YELLOWSTONE GRIZZLY BEAR INVESTIGATIONS

ANNUAL REPORT OF THE INTERAGENCY STUDY TEAM
1992

National Park Service
U.S. Forest Service
Montana Fish, Wildlife and Parks Department
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INTRODUCTION

The Interagency Grizzly Bear Study Team (IGBST) was initiated in 1973 and is a cooperative effort of the National Park Service, Forest Service, and since 1974 the States of Idaho, Montana, and Wyoming. The IGBST conducts research that provides information needed by various agencies for immediate and long-term management of grizzly bears (*Ursus arctos horribilis*) inhabiting the Yellowstone area. With increasing demands on most resources in the area, current quantitative data on grizzly bears are required for formulation of management decisions that will insure survival of the population. IGBST annual reports are intended to facilitate the timely transfer of research results and perspectives to management of the population.

Objectives of the study are to determine the status and trend of the grizzly bear population, the use of habitats and food items by the bears, and the effects of land management practices on the bear population. Earlier research on grizzlies within Yellowstone National Park provided data for the period 1959-87 (Craighead et al. 1974). However, changes in management operations by the National Park Service since 1987 - mainly the closing of open pit garbage dumps - have markedly changed some food habits (Mattson et al. 1991), population parameters (Knight and Eberhardt 1985), and growth patterns (Blanchard 1987).

Distribution of grizzly bears within the study area (Basile 1982, Blanchard et al. 1992), movement patterns (Blanchard and Knight 1991), food habits (Mattson et al. 1991), and habitat use (Knight et al. 1984) have been largely determined and are now being studied on a monitoring and updating level. Efforts are being concentrated on gathering population parameter data, determining behavior patterns, and assessing the effects of land use practices.

Movement data conclusively indicate that the existence of semi-autonomous population segments is unlikely and that the determination of population size will be difficult due to the average home range sizes of individual bears (cf. Blanchard and Knight 1991). Population trend indices appear to be more meaningful and measurable than a number estimate (Eberhardt et al. 1986). Research is ongoing in the attempt to document a sensitive and reliable trend index .

Data analyses and summaries presented in this report supersede all previously published data. Study methods are reported by Blanchard (1985) and Mattson et al. (1991). The study area has been described in detail by Blanchard and Knight (1991) and Mattson et al. (1991).

RESULTS AND DISCUSSION

Monitoring/Population Trend

Marked Animals

Sixteen individual grizzly bears were captured and marked during 1992 (Table 1), including 6 females (5 adult) and 10 males (7 adult). Ten of the 16 had not been marked previously. Fifteen captures were a result of research efforts and were released on-site. One adult male was captured in a management action resulting from livestock predation. This bear was radio-marked and released on site.

A total of 41 grizzly bears were monitored for varying intervals during 1992, including 14 adult females. A maximum of 11 adult females were monitored consecutively during October and November and were wearing active transmitters at denning.

Unduplicated Females

One method of monitoring population trend is recording the number of unduplicated females with cubs-of-the-year (COY) each year. A summary of procedures used to determine whether or not observations are duplicates were reported by Knight et al. (1989). Detailed discussions of methodology and biases are presented by Knight (in prep.).

Twenty-three unduplicated females with COY were observed in 13 Bear Management Units (BMUs) within the Recovery Zone during 1992 (Fig. 1). The current running 6-year average (1987-92) for the entire study area is 20 females/year with an average litter size of 2.16 cubs compared to an average of 15 females/year with an average litter size of 1.98 for the entire study period (Table 2). This 6-year average has steadily increased from 12 females/year during the period of 1973-78 to 20 during the period 1986-92.

Table 1. Grizzly bears captured during 1992.

Bear	Sex	Age	Date	Location[a]	Release site	Trapper
184	M	11	4/13	DuNoir R, Diamond G Ranch, SNF	On site	WY
185	M	6	4/14	Six Mile Creek, SNF	On site	WY
197	F	8	5/25	Long Creek, SNF	On site	WY
198	M	19	5/25	Long Creek, SNF	On site	WY
199	M	3	6/20	Frontier Creek, SNF	On site	WY
101	F	10	7/13	Richards Pond, YNP	On site	IGBST
104	F	10	7/24	North Fork Shoshone, SNF	On site	WY
163	F	8	8/1	Wiltse cabin, Pahaska, SNF	On site	WY
200	M	10	8/4	Wapiti Creek, GNF	On site	IGBST
201	M	2	8/6	Wapiti Creek, GNF	On site	IGBST
202	F	4	8/18	Eldridge Creek, GNF	On site	IGBST
203	M	12	8/25	Flagstaff Creek, BTNF (mgt)	On site	WY
140	M	13	9/27	Mesa Pit, YNP	On site	IGBST
204	M	2	10/1	Grebe Lake road, YNP	On site	IGBST
205	F	8	10/5	Hayden Valley, YNP	On site	IGBST
206	M	18	10/26	Antelope Creek, YNP	On site	IGBST

	Females	Males
Adult	5	7
Subadult	1	3

	Females		Males	
	Ad	SAd	Ad	SAd
Research	5	1	6	3
Management			1	

New bears: 10
Total individual bears: 16

[a] BTNF = Bridger-Teton National Forest, GNF = Gallatin National Forest, SNF = Shoshone National Forest, YNP = Yellowstone National Park, (mgt = management action).

