75	41	12-22-75	156	125 +
5	7-25-75	34	11-14-75	112	61
7	8-3-75	34	12-22-75	141	82
8	8-19-75	25	11-14-75	87	24
10	9-9-75	9	11-14-75	66	7

1/ Number of locations from time trapped until denned.

2/ Bear definitely in den this date; possibly denned a few days earlier.

3/ These figures approximate and represent area used during period tracked; therefore, they do not necessarily represent total home range size.

Table 11

Ranges of Activity of Radioed Grizzly Bears - 1975
(As indicated by standard diameters of areas of activity)

<u>Bear No.</u>	<u>Standard diameter in miles</u>	<u>No. of observations</u>	<u>Season(s) of use</u>	<u>No. of days</u>	<u>Period of observation ^{1/}</u>
4	10.97	41	Summer-fall	156	7-19 to 12-22-75
5	8.91	28	Summer-fall	84	7-25 to 10-17-75
	1.17	6	Predenning	26	10-20 to 11-14-75
7	6.46	13	Summer	41	8-3 to 9-12-75
	7.39	18	Fall	66	9-15 to 11-20-75
	0.37	3	Predenning	18	12-5 to 12-22-75
8	6.84	5	Summer	15	8-19 to 9-2-75
	3.29	20	Fall to denning	67	9-9 to 11-14-75
10	2.07	8	Fall to denning	42	10-3 to 11-14-75

1/ Bear was in den by latest date listed for each.

Bear No. 4, a three-year-old female, was radioed July 19 in Cabin Creek Basin, Montana. She was tracked for 156 days prior to denning (Fig. 12). She utilized a larger area in 1975 than any of the other four radioed bears. Her standard diameter of area of activity was 10.97 miles. She appeared to have four biological activity centers within her home range. One of these centered around livestock carrion. The remainder of her area appeared rather randomly used.

She commonly made movements of seven to nine airline miles within one- to three-day periods and made 14 to 19 airline mile movements within three- to eight-day periods. She is known to have traveled, at least periodically, with another larger grizzly bear from July until denning in late December. She did not use a predenning area in the vicinity of the den.

She was immobilized and reinstrumented on December 14. Then she made a northern movement of seven airline miles. She then returned south nine airline miles and was denned by December 22. Indications of considerable snowmobile activity were observed both in the area where she was reradioed and in the northern area shortly after she was reradioed.

Bear No. 5, a seven-year-old male, was trapped and instrumented at Cooke City, Montana, on July 25. He was moved by the Montana

