No + names of bears
1st radio tests with # 75 – Prototype

Jan. 1961
1960 season

Sub-project 2.9 An Ecological Study of the Grizzly Bear. Project Leaders: John J. Craighead and Frank C. Craighead, Jr. Student Investigator: Maurice Hornocker, Graduate Fellow. Assistants: Wes Woodgerd, Mike Stephen, Pete MacLachlan. Cooperators: National Park Service, State Fish and Game Department, National Science Foundation, National Geographic Society, Wildlife Management Institute.

General Objectives: 1. To study the population dynamics of grizzlies determining population density, sex and age composition, breeding age, reproductive capacity, mortality rate, and population turnover; 2. To determine home ranges, daily and seasonal movements and relate these to food habits, family composition and population density; 3. To determine carrying capacity and habitat requirements and relate these to food abundance, population density or structure and hibernation sites; 4. To investigate the role of the grizzly as a predator and the effect, if any, it may have on regulating the population of elk and other large prey species within a national park.

Financial Support: This project is supported by a five-year grant from the National Science Foundation and from annual grants from the Research and Exploration Committee of the National Geographic Society and the Wildlife Management Institute. Funds from the Montana Cooperative Wildlife Research Unit are annually budgeted for operational expenses and salaries.

The student investigator is supported by a National Science Foundation Cooperative Graduate Fellowship. The National Wildlife Federation has also helped with financial support.

Procedure: A trip was made to Yellowstone May 6 through 8, 1960. Several grizzlies were sighted in different areas of the Park. Two of these

were color-marked bears. Data on movement and early spring food habits were obtained.

A plan for the summer's work was discussed with Superintendent Garrison and staff. Arrangements were made for housing facilities and for liaison between research workers and National Park Service personnel. Two illustrated lectures were scheduled to familiarize Park Service personnel with the objectives of the grizzly bear study and with the techniques and activities involved in the summer's work.

Intensive work began June 23 and continued into the first week of November.

General Work Plan: The study is divided into several phases with specific objectives.

Phase I. Exploratory Phase: This phase has been accomplished. Time (2 years).

Phase II. Long-Range Objectives: This phase will run concurrently with Phase III and continue for a minimum of five years after Phase III has been completed.

Objectives: 1. Determine with marked known-age animals the breeding age of males and females; 2. Observe behavior and follow the fate of marked family groups over a period of years; 3. Attempt to develop age criteria from a collection of known-age specimens; 4. Obtain growth and development rates from marked known-age animals; 5. Gather food habits data and attempt to evaluate the role of the grizzly as a predator; 6. Continue to gather data on all objectives listed under Phase III; 7. Record age-specific mortality and set the stage for eventually determining longevity of individuals and population turnover; 8. To accumulate knowledge on all aspects of grizzly bear behavior; 9. Relate habitat conditions to population size and structure; 10. Make management suggestions based on data obtained.

Results: Capturing: Sets were made at feeding areas, along the back roads and outside camp grounds. Forty-seven grizzlies were trapped during the course of the summer, immobilized, individually marked, weighed, measured, dental impressions taken, and released.* Of these, 24 were males and 23 were females. Six cubs and five yearlings were among those captured.

At least one member of 20 family groups is now individually marked (includes animals marked in 1959). This information is presented in Table X.

The list of marked "lone individuals" is presented in Table XI (includes animals marked in 1959).

In addition to artifically marked animals, there were present a number of unmarked but recognizable individuals. These bears fall into two classes:

1. Those permanently recognizable from year to year, and,
2. Those not permanently recognizable as individuals.

* 3 succumbed; 44 released.

The latter class can be recognized during the course of a season by family grouping, pelage, body conformation, minor wounds, etc. These bears are recorded in Table XII. As the number of marked individuals in the population increased and as the number of observations grew, it became difficult to meaningfully associate a particular animal with its number. Meaningful names were found to be more readily associated.

Thus to facilitate communication between research workers on the project, many individual grizzlies, both those color-marked and those unmarked but recognizable, have been given names. The names are associated with physical characteristics or behavior traits that are peculiar to particular animals and tend to individualize the animals.

Recaptures: Seven recaptures were made of bears marked in 1959. Ten recaptures were made of bears marked earlier in 1960.

Trapping success for both 1959 and 1960 is presented in Table XIII.

Table X

Marked Grizzly, 1959 - 1960, Family Groups

Family No.	Bear No.	Name	Sex	Age, 1960	Color Marker R. ear	Color Marker L. ear	Neck	Remarks
1	5	Lonesome	F	2 yrs.	purple	purple	yellow	Adopted by sow/w/yearling cub
		Dark sow	F	Adult	unmarked	unmarked		
		Dark yearling	?	1 year	unmarked			
2	6	First cub	F	1 year	yellow loop, green tip	yellow loop, green tip	none	Sow with 3 yearling cubs
	7	Green sow	F	Adult	Green	Green	none	
	51	Cub of # 7	M	1 year	green loop, pink tip	red & white rope	none	
		Cub of # 7	?	1 year	unmarked			
3	10	Light 2 yr. old	F	3 yrs.?	blue	blue	yellow	Group of three light-colored bear
	35	Light bear	M	3 yrs.?	white loop, red tip	white loop, red tip	none	
		Litter mate	?	3 yrs.?	unmarked			
4	15	Yellow R. ear	F	2 yrs.	yellow	none	yellow	Two 2 yr. olds, usually appear together
		Littermate	?	2 yrs.	unmarked			
5	17	Rabbit cr. sow	F	Adult	green	green	none	Sow marked in '59; has 1 cub in '60
		Cub of #17	?	Cub	unmarked			
6	18	Rabbit cr. sow	F	Adult	green	green	none	Sow marked in '59; has 3 cubs in '60
		3 cubs	?	cubs	unmarked			
7	8	Green thumb sow	F	Adult	green	green	blue	Sow marked in '59; has 2 cubs in '60
		2 cubs	?	cubs	unmarked			

Marked Grizzly, 1959 - 1960, Family Groups (Cont.)