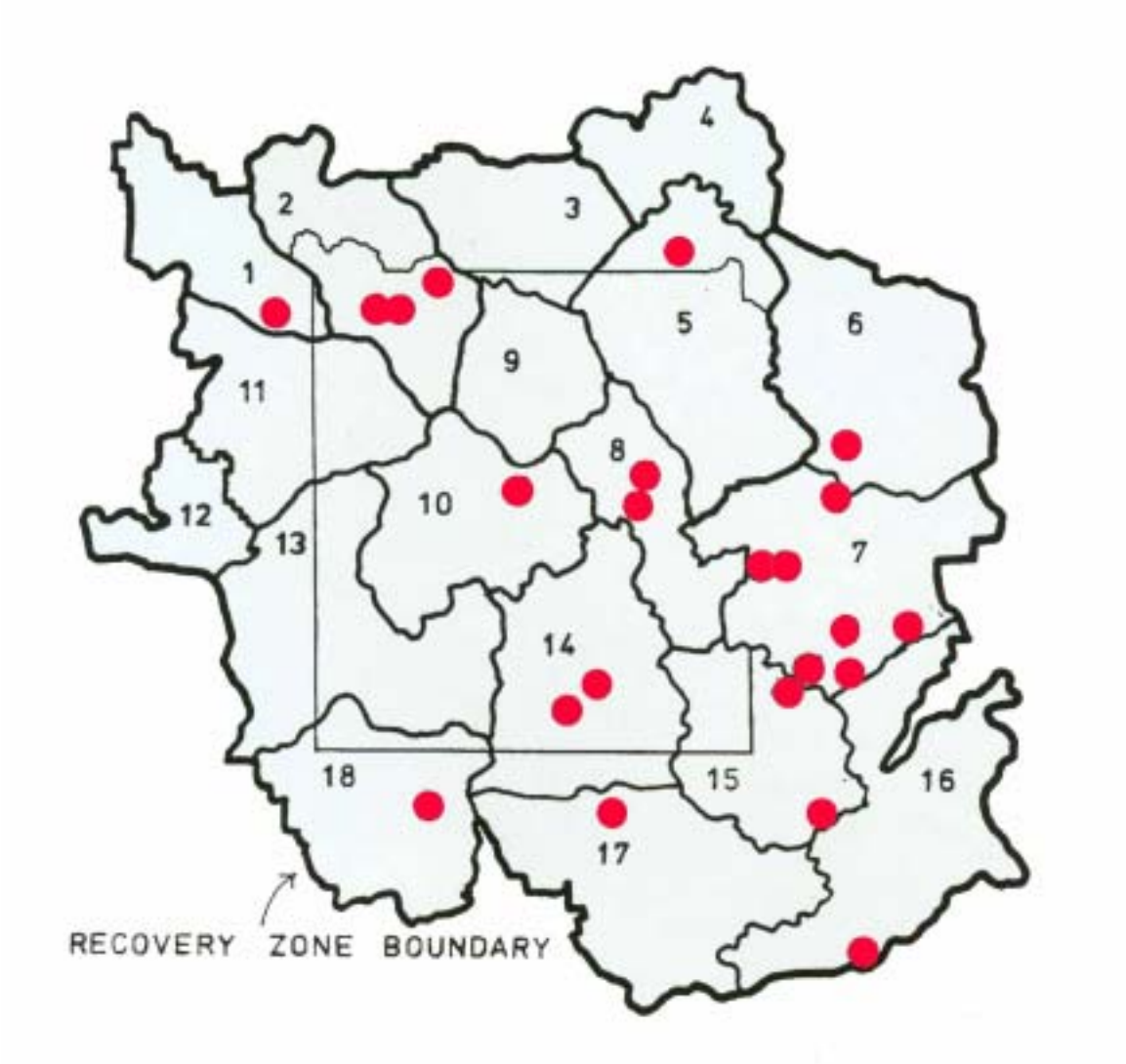


Fig. 1. Locations of initial observations of 23 unduplicated females with cubs-of-the-year during 1992.

Table 2. Annual unduplicated female grizzly bears with cubs-of-the-year and adult female deaths, 1973-92.

Year	Females	Cubs	Mean litter size	Adult female deaths (known and probable)
1973	14	26	1.86	4
1974	15	26	1.73	4
1975	4	6	1.50	1
1976	16	30	1.88	1
1977	13	25	1.92	6
1978	9	18	2.00	1
1979	13	29	2.23	2
1980	12	23	1.92	1
1981	13	24	1.85	5
1982	11	20	1.82	4
1983	13	22	1.69	2
1984	17	30	1.76	2
1985	9	16	1.78	2
1986	25	48	1.92	2
1987	13	29	2.23	2
1988	19	40	2.11	2
1989	16	30	1.88	0
1990	24	57	2.38	4
1991	24	43[a]	1.87	0
1992	23	56	2.43	0
Total	303	598		45
Mean	15.15	29.90	1.98	2.25

[a] Number of cubs for 23 females; litter size for 1 female unknown.

Observation Flights

During 1992, 44% of the unduplicated females with COY were seen on IGBST observation flights (Table 3). Observation flights accounted for an average 44% of the unduplicated observations during 1986-92 when methodology was similar; 8% were recorded incidentally on observation flights made by other researchers over the study area, 32% from ground sightings, and 16% from IGBST trapping efforts and radio-tracking flights only. Seventy percent of the 23 unduplicated females with COY seen on observation flights were on talus slopes above timberline where the bears were feeding on aggregations of army cutworm moths *(Euxoa auxillaris).*

Table 3. Annual unduplicated female grizzly bears with cubs-of-the-year by prioritized method of observation, 1973-92.

	Observation flights		Ground	Radio	
Year	IGBST	Other	sightings	flight/trap	Total
1973	2	5	7		14
1974	9		6		15
1975	1	2	1		4
1976	1	3	9	3	16
1977		1	8	4	13
1978			6	3	9
1979	3		7	3	13
1980	4		4	4	12
1981		2	7	13	
1982	3		5	3	11
1983	4		5	4	13
1984	7		10		17
1985	2		5	2	9
1986	9	2	10	4	25
1987	5	1	4	3	13
1988	7	1	7	4	19
1989	7	2	5	2	16
1990	8	0	12	4	24
1991	17	2	2	3	24
1992	10	4	6	3	23

Fifteen of the 16 flight areas were flown at least once between 23 June and 26 August for an average 3.27 hours each. Six flight areas in Wyoming outside Yellowstone National Park were flown at least 3 times each. Grizzly bear observation rate was 2.97 bears/hour on 31 observation flights (Table 4) compared to 0.28 unmarked bears/hour on 49 radio-tracking flights.

Table 4. Unmarked grizzly bears observed during observation flights, 1973-92.

Year	Number flights	Number hours	Total bears	Bears/hour	Unduplicated females with COY/hour
1973	24	75.90	59	0.78	0.03
1974	47	146.30	128	0.87	0.06
1975	24	47.20	20	0.42	0.02
1976	5	18.50	30	1.62	0.05
1977	0				
1978	0				
1979	7	23.00	14	0.61	0.13
1980	6	22.30	27	1.21	0.18
1981	4	16.00	13	0.81	0.25
1982	6	23.70	23	0.97	0.13
1983	41	124.30	36	0.29	0.03
1984	11	29.00	27	0.93	0.24
1985	16	30.50	21	0.69	0.07
1986	24	52.00	29	0.56	0.17
1987	20	47.20	35	0.74	0.11
1988	17	33.87	62	0.66	0.21
1989	37	88.71	87	0.98	0.08
1990	39	86.01	81	0.94	0.09
1991	46	99.24	257	2.59	0.17
1992	31	68.73	204	2.97	0.15

Survivorship

Survivorship of marked animals through 1992 is given in Table 5. Both males and females have the lowest chance of surviving their 2-year-old year, the time most young are weaned. Females have a greater chance of surviving after 5 years than they did during 1987 (Fig. 2).