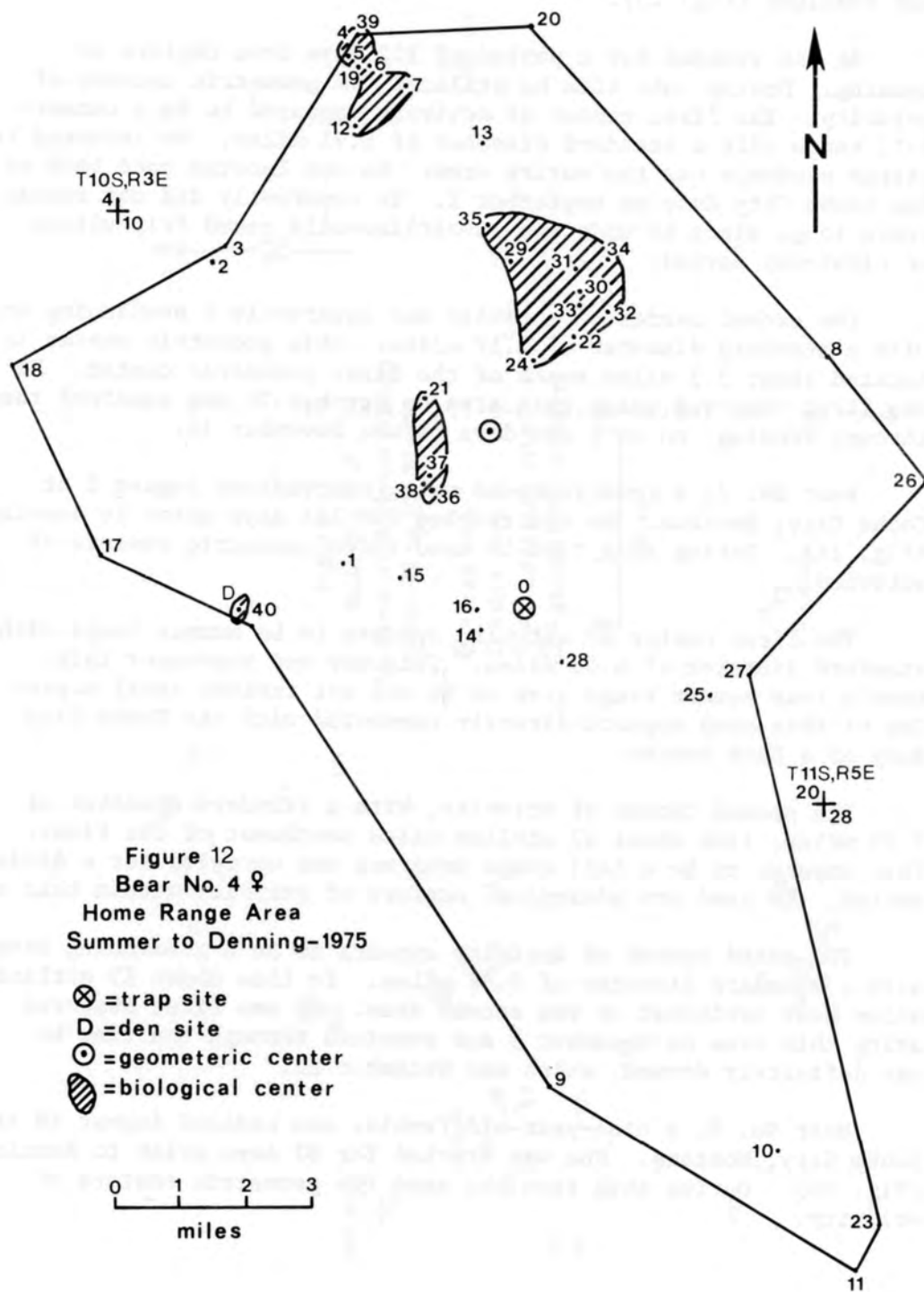
Table 12

Location Numbers and Dates for Radio-Instrumented Bears
Summer 1975 to December 31, 1975

Obs. No.	Date	Obs. No.	Date	Obs. No.	Date	Obs. No.	Date
Bear No. 4, instrumented 7-19-75, Cabin Creek Basin, Montana							
0	7-19	11	8-20	22	9-24	33	11-12
1	7-20	12	8-28	23	9-26	34	11-14
2	7-28	13	8-29	24	10-1	35	11-20
3	7-29	14	9-2	25	10-3	36	12-5
4	8-1	15	9-5	26	10-9	37	12-9
5	8-4	16	9-8	27	10-15	38	12-14
6	8-6	17	9-10	28	10-17	39	12-20
7	8-11	18	9-12	29	10-20	40	12-22
8	8-12	19	9-15	30	10-29	41	12-24
9	8-15	20	9-20	31	10-31	42	12-29
10	8-19	21	9-22	32	11-4		
Bear No. 5, instrumented 7-25-75, Cooke City, Montana, and transplanted to Buffalo Horn Creek, Montana							
0	7-25	10	8-25	19	9-20	28	10-17
1	7-28	11	8-28	20	9-22	29	10-20
2	7-29	12	9-2	21	9-24	30	10-29
3	8-4	13	9-5	22	9-26	31	10-31
4	8-10	14	9-8	23	9-29	32	11-4
5	8-12	15	9-9	24	10-1	33	11-12
6	8-12	16	9-10	25	10-3	34	11-14
7	8-15	17	9-12	26	10-9	35	11-20
8	8-15	18	9-15	27	10-15	36	12-22
9	8-20						
Bear No. 7, instrumented 8-3-75, Cooke City, Montana							
0	8-3	9	9-8	18	9-29	27	11-4
1	8-6	10	9-9	19	10-1	28	11-12
2	8-10	11	9-10	20	10-3	29	11-14
3	8-15	12	9-12	21	10-9	30	11-20
4	8-20	13	9-15	22	10-15	31	12-5
5	8-25	14	9-20	23	10-17	32	12-9
6	8-27	15	9-22	24	10-20	33	12-22
7	9-2	16	9-24	25	10-29	34	12-29
8	9-5	17	9-26	26	10-31		