Family No.	Bear No.	Name	Sex	Age, 1960	Color Marker R. ear	Color Marker L. ear	Neck	Remarks
8	21	Gardiner collared sow	F	Adult	green	green	none	Sow marked in '59; has 2 cubs in '60
		2 cubs	?	cubs	unmarked			
9	25	50 lb. cub	?	1 year	yellow loop, red tip	yellow loop, red tip	none	Sow with 2 yearlings, one #25 none observed in '60
		Mother of #25	F	Adult	unmarked			
		Littermate of 25	?	1 year	unmarked			
10	26	90 lb. cub	M	1 year	yellow loop, blue tip	yellow loop, blue tip	none	Sow with 3 yearlings, one #26, one #77. (Yearlings pelage "red" in spring of '60)
		Sow	F	Adult				
	77	Littermate	F	1 year	white rope, red flag	white rope, red flag	none	
		Littermate	?		unmarked			
11	29	Sucostrin Kid's sister	F	1 year	yellow loop, white tip	yellow loop, white tip	none	#29 marked in '59; #36 in '60. #36 unobserved since marking.
	36	Sucostrin Kid	M	1 year	white loop, yellow tip	white loop, yellow tip	none	
		Sow	F	Adult	unmarked			
12	32	Collared bear	?	3 yrs.?	Red loop, purple tip	Red loop, purple tip	none	2 collared bears. #32 unobserved since marking.
		Littermate (also collared)	?	3 yrs.?	unmarked			
13	37	Dump Kid	M	2 yrs.	white-green	white-green	none	Family has since broken up - sow weaned cubs (July 3, 1960) 37 & 38 still together Collar of P.C. braided rope on #37
	38	Dump Kid	M	2 yrs.	white-blue	white-blue	none	
	39	Sow	F	Adult	white-purple	white-purple	none	

Marked Grizzly, 1959 - 1960, Family Groups (Cont.)

Family No.	Bear No.	Name	Sex	Age, 1960	Color Marker R. ear	Color Marker L. ear	Neck	Remarks
14	40	3 or 4 yr. old sow	F	3 or 4	yellow-pink	yellow-pink	none	Sow with 2, 3 or 4 yr. olds, one #40. Littermate appears to be male, is much larger.
		Littermate	?	3 or 4	unmarked			
		Sow	F	Adult	unmarked			
15	43	Grizzled cub	M	cub	blue-red	blue-red	none	Grizzled sow and grizzled cubs.
	52	Big cub	M	cub	yellow&black rope-red flag	same	none	
	65	Sow	F	Adult	Blue&white rope, white flag	same	plastic box	
16	48	Black sow ("Abandon")	F	Adult	green-yellow	green-yellow	none	Black sow and cub, sow abandoned cub after marking. Cub now with #53.
	49	Black cub of "Abandon"	M	cub	green-white	green-white	none	
17	53	Cub of Rip-nosed sow	F	cub	yellow rope, red flag	same	none	Rip-nosed sow with 2 cubs, one of them #53. #49, the black cub also with group (adopted)
		Littermate	?	cub	unmarked			
		Rip-nosed sow	F	Adult	unmarked			
18	56	Rabbit Cr. yearling	M	1 year	purple-white	purple-white	none	Old sow with 2 yearling cubs.
	57	Rabbit Cr. yearling	M	1 year	purple-yellow	same	none	
	58	Rabbit Cr. sow	F	Adult	red&white rope yellow flag	same	plastic box	
19	59	Pelican Cr. sow	F	adult	purple-red	same	none	Sow with 1 cub.
		Cub	?	cub	unmarked			

Marked Grizzly, 1959 - 1960, Family Groups (Cont.)

Family No.	Bear No.	Name	Sex	Age, 1960	Color Marker R. ear	Color Marker L. ear	Neck	Remarks
20	70	Cub of white-faced sow	F	cub	yellow rope, green flag	same	none	White-faced sow with one cub
	72	White-faced sow	F	Adult	red & white rope, green flag	same	none	

Table XI

Marked Grizzly, 1959 - 1960, Lone Individuals

No.	Name	Sex	Age	Color marker R. ear	Color marker L. ear	Neck Marker or Collar	Remarks
2	Old Yellar	M	Adult	yellow	same	blue	
12	Inge	M	"	purple	same	pink	One ear marker and neck marker lost
14	Bruno	M	"	purple	none	none	Seen infrequently
20	Boar	M	"	purple	none	green	Observed August 24, 1960
27	Big foot Karen	M	"	red loop green tip	same	none	
28	Shirley	M	"	red loop white tip	same	none	Observed throughout summer of '60. Ear markers broken but recognizable.
30	Biggest Bear	M	"	red loop blue tip	same		" "
33	Large Brown Bear	M	"	red loop pink tip	same		
41	Ivan	M	"	blue loop orange tip	same		Not readily accepted by other bears.
44	Escape	F	"	blue loop green tip	same	none	
45	Jess	F	3-4 yrs.	white loop pink tip	same	none	
46	No name	M	Adult	blue loop pink tip	same	none	
47	Ranger	F	3-4 yrs.	blue loop yellow tip	same	none	
50	Half-century	M	Adult	green loop purple tip	same	none	

Marked Grizzly, 1959 - 1960, Lone Individuals (Cont.)

No.	Name	Sex	Age	Color marker R. ear	Color marker L. ear	Neck Marker or Collar	Remarks
54	-------	F	3-4 yrs.	pink loop white tip	same		
55	-------	F	3-4 yrs.	pink loop green tip	same	none	
60	-------	M	Adult	purple loop blue tip	same	none	
61	-------	F	2 yr.(?)	pink loop red tip	same	none	
62	-------	F	2-3 yrs.	pink loop blue tip	same	none	
63	-------	M	Adult	purple loop pink tip	same	none	
64	Grandma	F	"	pink loop yellow tip	same	none	
66	-------	F	"	blue&white rope white flag	same	none	
67	-------	M	3-4 yrs.	green loop red tip	same	none	
68	-------	M	3-4 yrs.	pink	same	none	
69	-------	M	Adult	purple loop green	same	none	
73	Scar chest	M	"	Black-yellow rope, blue flag	same	none	Has notched ear. Largest bear trapped

Marked Grizzly, 1959 - 1960, Lone Individuals (Cont.)

No.	Name	Sex	Age	Color marker R. ear	Color marker L. ear	Neck Marker or Collar	Remarks
74	------	M	3-4 yrs.	none			Ear tags only.
75	------	F	Adult	white	same	none	
76	Peg Leg	M	3-4 yrs.	none	same	none	Ear tags only

Table XII

Unmarked but Permanently Recognizable Bears
1959 - 1960

I. Recognizable from year to year

	Name	Sex	Age	Characteristics
1.	Scarface	M	Adult	Left ear missing; massive scars on both sides of head. Large male.
2.	Cutlip	M	Adult	Very large male, right lower lip torn, hangs down.
3.	Collared pair	?	?	(One is marked). Very prominent light colored collars. Younger bears (3-5 year olds).
4.	Old Mose (White Claw)	M	Adult	Old appearing male, light colored, very white claws.
5.	Shorty	M	Adult	Large male, very short and stocky, very massive head. Deep, short body.
6.	Scarneck	M	Adult	Large, black male, left ear very short, end of right ear gone, scar on top of muzzle. Scar on right shoulder. Rabbit Creek.
7.	Notch-ear	M	Adult	Large, black male, lower part of left ear gone. Scar on right side. Rabbit Creek.
8.	Old Ear-less	M	Adult	Large, old appearing brown male. Both ears gone, large bare area on right rump. Rabbit Creek.