Table 5. Grizzly bear survivorship by sex and age class.

	Sample size			Survivorship		
Age	Male	All	Female	Male	All	Female
Cub	26	112	27	0.88	0.83	0.89
1	27	101	26	0.78	0.84	0.85
2	28	54	23	0.68	0.76	0.83
3	29	54	25	0.86	0.87	0.88
4	27	53	26	0.81	0.85	0.88
	137	374	127	0.80	0.83	0.87
5	26	52	26	0.73	0.81	0.88
6	17	46	29	0.88	0.91	0.93
7	11	39	28	0.91	0.92	0.93
8	15	40	25	1.00	0.93	0.88
9	11	27	16	0.91	0.93	0.94
10	11	30	19	1.00	1.00	1.00
11	11	25	14	1.00	1.00	1.00
12	9	21	12	0.67	0.81	0.92
	111	280	169	0.87	0.91	0.93
13	7	16	9	1.00	0.94	0.89
14	8	16	8	0.75	0.87	1.00
15	6	13	7	1.00	1.00	1.00
16	4	12	8	1.00	0.83	0.75
17	4	9	5	0.75	0.89	1.00
18	4	7	3	1.00	1.00	1.00
19	4	6	2	0.75	0.67	0.50
20	2	4	2	1.00	1.00	1.00
21	2	4	2	1.00	1.00	1.00
22	2	4	2	1.00	0.75	0.50
	43	91	48	0.91	0.90	0.90
All adults:	154	371	217	0.88	0.91	0.92
Survival to age 5:				0.33	0.39	0.49
Total bear years:	291	745	344			

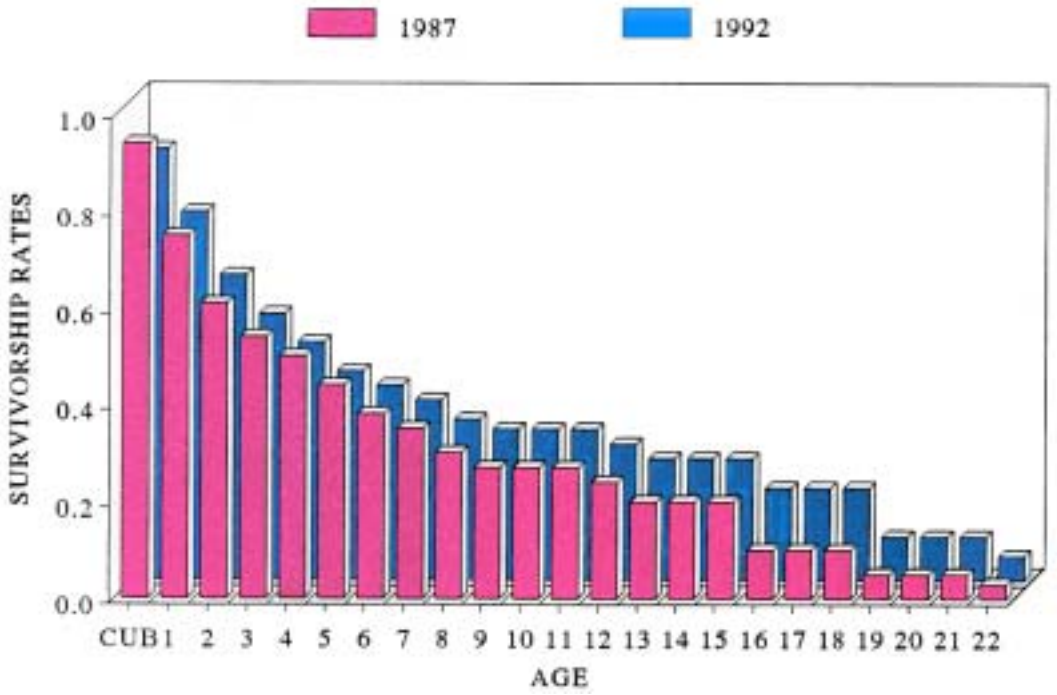


Fig. 2. Survivorship rates of females during 1987 and 1992.

Mortalities

Eight mortalities were recorded during 1992 (Table 6), including 4 human-caused and 4 from natural causes.

Table 6. Grizzly bear mortalities recorded during 1992.

Bear	Sex	Age	Date	Type	Location[a]	Cause
187	M	5	3/5	Known	Tepee Cr, GNF	Natural: unknown cause
1	M	28	4/21	Known	Cliff Cr, YNP	Natural: unknown cause
Unm	F	1	5/14	Known	Park Point, YNP	Natural: killed by larger bear
180	M	5	5/21	Known	Burroughs Cr, SNF	Natural: pneumonia/poor condition
176	M	5	8/13	Known	Buck Cr, GNF	Human-caused: shot in camp
186	M	4	9/12	Known	Grinnell Cr, SNF	Human-caused: shot by black bear hunter
202	F	4	Sept.	Known	Flattop Mtn, GNF	Human-caused: illegally shot
198	M	Ad	10/3	Known	Brooks Lake, SNF	Human-caused: shot by hunters

[a] GNF = Gallatin National Forest, SNF = Shoshone National Forest, YNP = Yellowstone National Park.

Grizzly bear mortalities from 1973-92 are depicted in Fig. 3 and Table 7. These deaths include known and probable mortalities as defined by Craighead et al. (1988).