Table 12 - Continued

Obs. No.	Date	Obs. No.	Date	Obs. No.	Date	Obs. No.	Date
Bear No. 8, instrumented 8-19-75, Cooke City, Montana							
0	8-19	7	9-12	14	10-1	21	10-31
1	8-22	8	9-15	15	10-3	22	11-4
2	8-25	9	9-20	16	10-9	23	11-12
3	8-27	10	9-22	17	10-15	24	11-14
4	9-2	11	9-24	18	10-17	25	11-20
5	9-9	12	9-26	19	10-20	26	12-22
6	9-10	13	9-29	20	10-29		
Bear No. 10, instrumented 9-9-75, Cooke City, Montana							
0	9-9	3	10-15	6	10-31	9	11-20
1	10-3	4	10-20	7	11-4	10	12-22
2	10-9	5	10-29	8	11-14		



Fish and Game Department 21 airline miles to the North Absaroka between the Second and West Forks of Buffalo Fork Creek. Three days later he was in the Slough Creek drainage where he generally has remained (Fig. 13).

He was tracked for a period of 112 days from capture to denning. During this time he utilized two geometric centers of activity. The first center of activity appeared to be a summer-fall range with a standard diameter of 8.91 miles. He appeared to rather randomly use the entire area. He was located once back at the Cooke City dump on September 2. He apparently did not remain there long, since he made the 26-airline-mile round trip within an eight-day period.

The second center of activity was apparently a predenning area with a standard diameter of 1.17 miles. This geometric center is located about 5.5 miles south of the first geometric center. He was first observed using this area on October 20 and remained there through denning, on or a few days before November 14.

Bear No. 7, a four-year-old male, was radioed August 3 at Cooke City, Montana. He was tracked for 141 days prior to denning (Fig. 14). During this time he used three geometric centers of activity.

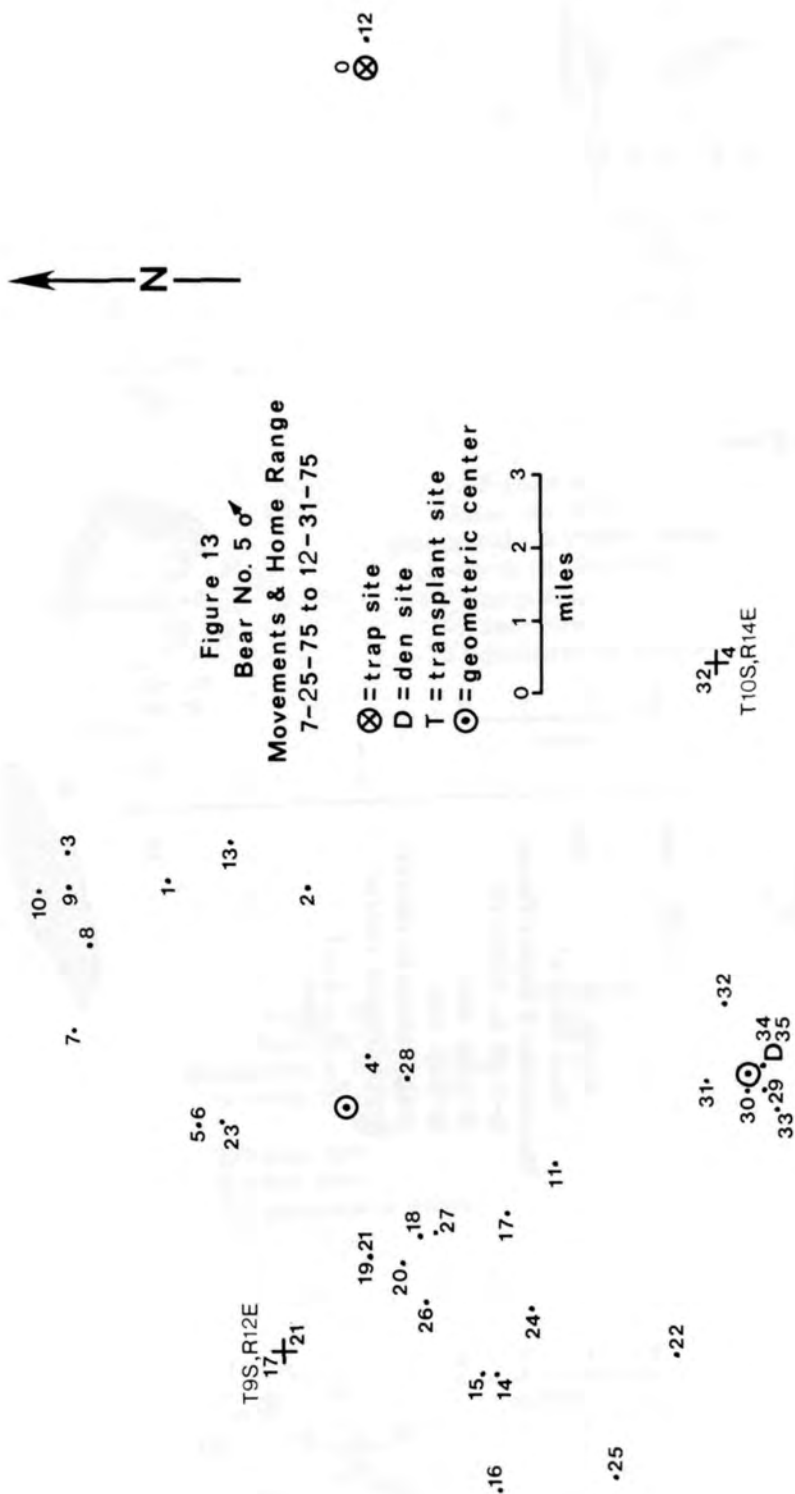
The first center of activity appears to be summer range with a standard diameter of 6.46 miles. This may not represent this bear's true summer range size as he was not radioed until August 3. Use of this area appears directly connected with the Cooke City dump as a food source.