Unmarked but Permanently Recognizable Bears
Captured and Marked During Summer of 1960.

1.	Scarchest (marked Sept. 8, 1960)	M	Adult	Big brown bear, notched right ear (prominent); left ear slightly notched. Male. Originally had massive scar on chest.
2.	Peg Leg	M	3 - 4	Young bear (3-4 yr. old) light colored. Decided limp on one hind leg (R. or L.?).

Unmarked but Temporarily Recognizable Bears
1959 - 1960

II. Recognizable by family groupings, by pelage color, wounds, etc. (area). Not permanently recognizable as individuals.

	Name	Sex	Age	Characteristics
1.	Mae West	F	Adult	Slighly built black sow with two black cubs. Prominent hump.
2.	Sow with collared Cubs	F	Adult	Cubs have prominent collars (2 cubs).
3.	Highpockets	?	3 - 4	Short bodied, fairly large bear (male?) with very big, high rump.
4.	Brown sow with 2 brown cubs	F	Adult	Whole family a dull brown color.
5.	Sow with 3 very small cubs.	F	Adult	Slightly built sow; cubs are very small, not half as large as average cubs.
6.	Sow with sharp-pointed head with 2 white faced and shouldered cubs.	F	Adult	Slightly built sow with long tapered head; cubs have light colored heads and shoulders.

Unmarked but Temporarily Recognizable Bears
Captured and marked During the Summer of 1960

Note: See dates on family groups.

1.	Ripped-nose Sow	F	Adult	Sow with two white-faced cubs. Nose ripped. (Marked one cub; adopted cub #49).
2.	Grizzled sow with 2 grizzled cubs	F	Adult	No other sow - cub combination similar to this. (Marked this whole family).
3.	Sow with 1 dark cub.	F	Adult	Black sow with 1 black cub. (Marked both - sow abandoned cub).
4.	Sow with 1 white-faced cub.	F	Adult	Combination of light-colored sow and white-faced cub. (Marked both).

Table XIII

Trapping Success

1959	
Trap Nights	21
Successful trap nights	14
Trapping success	76%
1960	
Trap Nights	71
Successful trap nights	51
Trapping success	71.8%

Immobilizing and Anaesthetizing: In 1959, succinylcholine chloride only was used to immobilize grizzly bears (Craighead, et al, 1960). During the summer of 1960, succinylcholine chloride was again used to immobilize bears, but complete anaesthesia was effected by the use of pentobarbital sodium.

Immobilizing: 1959: Intramuscular injections of succinylcholine chloride (strength of 100 mg per cc solution) were made on 32 grizzlies with Co_2 gun and propulsive syringes. Both trapped and free-roaming bears were administered injections in this manner. For both trapped and free-roaming bears this method was quite costly as syringes were usually damaged at short ranges and lost at long ranges.

1960: Trapped Bears--Succinylcholine chloride was administered to 56 trapped bears with a syringe attached to the end of an aluminum pole, as described by Troyer (Verbal, 1960). However, some refinements were made. Troyer experienced difficulty in avoiding breakage when using metal syringes and turned to the more expensive (but more durable) nylon syringe. We experimented with each of these, but found plastic disposable syringes to be the most feasible. These may be obtained in various sizes. We used the 2 cc size, which is inexpensive (about 9¢ each) so the fact that they invariably break on injection is of little consequence. At the suggestion of Ranger Art Hayes, the method of attachment was also refined. A threaded brass bolt, the exact size to fit a 2 cc syringe was fastened securely to the end of a wooden pole. This substituted for the plunger and when the syringe barrel was slipped on, made a more solid arrangement.

A trapped bear's attention was attracted to one side of the trap and another worker quickly "stabbed" the bear through one of several openings in the trap. Injection was usually attempted in the neck - more consistent results were obtained with neck injections.

Various needle lengths were used depending on size of the bear. The most satisfactory needles, however, were 3/4" and 1 3/4". 16 gauge needles were used exclusively.

Free Roaming Bears--Succinylcholine chloride was administered to 8 free-roaming bears with Co_2 gun using propulsive syringes.

Anaesthetizing: The pentobarbital sodium was prepared at a strength of 250 mg per cc. of solution. Nembutal was the brand used. As soon as the bear was sufficiently immobilized with succinylcholine, the pentobarbital was injected. This was done with a 20 cc nylon syringe fitted with a 16 gauge, 3 inch needle. Injections were made intrapulmonarily. Bears coughed lightly as injection was made; the drug's effect was quite rapid, generally putting the bear into a sound sleep within 10 minutes. Details of the method will be reported on later. At least 3 injections were made directly into the heart. The intrapulmonary injections appear to be much safer and to take effect more rapidly than injections made intraperitoneally.

Dosages: Nineteen bears were administered succinylcholine chloride only. The average dosage was 1 mg per 5.62 lbs. of body weight.

Forty-five bears were administered both succinylcholine chloride and pentobarbital sodium. The average succinylcholine dosage was 1 mg per 5.53 lbs. of body weight. The average pentobarbital dosage was 1 cc per 14.91 lbs. of body weight.

Marking: 1959: All bears were ear marked with colored poly-vinyl tape and metal (aluminum) ear tags. (Craighead, op. cit.). Of the 27 bears marked and released in 1959, 25 were accounted for in 1960. An evaluation of the plastic ear streamers is presented in Table XIV.

Bears No. 1 through 22 were also marked with a plastic streamer attached to the scruff of the neck. An evaluation of this type marker is presented in Table XV.

1960: All bears, with the exception of the following, were marked with poly-vinyl tape in each ear. Metal tags were also placed in each ear (exception No. 32, no ear tags).

The following eight bears were marked with polyethylene rope:

No. 52
53
58
65
70
72
73
77

The rope was threaded through a hole cut in the ear with a sharp knife or scapel. It was braided together to form a loop and the ends fused with a lighted match. These markers were tried on an experimental basis and will be evaluated for color retention and durability. Two bears were marked with metal ear tags only. Bears were tatooed in the upper lip and behind the foreleg.