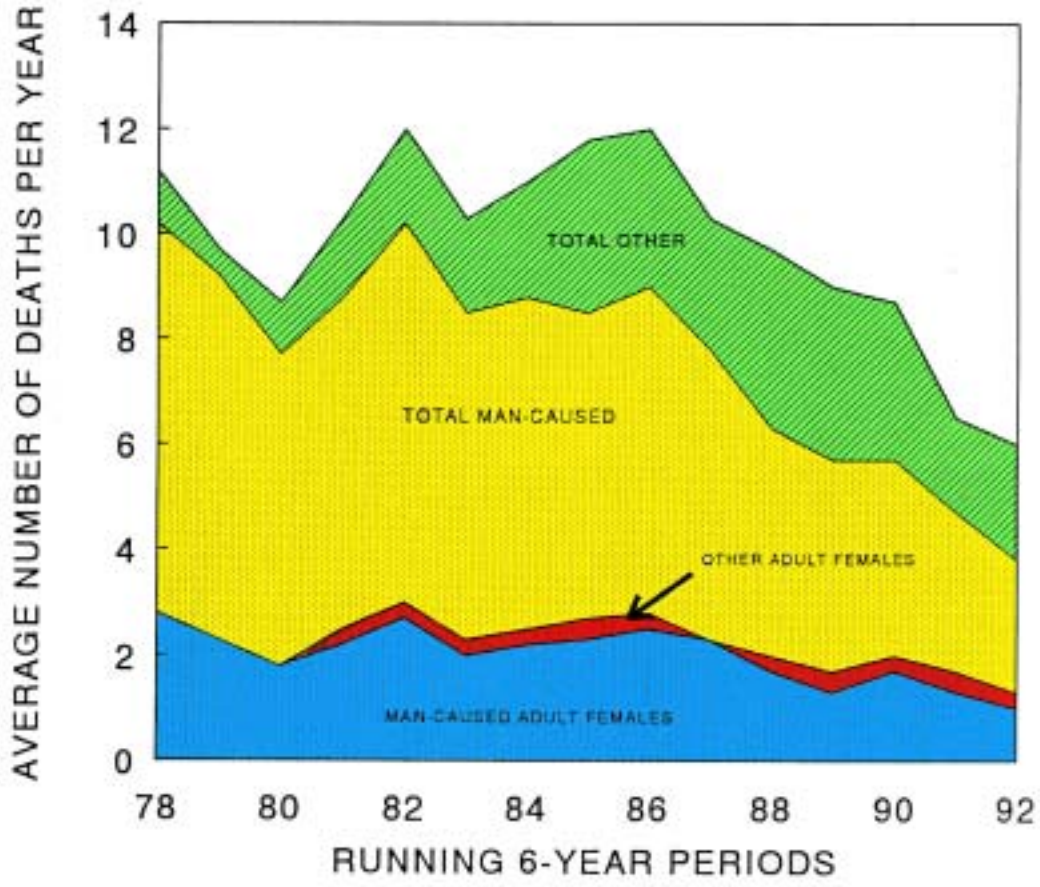


Fig. 3. Average number of grizzly bear deaths per year during running 6-year periods. "Other" deaths include those from natural and unknown causes.

Table 7. Known and probable grizzly bear deaths, 1973-92.

	All bears		All adult females	
Year	Human-caused	Other[a]	Human-caused	Other
1973	14	3	4	0
1974	15	1	4	0
1975	3	0	1	0
1976	6	1	1	0
1977	16	1	6	0
1978	7	0	1	0
1979	8	0	1	0
1980	6	4	1	0
1981	10	3	3	2
1982	14	3	4	0
1983	6	1	2	0
1984	9	2	2	0
1985	6	7	2	0
1986	9	2	2	0
1987	3	0	2	0
1988	5	8	0	2
1989	2	1	0	0
1990	9	0	4	0
1991	0	0	0	0
1992	4	4	0	0

[a] Includes deaths from natural and unknown causes.

Food Habits

Scat Analysis

Food habits represented by fecal analysis often do not accurately reflect relative proportions of ingested items because different diet items are digested at varying rates and to different degrees. More easily digested items such as meat and berries are under-represented in fecal analysis while vegetal items are over-represented.

Fecal analysis for scats collected during 1991 are presented in Appendix A. Results from scats collected during 1992 are presented in Table 8.

Table 8. Seasonal grizzly bear scat contents for 1992.

	Spring[a] (*n* = 137)		Summer[b] (*n* = 134)		Fall[c] (*n* = 49)		Total (*n* = 329)	
	% freq.	% vol.	% freq.	% vol.	% freq.	% vol.	% freq.	% vol.
Whitebark pine seeds	0	0	5.22	2.63	63.27	52.67	11.55	8.92
Berries								
Vaccinium	3.65	1.03	2.24	1.31	4.08	0.31	3.04	1.01
Sporophytes								
Equisetum	4.38	1.64	0.75	0.04	0	0	2.13	0.70
Others	3.65	0.59	3.73	2.25	6.12	6.12	5.17	2.29
Foliage								
Graminoids	70.07	53.87	61.19	27.34	40.82	14.94	60.48	35.80
Forbs	40.15	19.52	62.68	44.82	16.33	8.37	44.70	27.65
Cirsium	3.64	1.53	5.23	4.06	0	0	4.56	2.92
Epilobium	1.46	0.44	5.22	2.49	4.08	0.82	3.34	1.48
Osmorhiza	2.92	0.72	2.24	1.80	0	0	2.13	1.03
Taraxacum	6.57	4.81	15.67	5.07	8.16	1.53	1.82	1.31
Trifolium	17.52	6.12	45.52	26.75	8.16	4.08	27.05	14.05
Roots	12.41	5.93	16.42	10.28	8.16	2.61	13.06	7.04
Lomatium	3.65	1.20	7.46	4.30	0	0	4.56	2.25
Perideridia	0.73	0.11	6.72	4.16	8.16	2.61	4.26	2.13
Mammals	28.47	6.50	20.15	3.38	18.37	4.86	24.92	5.65
Elk	3.65	1.18	2.99	0.39	2.04	0.51	3.95	1.25
Bison	5.11	0.98	2.99	1.40	8.16	2.98	5.17	1.57
Small mammals	10.95	0.71	4.48	0.06	8.16	1.37	7.60	0.53
Unid Cervidae	13.14	3.04	7.46	0.95	0	0	9.12	1.82
Insects	10.95	1.79	0	0	16.33	0.04	13.98	1.98
Ants	9.49	0.80	15.67	1.68	16.33	1.53	13.37	1.47
Debris	37.23	9.19	30.60	6.32	30.61	10.12	34.35	8.74