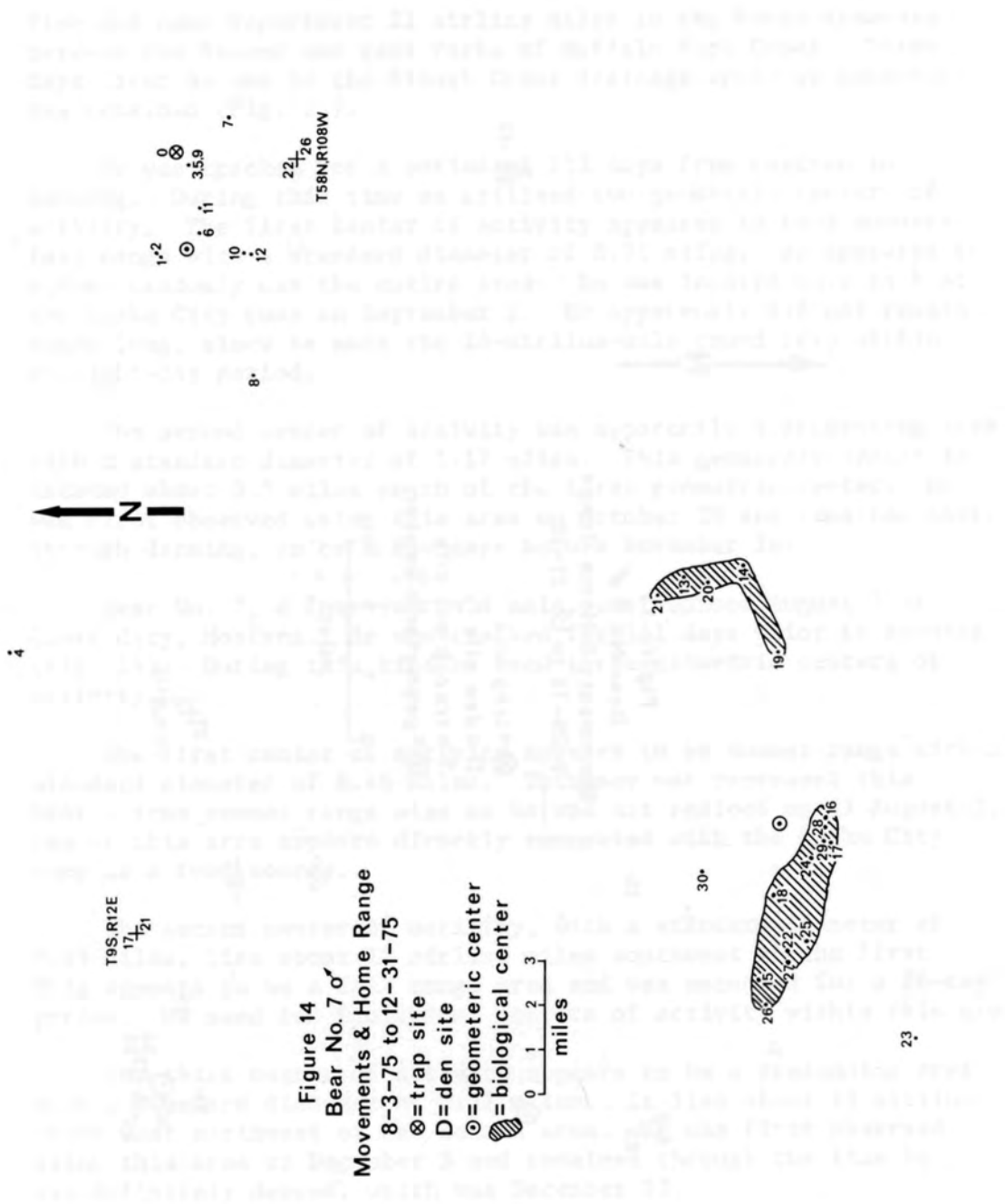
The second center of activity, with a standard diameter of 7.39 miles, lies about 12 airline miles southwest of the first. This appears to be a fall range area and was occupied for a 66-day period. He used two biological centers of activity within this area.