Table XIV

Evaluation of Plastic Ear Markers, 1959 - 1960 (Bears marked in '59)

Bear No.	Sex	Age	Date Marked	Date(s) observed	Condition of right ear marker	Condition of left ear marker
1	M	A	6-26-59	9-1-60	Gone	Tail broken off; loop & small portion of tail intact.
2	M	A	6-27-59	8-3-60 to 9-1-60	Gone	Tail appeared completely gone; loop still intact; visible with scope.
3	F	2 yrs.	6-28-59	7-4-59 (shot)	Excellent	Excellent
4	M	A	7-2-59	7-25-60	Excellent, except tip broken off	Excellent, except tip broken off.
5	F	1 yr.	7-4-59	6-25-60 to 9-2-60	Tail broken off; not visible.	Appeared intact; later tail was broken off.
6	F	cub	7-4-59	6-16-60 to 10-15-60	Not marked in this ear.	Intact, but tip broken off.
7	F	A	7-4-59	6-16-60 to 10-15-60	Tail broken; plainly visible	Same
8	F	A	7-8-59	8-3-60	Intact	Intact
9	F	2 yrs.?	7-9-59	8-16-60	Intact, excellent	Intact, excellent.
10	F	2 yrs.?	7-19-59	6-25-60 to 8-25-60	Tail broken off; plainly visible	Tail broken off; plainly visible.
11	F	1 yr.?	7-19-59	8-1-59 (shot)	Excellent	Excellent
12	M	A	7-21-59	6-17-60 to 8-25-60	Gone	Tail broken off; plainly visible.
14	M	A	7-26-59	9-22-59	Gone	None attached

Evaluation of Plastic Ear Markers, 1959 - 1960 (Bears marked in '59) (Cont.)

Bear No.	Sex	Age	Date Marked	Date(s) Observed	Condition of right ear marker	Condition of left ear marker
15	F	1 yr.	7-27-59	6-16-60 to 8-17-60	Tip broken off; plainly visible.	None attached
16	F	A	7-28-59	7-8-60	Intact	Broken off short, but visible.
17	F	A	7-29-59	7-8-60	Gone	Broken off short, but visible.
18	F	A	7-30-59	7-12-60	Intact	Intact
19	M	2 yrs.?	7-31-59	4-6-60 (shot)	Tip broken off.	Tip broken off.
20	M	A	8-4-59	3-24-60	Gone	Gone
21	F	A	8-5-59	8-24-60	Intact	Intact
22	M	A	8-7-59	10-29-60 (shot)	Intact, excellent	Intact, excellent
25	?	cub	8-20-59	Not observed in '60		
26	M	cub	8-21-59	5-7-60	Gone (later remarked)	Gone (later remarked)
27	M	A	8-22-59	Not observed in '60		
28	M	A	8-28-59	6-16-60	Intact; later lost this marker (7-29-60)	Tip broken off; later lost this marker (7-29-60)
29	F	cub	8-28-59	6-16-60 to 10-19-60	Broken off very short, barely visible	Gone
30	M	A	9-10-59	6-16-60 to 8-31-60	Intact	Intact

Table XV

Evaluation of Neck Marker, Bears Marked in 1959

Bear No.	Sex	Age	Date Marked	Date(s) observed	Condition of marker and site (if observed)
1	M	A	6-26-59	9-1-60	Gone
2	M	A	6-27-59	8-3-60	Gone
3	F	2 yrs.?	6-28-59	7-4-59 (shot)	Excellent
4	M	A	7-2-59	7-25-60	Tip broken off; site not healed.
5	F	1 yr.	7-4-59	6-25-60	Gone
6	F	cub	7-4-59	6-16-60	Tip broken off; site infected; marker removed.
7	F	A	7-4-59	6-16-60 to 10-15-60	Intact, but tip appears to be broken off.
8	F	A	7-8-59	8-3-60	Intact, appears excellent
9	F	2 yrs.?	7-9-59	8-16-60	Gone
10	F	2 yrs.?	7-19-59	6-25-60 to 8-25-60	Appears good.
11	F	1 yr.?	7-19-59	8-1-59 (shot)	Excellent
12	M	A	7-21-59	6-17-60 to 8-25-60	Gone
15	F	1 yr.	7-27-59	6-16-60 to 8-17-60	Appears good.
16	F	A	7-28-59	7-8-60	Gone
17	F	A	7-29-59	7-8-60	Gone

Evaluation of Neck Marker, Bears Marked in 1959 (Cont.)

Bear No.	Sex	Age	Date Marked	Date(s) observed	Condition of marker and site (if observed)
18	F	A	7-30-59	7-12-60	Appears good.
19	M	2 yrs.?	7-31-59	4-6-60	Good; tip broken off
20	M	A	8-4-59	8-24-60	Gone
21	F	A	8-5-59	8-24-60	Appears intact
22	M	A	8-7-59	10-29-59 (shot)	Excellent

Summary of Marking Technique, 1959

Colored Plastic Ear Markers:

Total number ear markers attached in 1959	51
Total number ear markers lost by 1960 (Approx. year later)	10
Total number ear markers intact in 1960	18
Total number ear markers broken but visible in 1960 . . .	16
Total number ear markers broken and not readily visible in 1960	3
Total number ear markers accounted for in 1960	47*

* (2 bears, No. 25 and No. 27, were not observed in 1960. Each had 2 ear markers attached.)

Neck Marker:

Total of 20 bears marked with neck marker and released.	
Total number neck markers lost by 1960	8
Total number neck markers retained	12*

* (3 of these 12 bears were killed by hunters during the summer and fall of 1959, a relatively short time after being marked. Of the 9 bears carrying neck markers into and from hibernation, 4 markers were broken but easily visible. Five markers appeared to be intact).

Metal Ear Tags: Twenty-seven bears were marked with metal ear tags and released. Of these, 25 bears were accounted for. The metal ear tags were retained in all cases with the exception of one, No. 9. This bear had lost both tags, but had retained both colored plastic ear markers.

Tatoo: Thirteen bears were tattooed behind the foreleg in 1959. Three of these were examined some time after tattooing - two in 1959 and one in 1960. Of the two examined in 1959, one tattoo was easily readable, the other was unintelligible. The tattoo examined in 1960 was easily readable.

Forty bears were tattooed behind the foreleg or in the upper lip or both in 1960. A number of these animals were inspected some time after marking and in most cases, the tattoo was easily readable.

Dental Impressions: A Method for obtaining dental information useful in aging grizzly bears without sacrificing the animal was employed in 1960. Dental trays were fashioned from heavy aluminum foil. This was generally accomplished in a few minutes after a bear had been anaesthetized; the trays could then be readily adjusted to fit the teeth and jaws. Four impressions were usually made: the upper incisors and canines, the lower incisors and canines, the upper premolars and molars, and the lower premolars and molars. Elastic impression material was used to make all impressions and casts were poured with dental stone.

Impressions were made on 37 different individuals in 1960.

Blood Samples: Blood samples were taken from 30 different individuals. These were obtained on filter discs and dried for future study.

Milk Samples: A sample of milk from a lactating female was obtained for Dr. Robert Jenness, University of Minnesota.

Sternal Puncture: A sternal puncture was made on two individuals to obtain dividing cells, and the material was sent to Dr. Otto Stein at Montana State University for study.

Cardiograph: Cardiographs of a young female and a fairly old male were made by Harold Braun, Missoula heart specialist, and E. W. Pfeiffer, professor of physiology at Montana State University. The bears were anaesthetized for this purpose and the operation demonstrated that cardiographs and other types of physiological information could be taken routinely from anaesthetized bears.