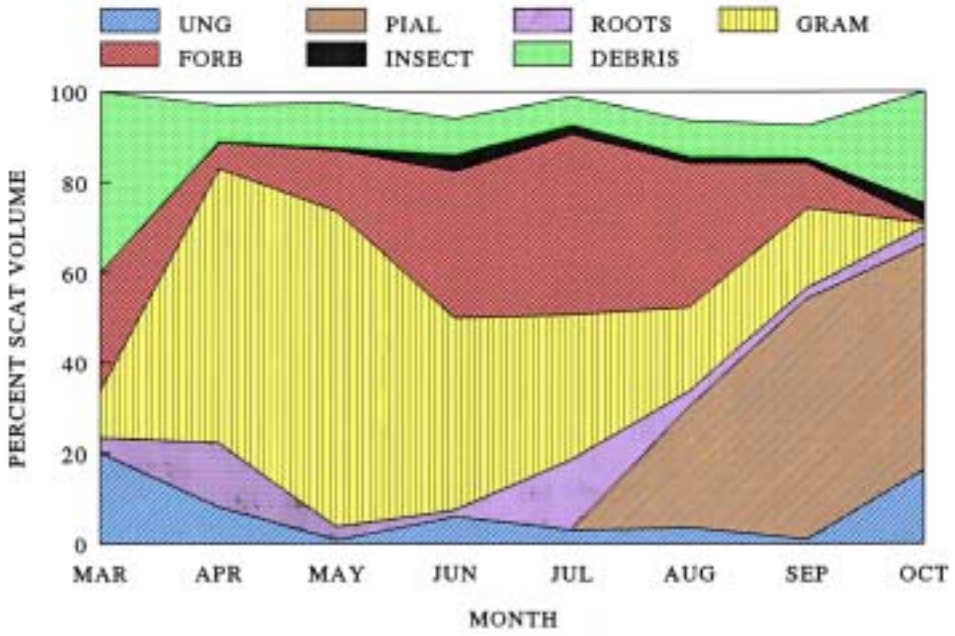
[a] March, April, May, and June.
[b] July and August.
[c] September and October.

During spring, scats were primarily composed of graminoid and forb foliage (Fig. 4). Percent volumes of these food items were significantly above the 1977-87 monthly averages for April, May, and June. Conversely, volume of ungulate remains was significantly lower in April and May scats compared to the 1977-87 average.

During summer, volumes of food items were not different from the 11-year average.

During fall, whitebark pine (*Pinus albicaulis*) seeds remains comprised a greater volume than the 11-year average, and roots were present in lower volumes.

1992



1977-87
average

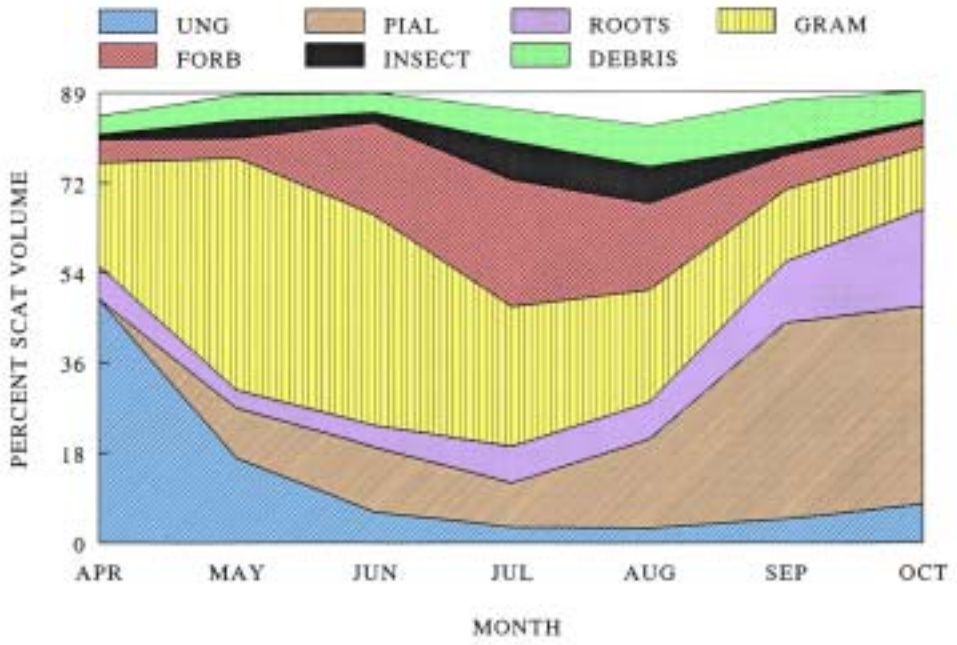


Fig. 4. Percent scat volume of food items during 1992 compared to the 1977-87 average.

Whitebark Pine Cone Production

Whitebark pine cone production was recorded on 19 transects throughout the Yellowstone ecosystem in 1992 (Fig. 5). Nine of those transects produced at or above the 13-year average of 15.7 cones/tree and the average overall production in 1992 was not different from the 13-year average (Fig. 6). Production was similar to 1991 (Table 9) when 77% of fall grizzly bear feeding activities involved searching for whitebark pine seeds. During 1992, 54% of fall feed site examinations indicated this feeding activity. Since grizzly bears generally consume these seeds to the near exclusion of other food items when they are available in sufficient quantity, we expected relative few management action situations to occur as bears searched for alternate foods in association with human activity. No such situations occurred in 1992.