The third center of activity appears to be a predenning area with a standard diameter of 0.37 miles. It lies about 13 airline miles west northwest of the second area. He was first observed using this area on December 5 and remained through the time he was definitely denned, which was December 22.

Bear No. 8, a nine-year-old female, was radioed August 19 at Cooke City, Montana. She was tracked for 87 days prior to denning (Fig. 15). During this time she used two geometric centers of activity.

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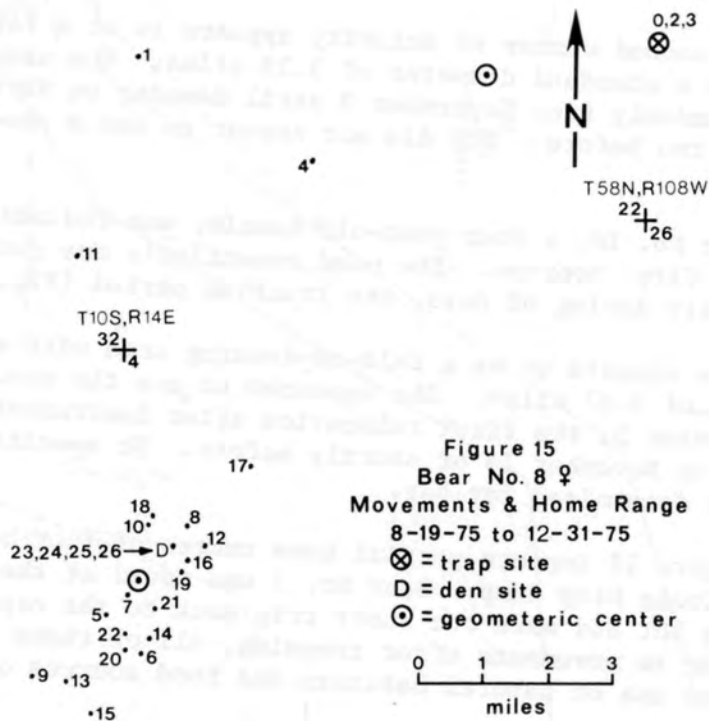
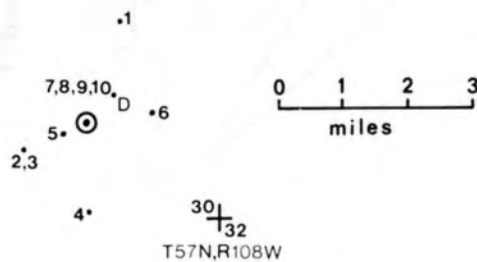