Autopsies: Autopsies were made on both grizzly and black bears shot by park personnel. Dr. Berthrong, pathologist at the University of Colorado Medical Center made a number of autopsies and collected adrenals, thyroid, and aortas for study. Blood samples were taken and more attention will be given this in the future.

Radio Tracking: Several methods of attaching radio transmitters to grizzlies were tested. Under-skin attachments using poly-vinyl tape, nylon line, and copper and brass wire were tried. The vinyl tape appeared to be most satisfactory, but results are not yet conclusive.

An adjustable collar made of polyethelene braided rope proved very satisfactory and dummy transmitters remained intact throughout the summer.

Testing Radio Tracking Equipment:

I. The following tests were made with a transistorized crystal controlled transmitter designed for tracking grizzly bears. A two turn loop antenna with a diameter of approximately 9" was used with the transmitter, following directions provided.

The first test was made at Mammoth, Yellowstone Park, starting at 10:55 a.m. on October 19. The receiver was a Hallicrafter mod sx-42 with a long horizontal wire antenna. It was housed in the radio shop which in turn was surrounded by other buildings. The field strength indicator was kept in the radio house and the transmitter was carried in a car. Communication was maintained by means of two-way voice radio. These were portable sets. The road was winding and climbed rapidly. Stops were made at what seemed to be appropriate spots. The transmitter was carried off approximately 100 feet from the car and was turned off or on as directed by the man at the receiver. Tests were run at the following stations:

Station	Road Mileage	Est. straight line mileage	F.S.I. Reading	Receiver Halcft BFO
1	.7 mi	.5 mi (behind hill)	4	signal recd.
2	1.0 mi	.75 mi	0	signal recd.
3	1.5 mi	1.25 mi	3-4 max sensit.	signal recd.
4	2.6 mi	1.75 mi (behind hill in scattered timber)	0	no signal
5	2.9 mi	2.0 mi approx.	1-2	no signal

By turning the transmitter on and off it was determined that signals from the last two stations were not ours.

Ham interference increased and after further checking we were doubtful if we could say that any of the signals received at stations 3-5 were definitely from our transmitter.

At 11:30 another test was made, this time driving downhill. We kept the transmitter on and were able to identify the signal at a distance of .8 mi. Ham interference made it impossible to identify the signal at a greater distance.

We next tried to see how far we could pick up the signal with the field strength indicator alone. This test was conducted in open sagebrush country. The maximum distance was .4 mi. The indicator read 1 at maximum sensitivity. Even on this test it was difficult to identify the signal due to interference.

The above tests were made with the help of Mr. Fred Dennison who is charged with keeping the Park's radio system operating and the equipment maintained.

Mr. Dennison checked the 32 Mc frequency on the Hallicrafter and said it sounded much better than 28 megacycles.

After these tests Mr. Dennison had several suggestions to make. He felt we needed more power and should go to 100 milliwatts. He also thought that the citizen band might be better as he knew of no sets around Yellowstone other than tourists passing through. He felt we would get less jamming or interference.

II. On October 20 at 8:00 a.m. we conducted tests in the vicinity of Trout Creek. This is an area inhabited by a large number of grizzlies during the summer months and would be the location we would pick for first instrumenting a bear. No portable BFO receivers were available so this test was made with the field strength indicator only.

At maximum sensitivity a signal of 0-1 was received at .1 mi. This was determined by turning the transmitter switch on and off.

A similarly weak signal was received at a little over .25 mi. The first test was on the level and the transmitter always in sight. The second was in rolling country where the transmitter was out of sight for the latter half of the distance but in sight again at maximum distance.

A signal was received from behind a high mound of earth at a distance of 150 yards.

At 150 yards a stronger signal was received when the transmitter was behind but close to a large lodgepole pine than when moved out into sight. Apparently the tree acted as an aerial.

All tests were conducted with the axis of the loop pointing toward the receivers.

III. On October 22, we were able to get the use of another BFO Hallicrafter receiver, located in Jackson Hole. This was a model S-76. A headset was used to pick up the signal.

In this test the transmitter was carried away from the receiver by walking in a straight line. At stations located at 100 foot intervals the transmitter was turned on and kept on for 20 seconds. Arrangements had been made to ring a siren when the signal could no longer be heard or identified. The signal was heard up through the tenth station or at a distance of 1000 feet. At the eleventh station, or 1100 feet, another signal came in and the signal could not be identified. The signal dropped off rapidly at first but after this initial drop it did not fall off much. The receiver operator, who is an experienced radio man, thought that with a sensitive receiver this particular signal could be picked up between 1 and 2 miles away.

These tests, as well as the former ones, indicated that the collar or loop antenna is quite directional and that the signal intensity varies greatly with the position of the transmitter loop antenna. It might be difficult, or at times impossible, to locate a bear even a short distance away if he were heading toward or going directly away from the receiver. This difficulty can probably be overcome by the use of two or more receivers.

Attempts were made to get a bearing on the known position of the transmitter by rotating the F.S. indicator and its loop antenna. With minimum readings on the dial, the axis of the indicator loop sometimes pointed in the direction of the transmitter but very often did not.

IV. On October 26, 1960, we retrapped grizzly No. 75. This was a mature female weighing 365 lbs. She was fat and in good condition prior to going into hibernation. The circumference of her neck was 29". Her head and neck were just a little too big for the transmitter collar to fit over comfortably. It would have made a very tight squeeze going over her ears and once over would have impeded respiration.

We were anxious to determine whether the strength of the signal might vary when the transmitter loop was put over her head or neck. We accordingly conducted the following tests:

1. The strength indicator was adjusted to the mid point of 12 with the transmitter and antenna loop held above the grizzly's head. The bear's head was then lifted and the collar was slipped over the head as far as it would go. The transmitter and collar were held in the same position. With the collar around the bear, the indicator reading dropped to $1\frac{1}{2}$.

2. With the bear lying on her side and sleeping the collar was held six inches above the bear and with the loop parallel to the ground. The reading on the indicator was adjusted to 12. The collar and transmitter were then dropped down to rest on the side of the bear. The indicator reading then dropped to 3.

3. The bear's left front leg was lifted up and the transmitter loop was put around the leg. The axis of the loop was pointed toward the indicator and the loop was at right angles or perpendicular to the ground. In this position the indicator read 9. With the transmitter and indicator in the same positions but the loop off the leg the indicator reading was 25 plus.

4. The field indicator was placed 50 feet from the bear and adjusted to maximum sensitivity. The transmitter loop was placed on the bear's side with the loop parallel to the ground. The indicator read 2-3. In the same position but 6" above the bear the indicator read 1/2.