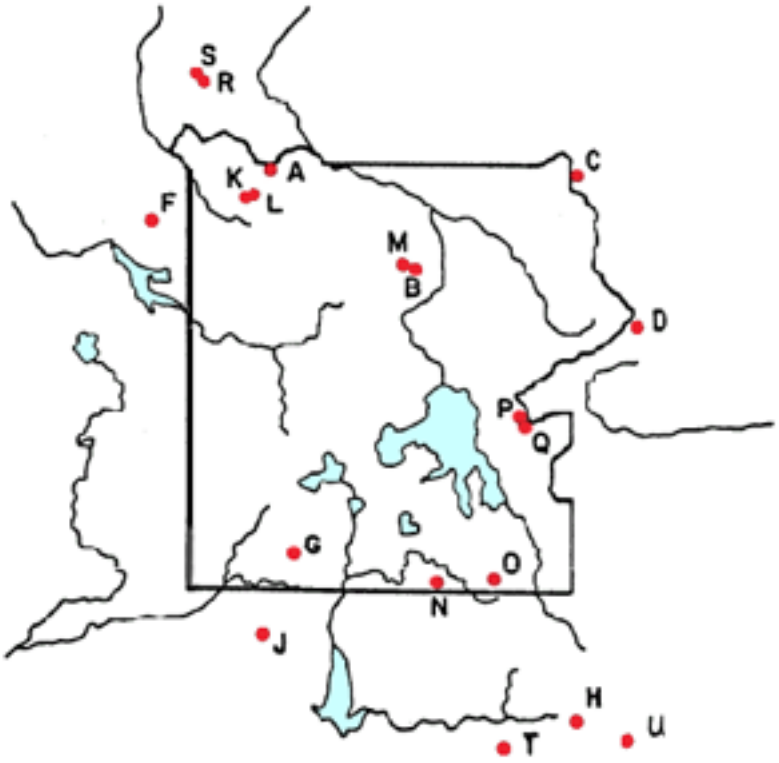


Fig. 5. Locations of whitebark pine cone transects within the study area.

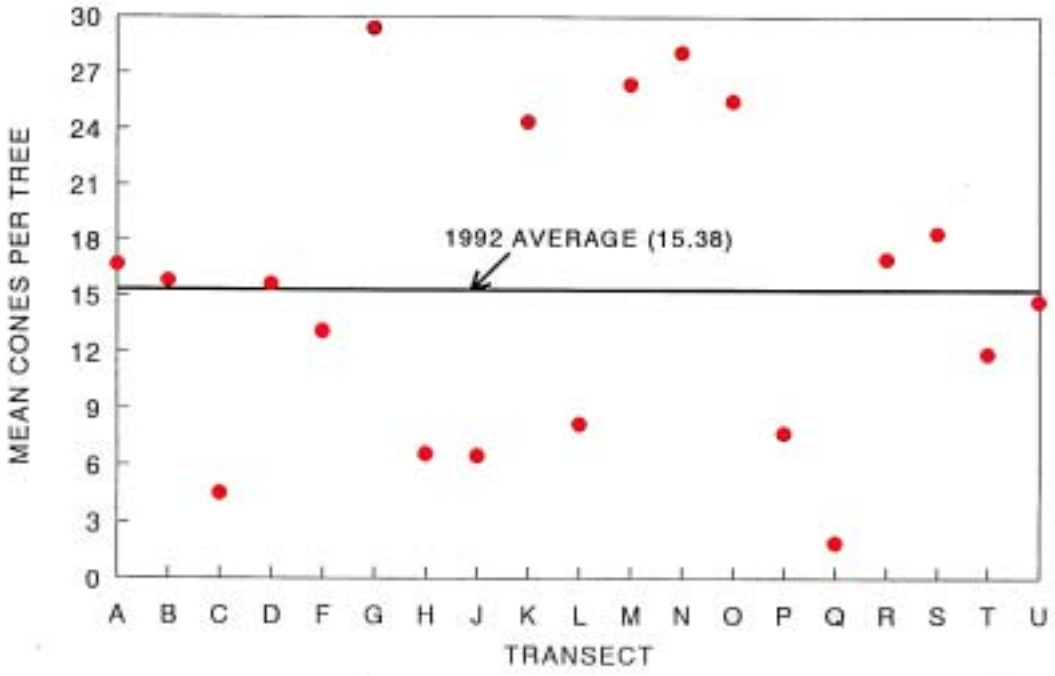


Fig. 6. Whitebark pine cone production on study area transects during 1992.

Table 9. Mean annual whitebark pine cone production on study transects.

Year	Total cones	Total trees	Total transects	Mean cones per tree	Mean cones per transect	Cones/transect/year SD	Min.	Max.	Mean Julian date read each year
1980	2,312	90	9	25.69	256.89	122.99	139	562	212
1981	1,191	90	9	13.23	132.33	148.69	8	489	204
1982	1,443	85	9	16.98	160.33	154.18	0	463	229
1983	1,531	88	9	17.40	170.11	88.78	78	372	211
1984	360	56	6	6.43	60.00	41.41	14	124	220
1985	2,312	85	9	27.20	256.89	192.27	17	625	214
1986	103	75	8	1.37	12.88	13.18	0	38	207
1987	394	155	16	2.54	24.63	37.49	0	118	217
1988	406	169	17	2.40	23.88	44.32	0	148	208
1989	10,199	209	21	48.80	485.67	384.27	7	1,473	206
1990	319	207	21	1.54	15.19	51.52	0	243	212
1991	2,744	177	18	15.50	152.44	107.99	7	366	215
1992	2,876	187	19	15.38	151.37	81.67	19	294	209

Feed Sites

Ground investigation at 164 aerial locations of radio-marked grizzly bears from April-October revealed evidence of feeding activity at 41% of the sites. Evidence of activity other than feeding was recorded at an additional 29 sites, and no sign of bear activity was evident at the remaining 68 sites.

Grizzly bear activity was recorded at an additional 153 sites not associated with an aerial location of an instrumented bear (142 with feeding activity and 11 with other sign recorded). Activities are summarized in Table 10 for those sites with evidence of feeding.

Table 10. Seasonal frequencies of activities at feeding sites during 1992.

Feeding activity	Spring[a] (n = 135)	Summer[b] (n = 72)	Fall[c] (n = 46)	Total (n = 253)
Whitebark pine seeds	0	0.01	0.54	0.10
Grazing	0.30	0.17	0.02	0.21
Digging roots	0.19	0.33	0.02	0.21
Digging rodents/caches	0.24	0.14	0.02	0.17
Large mammals	0.10	0.08	0.02	0.08
Searching insects	0.14	0.22	0.17	0.17
Miscellaneous[d]	0.03	0.04	0.11	0.05

[a] April, May, and June.
[b] July and August.
[c] September and October.
[d] Berries, cambium, mineral dig, unknown dig, mushrooms.

The most frequently recorded feeding activity during spring was grazing graminoid and forb foliage, and digging for pocket gophers (*Thomomys thalpoides)* and their food caches. Diggings for roots were the most frequently observed activity during summer. The roots most commonly sought were biscuitroot *(Lomatium cous*). The second most frequent feeding activity was searching for insects, largely ants. During fall, the most common feeding activity was searching for whitebark pine seeds in red squirrel *(Tamiasciurus hudsonicus)* middens.