Figure 16
Bear No. 10 ♀
Movements & Home Range
9-9-75 to 12-31-75

⊗ = trap site
D = den site
○ = geometric center



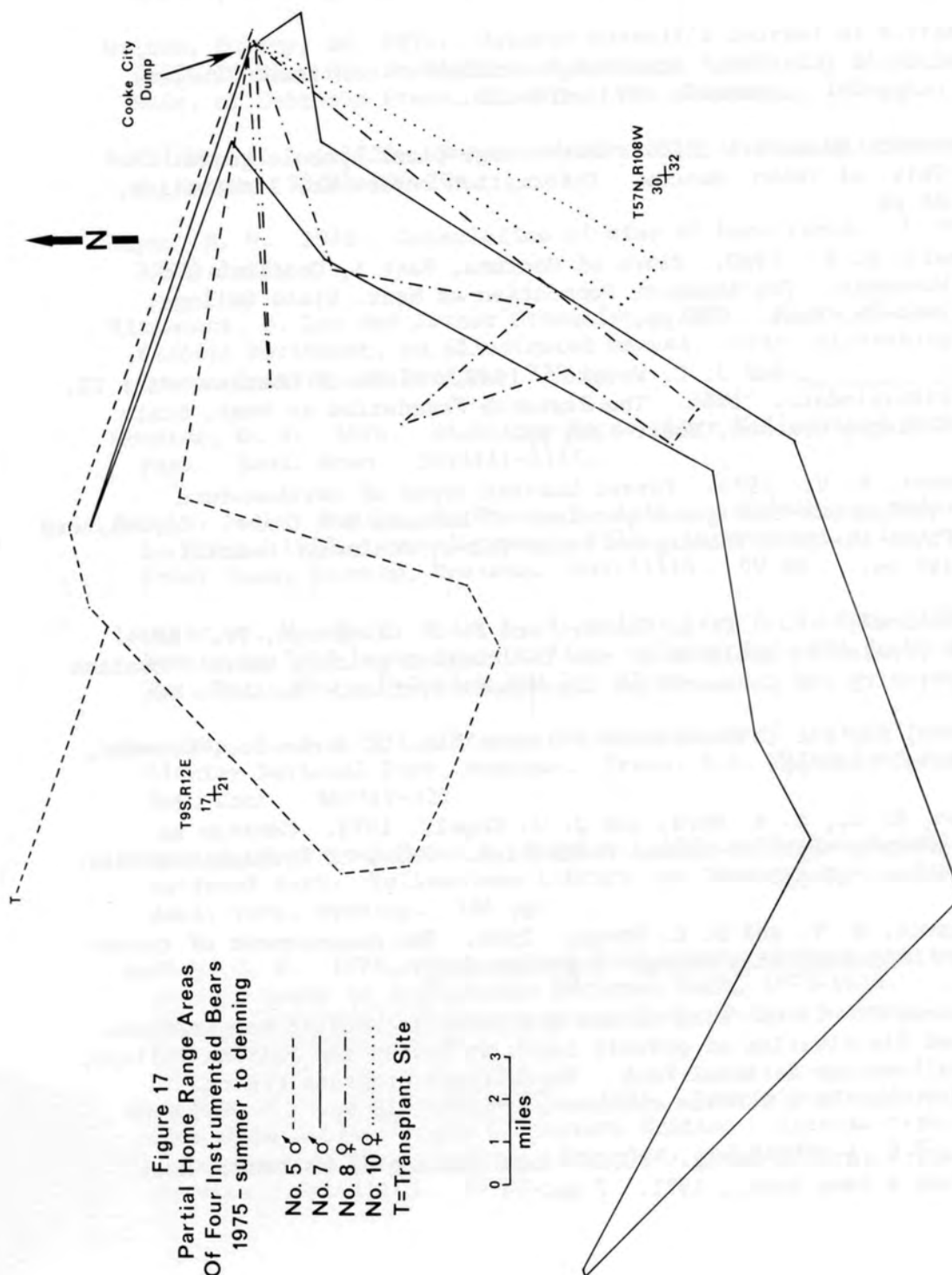
The first center of activity appears to be part of a summer area with a standard diameter of 6.84 miles. This area is connected with the Cooke City dump and was used for 15 days following instrumentation.

The second center of activity appears to be a fall to denning area with a standard diameter of 3.29 miles. She used this area rather randomly from September 9 until denning on November 14 or a day or two before. She did not appear to use a specific predenning area.

Bear No. 10, a four-year-old female, was radioed September 9 at Cooke City, Montana. She used essentially one geometric center of activity during 66 days, the tracking period (Fig. 16).

This appears to be a fall-to-denning area with a standard diameter of 2.07 miles. She appeared to use the area randomly from October 3, the first relocation after instrumenting, until denning on November 14 or shortly before. No specific predenning area was determined for her.

Figure 17 depicts partial home ranges of four bears instrumented at the Cooke City dump. Bear No. 5 was moved at the time of trapping but did make one short trip back to the capture site. According to movements after trapping, all of these bears made extensive use of natural habitats and food sources other than the dump.



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