This same test was conducted again but this time the axis of the transmitter loop was pointed toward the indicator with the loop perpendicular to the ground. The sensitivity had to be lowered. With the transmitter loop above the bear the reading was adjusted to 12. With the loop resting on the bear the reading dropped to 5.

5. The field indicator was placed 100 feet from the bear and was set at maximum sensitivity. The transmitter loop was held above the bear and parallel to the ground. Twelve inches above the bear the indicator read 25. When dropped down in the same position to rest on the bear the reading was 4.

This was repeated with the loop perpendicular to the ground and the axis toward the indicator. The reading with the transmitter loop on the bear was 25 plus. The reading 12" above the bear was also 25 plus.

The sensitivity was then reduced until the indicator read 12 when the transmitter loop was held in the same position above the bear as in the previous test.

With the loop on the bear the reading was 12. In this case there was no drop in the strength of the signal.

Additional tests are in progress, however we tentatively conclude that with equipment currently available tracking could be effective up to five miles with the 32 Mc frequency. There is evidence that a transmitter and receiver for the 2 meter band might give additional range. More details will be presented in future reports.

Cooperation from National Park Personnel: The administrators and personnel of Yellowstone National Park gave the project full support. Housing was furnished, and assistance given whenever required. This support has been instrumental in the successful conduct of the research.

Public Education: The various aspects of the project have been thoroughly documented with photographs. These are being used for both scientific and popular presentation of the research findings. They are invaluable in maintaining public understanding and support.

Phase III. Short-Range Objectives: This phase will be largely devoted to accomplishing short-range objectives, but maintaining continuity of effort and laying the groundwork for long-range objectives. Time (2-4 years).

Objectives: 1. To develop techniques and methodology; 2. To determine population density and the carrying capacity of the range in Yellowstone National Park; 3. To determine present population level and structure and the effect this may have, if any, on reproduction; 4. To observe and record breeding behavior of marked individuals in a population; 5. To determine mortality rate of adults, yearlings, and cubs, and relate this to habitat condition and population density; 6. To record movement and territorial behavior of marked individuals and of family groups.

Subphase A: A Study of Grizzly Bear Population Structure and Behavior. Project Leader: John J. Craighead. Student Investigator: Maurice Hornocker, Graduate Fellow.

Objectives: 1. To capture, mark, and release grizzly bears for field observation; 2. To determine the total population, population structure and density within Yellowstone National Park; 3. To observe and record behavior of individuals and family groups in a population; 4. To determine the natality and mortality of the population; 5. To record movements of individuals and of family groups.

The student investigator, while concentrating principally on the above objectives, has necessarily participated in and assisted with all aspects of the project.

Description of Conditions: Yellowstone National Park was investigated and found to have a wild grizzly population sufficiently free of artificiality that fundamental biological data could be obtained and on a quantitative basis. Grizzlies are numerous there, readily observable, and can be studied both in the vicinity of man and in the back country.

Skinner (1925) notes that as early as 1889 black bears, Ursus americanus, in Yellowstone began to frequent garbage piles but it was not until three or four years later that grizzlies followed their example. On August 2, 1916, he had 29 grizzlies in sight - the most he had ever seen at one time. At about this time he estimated a total of 40 grizzlies in Yellowstone. His descriptions of the grizzlies in those early days indicate the relations of these bears to man and to artificial food in the park have changed little if any in the past 50 to 60 years. Regarding this he says, "Three-fourths of the bears we ordinarily see in the park are near scrap piles, yet it is evident that this is not their principal food, or even any considerable part."

In 60 years of close association with man, the grizzlies in Yellowstone have not basically changed their behavior nor their habits. They have not become "roadside bums" like the black bear. From June through September they frequent the half dozen large garbage dumps chiefly during evening and night. Early in the season the bears are wary and come to the dumps only at night. Soon they get bolder and some begin arriving in the afternoon. This habit of concentrating where food is available has been characteristic of the grizzly from the time his numbers and behavior were first recorded and there are innumerable references to this in the literature. Storer and Trevis (1955) in citing early writers, quote such phrases as . . . "regiment of bears", . . . "countless troops", . . . "bears are very plentiful", . . . "are often seen in herds," . . . "not unusual to see fifty or sixty within twenty-four hours" . . . "the whole lake and swamp seemed alive with bears." These and numerous similar expressions referred to the California grizzly.

"Many early accounts tell of the grazing habits of grizzles. The bears congregated locally to forage in wild pastures and made seasonal migrations to such places." (Storer and Trevis, op. cit.). The same authors summed up the gregarious behavior of the California grizzly in these words, "But when grizzlies congregated with their kind to relish some desirable food - clover, acorns, or whale - they ate together peaceably."

Food disposal areas attract bears in Yellowstone, just as the salmon streams of Alaska concentrate the Alaskan brown bear, Ursus middendorfii during the spawning runs. While feeding at these areas some bears are indifferent to man, but most are alert and sufficiently shy to run at the least disturbance.

Skinner (1925) states, "Out in the wilderness that covers so much of the Yellowstone National Park, they (grizzlies) are just as wild, just as cautious, and just as difficult to find as bears anywhere else." This statement is essentially true today.

It seems the grizzlies' habit of concentrating where food is abundant and of seeking it boldly in the vicinity of man is not of modern origin.

With regard to their food, Skinner (op. cit.) says of grizzlies in Yellowstone . . . "grass is eaten as much, if not more, than any other single item, and this is true of the lordly grizzly as well as of the common bear . . . bears do not depend upon garbage."

Murie (1943 unpublished) studied the food habits of Yellowstone grizzlies and black bears and concluded that vegetation comprises 81 per cent of their food and garbage 6 per cent. He stated, "It was found too, that even at the camp grounds, where bears habitually sought garbage, natural food still constituted 89 per cent, garbage 10 per cent." Our examinations of grizzly bear feces at disposal areas during the summer of 1959 indicated heavy use of natural foods. The situation in Yellowstone where grizzlies concentrate to feed on garbage is not as artificial a condition as first appears.

It is the grizzlies' nature to scavenge and to congregate whenever food is available and we believe these natural traits of the grizzly are intensified under the conditions prevailing in Yellowstone. We seriously doubt if this will invalidate the basic data we plan to obtain; in fact, the behavior of grizzlies in Yellowstone is so reminiscent of the early accounts of the California grizzly as they came in contact with the settlers (Storer and Trevis, 1955) that we suspect "historic" bear and man relationships have been preserved rather than altered in Yellowstone National Park.