Movements and Feeding Strategies

Adequate data was available to determine annual range sizes for 15 grizzly bears during 1992 (Table 11). All ranges but 1 were not statistically different from cohort means recorded 1975-87. The 1 exception was a lone adult female with a larger than average range (1,007 km^2) located in the southeast of the study area on the Shoshone National Forest.

During spring, all cohorts exhibited lower mean rates of movement compared to the 1975-87 average (Table 12). These differences were statistically significant for adult females ($P = 0.004$, $t = 3.274$). Summer and fall rates of movements were similar to the 13-year average, except for adult males. That cohort exhibited lower than average rates of movement during both summer ($P = 0.040$, $t = 2.620$) and fall ($P = 0.033$, $t = 2.352$).

Larger than average annual ranges and rates of movement generally occur during years of native food shortages, especially during fall (cf. Blanchard and Knight 1991). Grizzly bear movements during 1992 generally indicated an overall adequate food supply. In addition, few incidents other than livestock predation occurred involving grizzly bears searching for alternate foods in association with human activity.

Table 11. Annual range sizes (km^2) of grizzly bears located ≥12 times and during all 3 seasons of 1992.

Cohort	Bear	Age	Number of locations	MCP[a]	1975-87 cohort mean MCP	(SD)
Females						
With COY[b]	104	10	19	130	231	(136)
	128	7	24	127		
With 2-year-olds	189	11	21	189	397	(309)
	194	16	15	165		
	196	7	20	93		
Lone adult	190	7	16	269	236	(114)
	193	6	18	583		
	197	8	19	1,007		
Subadult	179	3	26	358	365	(191)
	182	3	39	856		
Males						
Adults	152	19	23	1,008	874	(630)
	155	6	18	396		
	168	6	26	871		
	184	11	17	913		
	195	5	17	327		

[a] Minimum Convex Polygon
[b] COY = cub-of-the-year

Table 12. Seasonal rates of movement for radio-marked grizzly bears during 1992.

Season	Cohort (number of animals)		Locations per bear		Mean km/day/animal		
						1975-87	
			Mean	Range	1992	Mean	(SD)
Spring	Adult females with COY	(3)	10	(10)	0.2	0.7	(0.3)
	Other adult females	(8)	9	(4-14)	0.6	1.0	(0.5)
	Subadult females	(2)	14	(11-17)	1.0	1.1	(0.6)
	Subadult males	(1)	9		0.8	1.1	(0.6)
	Adult males	(14)	7	(4-10)	1.0	1.3	(0.8)
Summer	Adult females with COY	(3)	6	(5-7)	1.0	1.3	(1.0)
	Other adult females	(7)	5	(3-7)	1.4	1.4	(0.8)
	Subadult females	(3)	7	(4-10)	0.9	1.3	(0.6)
	Subadult males	(2)	7	(6-7)	0.6	1.1	(0.9)
	Adult males	(7)	6	(4-10)	0.8	1.9	(1.1)
Fall	Adult females with COY	(3)	5	(4-7)	0.5	1.2	(1.0)
	Other adult females	(7)	5	(3-8)	0.6	1.1	(0.8)
	Subadult females	(3)	8	(5-12)	0.8	0.9	(0.5)
	Subadult males	(1)	10		0.9	1.1	(0.8)
	Adult males	(6)	6	(3-10)	0.6	1.4	(0.8)

Grizzly Bear Habitat Use and Silvicultural Management Studies in the Southern One-Third of the Yellowstone Ecosystem

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Preliminary Summary: During 2 years of research, grizzly bears demonstrated occupancy of habitats north of highway 26/287 on the Wind River Ranger District, Shoshone National Forest. The Wind River Ranger District contains at least 3 adult females, 2 of which have portions of their home ranges outside of the Recovery Zone. Grizzly bear habitat use sites were restricted to currently unmanaged forested habitat. Bear food availability was similar to that found randomly within their home ranges. Bears selected sites of greater vegetative density and canopy cover than was found randomly within their home ranges. Habitat disturbance at clearcut sites was concluded to have long-term effects. Significant differences were not detectable among clearcut site characteristics when analyzed by age. All sites had little forest regeneration, shrub growth, and low security/hiding cover measurements. Clearcuts did not offer bear foods in different quantities than found at un-cut sites but may offer a less nutritious quality food. Nutritional analysis was not completed at the writing of this report and will be written as a separate report. It is felt that clearcuts will not be used by grizzly bears as long as security and canopy cover measurements remain low. Increased human use due to increased access provided through forest management is felt to limit bear habitat use. Recommendations include the destruction of all roads and trails created during forest management and the discontinued use of high habitat disturbance methods.

Number of known human-grizzly bear conflicts within different land ownership areas in the Yellowstone ecosystem, 1992

Land ownership	Total number of conflicts	Number of different incidents				
		Human injuries	Property damage	Livestock depredations	Bear deaths[a]	Confrontations[b]
Beaverhead N. F.	0	0	0	0	0	0
Bridger-Teton N. F.	15	0	3	8	0	4
Custer N. F.	0	0	0	0	0	0
Gallatin N. F.	8	1[c]	1	0	1	5
Grand Teton N. P./ Rockefeller Parkway	1	0	0	0	0	1
Idaho – private	0	0	0	0	0	0
Montana – private	1	0	0	0	1	0
Shoshone N. F.	24	1	13	0	2	8
Targhee N. F.	0	0	0	0	0	0
Wyoming – private	0	0	0	0	0	0
Yellowstone N. P.	12	1	1	0	0	10
Total	61	3	18	8	4	28

[a] Includes human-caused deaths only.
[b] Confrontations include incidents where people felt threatened by bears such as when bears bluff charged people or entered occupied backcountry camps or developed areas.
[c] Two people were injured during this incident.

LITERATURE CITED

Basile, J. 1982. Grizzly bear distribution in the Yellowstone area, 1973-79. U.S. Forest Service Research Note INT-321. 11pp.

Blanchard, B. 1985. Field techniques used in the study of grizzly bears. National Park Service, Interagency Grizzly Bear Study Team report. 24pp.

Blanchard, B. 1987. Size and growth patterns of the Yellowstone grizzly bear. International Conference on Bear Research and Management 7:99-108.

Blanchard, B., and R. Knight. 1991. Movements of Yellowstone grizzly bears. Biological Conservation 58:41-67.