Count Sites: A total of 37 counts were made at the different concentration sites during the summer and fall:

Site	No. Counts
Trout Creek	24
Rabbit Creek	6
West Yellowstone . .	3
Gardiner	2
West Thumb	2

There are several reasons for the greater number of counts at Trout Creek. This site is located in Hayden Valley, a large area of optimum bear habitat located in the geographical center of the Park. Subsequently, a greater number of bears are attracted to this area. Because of the open nature of the country, observations are more easily obtained here, and thus intensive operations were centered in the Trout Creek area. Bears become accustomed to the observer's vehicle and ignore it. The other concentration sites are located in or close to heavily timbered areas. Bears here are more wary. Counts may be made with accuracy, but other data is more difficult to obtain.

In addition to ground counts, four flights were made in 1960. These were made to test the feasibility of air counts, to inspect bear habitat, and to check bear movement. It was found that total counts could not be made accurately from the air. However, individuals marked with colored plastic ear

streamers were distinguished from the air. This should be of value in the future for recording movement of marked individuals. These flights also gave the observers an excellent picture of the habitat in Yellowstone that could be gained in no other manner.

Flights were made in the evening on:
July 15
August 9
September 8
September 11

Counts: The number of counts and census figures for each of the concentration areas are presented in Table XVI. These counts indicate a minimum of 169 grizzlies in Yellowstone National Park and immediate vicinity.

Classified Counts: Classified counts were made in both 1959 and 1960 as follows:

Cubs of the year,
Yearlings,
Two year olds,
Three or four year olds, and
Adults

It is believed that reasonably accurate counts can be made of two year olds and three-to-four year olds in the field. The criteria for distinguishing these age classes will be checked against marked known-age animals in the population. At the present time, however, our classified counts are accurate only in the cub, yearling and adult age classes.

Table XVI

Census, 1959 and 1960

Site	1959 No. Counts	1959 No. Bears	1960 No. Counts	1960 No. Bears
Trout Creek	17	96	24	98
Rabbit Creek	2	22	6	40
West Yellowstone	2	27	3	16
Gardiner	2	9	2	9
West Thumb	--	--	2	4
Pelican Creek			None	2*
Totals	23	154	37	169

* Female w/1 cub captured here.

Technique of Observing Marked Grizzlies: The value of marked animals in a population being studied has been well demonstrated in the literature. A permanent marker which is readily observable in the field makes this technique much more useful. Life history data may be obtained without the necessity of laborious retrapping or sacrificing of animals. In addition, animals marked in this manner may be observed in their natural environment without disturbing them, and data obtained on certain types of behavior otherwise difficult or impossible to obtain.

The situation previously described in Yellowstone lends itself ideally to this technique. For approximately two months during the summer, large concentrations of grizzlies can be readily observed. Observations were made from the same vantage point at each of the concentration sites. In addition observations were made afoot throughout much of the grizzlies' summer range.

Observations on Marked Bears, 1959: A total of 160 observations was made on marked individuals in 1959.

Adequate records were not kept on unmarked but recognizable individuals in 1959. Later, the value of these observations was realized, and complete records were kept in 1960.

Observations on Marked Bears, 1960: A total of 546 observations was made on marked bears in 1960. This included bears marked in both 1959 and 1960.

Of these 546 observations, 17 were obtained by retrapping the bears. This leaves a total of 529 observations made on individually marked, free-roaming animals. Thus the use of a color marker greatly increased the possibilities for observations on individual animals. Maximum number of observations on an individual was 34, the minimum was 1.

Of the 27 bears captured and released in 1959, 25 were accounted for:

2 were shot by rangers in 1959 when they entered campgrounds;
2 were shot by hunters outside Park boundaries, one (October 29) 1959 and one April 6, 1960;
1 died as a result of the drug (recapture, Sept. 2, 1960);
1 was shot as a nuisance bear on Aug. 3, 1960.

Thus, of the 27 bears marked and released in 1959, 23 were present when field work began June 15, 1960. Of these 23 marked individuals, observations were obtained on 21. Number 25, a cub when marked, and No. 27, an adult, were not accounted for in 1960. A total of 271 observations were obtained on these 21 bears. Of the 271, 7 were obtained by retrapping, leaving a total of 264 observations made on free-roaming individuals.

Forty-four bears were marked and released in 1960. Of these 44, 28 were subsequently observed. Since many of these bears were marked after dispersal from the concentration areas had begun (about Aug. 10), it was not expected that all newly marked bears would be sighted. However, 2 bears, No. 32 and No. 36, both marked late in June, were never seen after marking. No other bears marked before Aug. 1 escaped observation.

Two hundred seventy-five observations were made on these 28 bears. Of these 275, 10 were obtained by recapturing, leaving 265 observations made on free-roaming individuals.

Observations on Unmarked but Recognizable Bears, 1960: A total of 173 observations was made on unmarked but recognizable bears. Of these 135 were made on permanently (year to year) recognizable individuals, and 38 were made on temporarily recognizable individuals.

Thus, a total of 719 observations was made on individual animals during 1960.

Behavior: In making the number of observations tabulated, practically all aspects of grizzly bear behavior were recorded. No attempt is made here to describe or interpret the various types of behavior - the discourse would be quite lengthy and subject to change as the study progresses. However, it is believed that the quantitative approach will greatly strengthen any final conclusions or interpretations made of particular types of behavior. Table XVII presents the number of occasions on which each type of behavior was witnessed.

Table XVII

Number of Occasions on Which Particular Behavior Types were Observed, 1960

Type of Behavior	Number of Different Occasions Observed*
Social	52
Family	58
Reproductive	13
Trapped Bear	96
Defense of Food	15

* In recording social behavior, the interaction of the entire social structure was considered. On 58 different occasions, observations were made when at least one, and often as many as 12, family groups were involved. Trapped bear behavior includes 32 bears trapped in 1959. All 15 observations on defense of food were made in remote areas of the Park, some distance from the concentration sites.

In addition to the above, observations were made on seasonal behavior, behavior toward other animals, and other behavior that appeared significant.

Concentration, Dispersal, and Movement: It became apparent in 1960 from animals marked in 1959 and from observations of other recognizable individuals, that many, perhaps most, of the Yellowstone grizzlies do not inhabit areas close-by the summer concentration points. With the greater number of marked animals now in the population and from work accomplished in the spring and fall of 1960, it is becoming increasingly evident that grizzlies inhabit particular areas of the Park by season. Definite seasonal movement patterns have been established on a few individuals and family groups. More data will be collected on this in the future.

Movement from Hibernating Areas: Records on marked individuals are as yet inconclusive. However, Rangers and maintenance personnel report a seemingly general trend of movement from the relatively high areas in the northeastern part of the Park toward Hayden Valley. The writer and project leader visited the Park in early May, 1960. Tracks and sign indicated that a number of bears were following this route.

Movement to Spring Feeding Areas: Movement in the early spring appears to be to areas where food is most easily obtained. Extensive open park-like meadows, many of them supporting a grass-sedge vegetative type, occur throughout much of Yellowstone and bears are attracted to these. Family Group No. 10 was observed feeding in one of these meadows May 7 and 8. Park personnel report grizzly sightings in many similar meadows in early spring.

Movement to Summer Feeding Areas: By mid-June, in both 1959 and 1960, bear numbers at Trout Creek had built up to about 50 individuals. This buildup continued until 96 known individuals were frequenting the area in 1959 and 98 were present in 1960. The peak was reached on July 31, 1959 and on August 8, 1960.

Dispersal in Fall: A gradual decline in bear numbers began in both 1959 and 1960 by mid-August. The availability of natural food at this time, principally white-bark pine nuts (Pinus albicaulis) may be a factor in this dispersal. A sharp decline was witnessed at Trout Creek in early September in both years, and by mid-September, only a fraction of the original peak number was still frequenting the area.

It is felt that a number of bears may move outside Park boundaries to hibernate. Records on marked animals are as yet inconclusive; however, in 1959, an adult male trapped at Thumb was shot by a hunter outside the east boundary of the Park. Airline distance from Thumb was approximately 50 miles, but due to the rugged terrain it was necessary for this bear to travel a greater distance than 50 miles. In 1960, a large male trapped at Rabbit Creek was shot at Hawk's Rest in the Teton National Forest, Wyoming. This was a distance of 55 airline miles from Rabbit Creek, but again it was necessary for this animal to travel much farther. Movements of grizzlies from the Park are further substantiated by the fact that they are encountered in areas outside the Park in the fall where none are sighted earlier in the summer. With the greater number of marked animals now in the population, data on this movement will undoubtedly be strengthened in the future.

Daily Movement: Quantitative data on marked individuals is as yet lacking, but the daily movements of a few individuals have been plotted. A marked bear observed at 8 P. M. was sighted at 11 P. M. the same day approximately 12 miles distant. This same animal was sighted in different areas approximately 20 miles apart on succeeding days.

The area within a radius of 2-4 miles around the Trout Creek concentration has been inspected carefully. Only two bears were sighted on four different inspections (different directions from the concentration site) and very little sign observed. Well-used trails leaving the disposal area disintegrate at a distance of approximately two miles and apparently individuals and family groups go their own way. It is believed that by far the greater number of grizzlies travel, daily, more than four to five miles from the area, and that many of them travel 12 to 15 miles. More data will be collected on this in the future.

Induced Movements and Distances Traveled: Movement was induced in a number of individuals by trapping them in one area and releasing them elsewhere. These data are presented in Table XVIII.

In most cases, bears returned to the area where captured.

Table XVIII

Induced Movement and Distance Traveled

Bear No.	Area Captured	Area Released	Date Released	Date Observed	Area Observed	Distance From Area Where Released (Airline miles)
4	Thumb	Trout Creek	7-2-59	7-5-59	Thumb	15-20 miles
	Thumb	Carnelian Cr.	7-11-59	7-14-59	Trout Creek	15-20 miles
	Pelican Creek	Trout Creek	7-25-60	7-27-60	Pelican Creek	10 miles
	Pelican Creek	Rabbit Creek	7-27-60	8-2-60	Pelican Creek	18-20 miles
11	Canyon	Crystal Creek	7-19-59	7-28-59	Fishing Bridge	35 miles
12	Fishing Bridge	Crystal Creek	7-21-59	7-24-59	Trout Creek	30-35 miles
8	Thumb	Trout Creek	7-8-59	7-24-59	Rabbit Creek	18-20 miles
9	Thumb	Trout Creek	7-8-59	8-16-60	Thumb	15-20 miles
47	Thumb	Trout Creek	7-23-60	8-18-60	Shoshone Lake	20 miles
1	Thumb	Trout Creek	6-26-59	9-1-60	Old Faithful	18 miles

Natality: 1959: Fifteen sows were observed to have 26 cubs, making an average sow-cub ratio of 1:1.73. Litter sizes ranged from 1 to 3, but one sow was observed with 4 yearlings. These may not have all been her own; two cases of adoption have since been observed. Eighteen of these cubs were observed at Trout Creek.

1960: Seventeen sows were observed to have 35 cubs, making an average sow-cub ratio of 1:2.06. Seventeen cubs were observed at Trout Creek, 1 less than in 1959.

Mortality: Marked bears killed in both 1959 and 1960 and the cause of death are presented in Table XIX.

In addition to marked bear killed in 1959, an unmarked adult male was shot by Park personnel and a yearling male was trapped and sent to a zoo. Records on mortality are incomplete prior to June 20, 1959. Official Park records for this period will be inspected.

In 1960, 3 unmarked grizzlies were killed within Park boundaries. Seven bears were killed and 2 severely wounded by hunters on the Park's borders.

A questionnaire-type letter, containing information about the project and asking for information on any grizzly killed or sighted, is being prepared. This will be mailed to all packers and outfitters guiding hunting parties in areas bordering the Park in both Montana and Wyoming.

Table XIX

Marked Bears Deceased 1959 - 1960

No.	Name	Sex	Date Marked	Date Killed	Where Marked	Where Killed	How Killed
3		F	6-28-59	7-4-59	Trout Ck.	Lake	Shot by Rangers
4	Andy	M	7-2-59	8-8-60	Trout Ck.	Trout Ck.	Shot by Rangers
11		F	7-19-59	7-31-59	Crystal Ck.	Fishing Bridge	Shot by Rangers
13	Old Bear	M	7-24-59	7-24-59	W. Yellowstone	W. Yellowstone	Drug
19	Gardiner Bear	M	7-31-59	3-6-60	Gardiner	Gardiner	Shot by citizen in Gardiner
22	One Eye	M	8-7-59	10-6-59	Trout Ck.	S. W. of Cooke	Shot by hunter
23	Sow	F	8-10-59	8-10-59	Trout Ck.	Trout Ck.	Drug
24	Cub	M	8-11-59	8-11-59	Trout Ck.	Trout Ck.	Drug
31	Sow	F	6-19-60	6-19-60	Rabbit Ck.	Rabbit Ck.	Drug (Hazard bear)*
47	Young sow	F	7-23-60	8-6-60 (?)	Trout Ck.	Shoshone Lake	Unknown (probably shot by tourist)
1	First Bear	M	6-26-59	9-2-60	Trout Ck.	Trout Ck. (captured at Old Faithful camp gr.)	Drug (Hazard bear)*
71	Cub	M	9-2-60	9-2-60	Trout Ck.	Trout Ck. (captured at Old Faithful camp gr.)	Drug (Hazard bear)*

* Note: Designated for shooting by rangers. In an attempt to save these bears they were shot with propulsive syringes in or near campgrounds. Because of the danger involved and the hazard to campers should the drug dose prove insufficient, a heavier than normal dose of succinylcholine chloride was used. All bears survived the initial dose but succumed to a second dose. A stress factor may be involved.

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