Blanchard, B., R. Knight, and D. Mattson. 1992. Distribution of the Yellowstone grizzly bears during the 1980s. American Midland Naturalist 128:332-338.

Craighead, J.J., K.R. Greer, R.R. Knight, H.I. Pac. 1988. Grizzly bear mortalities in the Yellowstone Ecosystem, 1959-1987. Report of the Montana Department of Fish, Wildlife and Parks, Craighead Wildlife Institute, Interagency Grizzly Bear Study Team, and National Fish and Wildlife Foundation. 12pp plus data.

Craighead, J.J., J. Varney, and F. Craighead. 1974. A population analysis of the Yellowstone grizzly bears. Montana Forest and Conservation Experiment Station Bulletin 40. University of Montana, Missoula. 20pp.

Eberhardt, L.L., R.R. Knight, and B.M. Blanchard. 1986. Monitoring grizzly bear population trends. Journal of Wildlife Management 50:613-618.

Knight, R.R. In prep. Unduplicated female with cubs-of-the-year as an indicator of population status.

Knight, R.R., B.M. Blanchard, and D.J. Mattson. 1989. Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1988. National Park Service. 34pp.

Knight, R.R., and L.L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecology 66:323-334.

Knight, R.R., D.J. Mattson, and B.M. Blanchard. 1984. Movements and habitat use of the Yellowstone grizzly bear. National Park Service, Interagency Grizzly Bear Study Team report. 177pp.

Mattson, D.J., B.M. Blanchard, and R.R. Knight. 1991. Food habits of Yellowstone grizzly bears, 1977-87. Canadian Journal of Zoology 69:1619-1629.

APPENDIX

1991 Scat Analysis

During 1991, 411 scats were collected and analyzed for content (Appendix Table 1). Monthly scat contents by volume were similar to the 1977-87 averages (Appendix Table 2), except for whitebark seeds. Few if any seeds were available during spring and early summer from overwintered 1990 cones. However, during fall, over 90% of collected scats contained seed remnants which comprised over 75% of scat volume. All other food items were under-represented in fall scats compared to the 11-year average, except berries during October. *Ribes* sp. comprised nearly 8% of the scat volume compared to the 11-year average of 4%.

The predominant food items during spring were graminoid foliage, which occurred in 80% of the scats and accounted for over 50% of scat volume, and ungulates (45% frequency of occurrence, 16% volume). Bison contributed more to scat volume and occurred in more scats than elk or moose.

Graminoid and forb foliage dominated summer scat contents, both in frequency of occurrence and volume. Roots and ungulate remains occurred in slightly greater frequencies and volumes than the 11-year average. Tubers of *Lomatium, Perideridia,* and *Osmorhiza* predominated root remains, while elk predominated ungulate remains.

Unusual food items recorded in scat contents included remains of mountain goat, pica, and marmot in one scat each. Grizzly bear remains (other than hair) were found in one scat.

Appendix Table 1. Seasonal grizzly bear scat contents for 1991.

	Spring[a] (*n* = 83)		Summer[b] (*n* = 214)		Fall[c] (*n* = 97)		Total (*n* = 411)	
	% freq.	% vol.	% freq.	% vol.	% freq.	% vol.	% freq.	% vol.
Whitebark pine seeds	1.20	0.30	7.94	4.33	90.72	78.09	26.52	21.48
Berries								
Vaccinium			9.35	2.91	13.40	1.92	9.25	2.76
Others			3.27	2.93	4.13	3.05	1.46	1.73
Sporophytes								
Equistum	4.82	0.90	0.93	0.16			1.46	0.27
Others	2.41	0.90	0.47	0.07			0.73	0.05
Foliage								
Graminoids	79.52	54.24	57.94	29.28	48.45	8.12	57.66	28.53
Forbs	31.33	16.48	49.06	31.35	9.28	4.16	36.26	21.83
Cirsium			2.80	1.92			1.70	1.24
Epilobium	4.82	0.78	16.36	10.31	2.06	0.63	9.98	5.68
Lomatium			0.47	0.09			0.24	0.05
Osmorhiza	7.23	1.75	0.47	0.14			0.24	0.07
Taraxacum	21.69	11.14	23.83	9.17	5.15	1.37	18.00	7.35
Trifolium	6.02	3.53	18.22	8.08	1.03	0.21	11.24	5.15
Roots	14.45	5.96	17.30	9.65	2.06	1.92	12.40	6.67
Lomatium			8.41	4.44			4.62	2.31
Perideridia	1.20	0.12	5.14	3.11	2.06	1.92	3.41	2.09
Osmorhiza	7.23	1.75	2.34	1.30			2.68	1.03
Mammals	48.19	16.96	31.31	10.22	19.59	0.42	31.14	8.87
Elk	9.64	5.25	14.95	5.27			9.73	3.80
Bison	26.51	7.65					5.35	1.55
Moose	7.23	2.90	1.87	0.54			2.68	0.89
Small mammals	1.20	0.48	1.87	0.48	8.25	6.83	3.16	0.41
Insects	3.61	0.08	12.62	1.13	3.09	9.33	9.25	0.88
Ants	3.61	0.08	11.21	0.66	3.09	9.33	8.03	0.47
Trout			1.40	0.39			0.73	0.20
Debris	46.99	19.31	36.92	7.39	7.22	2.01	31.63	6.58

[a] March, April, May, and June.
[b] July and August.
[c] September and October.

Appendix Table 2. Percent volume of diet items in grizzly bear scats collected during 1991 compared to the 1977-87 average (Mattson et al. 1991).

	% volume in scats						
	April	May	June	July	August	September	October
1997-87	*n* = 84	*n* = 238	*n* = 696	*n* = 987	*n* = 787	*n* = 499	*n* = 340
1991	*n* = 3	*n* = 44	*n* = 35	*n* = 124	*n* = 90	*n* = 70	*n* = 26
Ungulates	48.5	16.8	6.1	3.1	2.9	4.7	7.7
	31.7	23.6	6.3	3.8	18.0	0.1	0
Rodents	2.2	3.5	0.8	0.2	0.8	0.8	1.1
	0	0.9	0	0.1	1.0	0.4	0
Cutthroat trout	t	1.0	2.3	4.4	0.5	0	0
	0	0	0	0.7	0	0	0
Insects	1.1	3.6	2.0	7.7	7.4	1.9	0.8
	0	0	0.2	0.3	2.3	0.4	0
Horsetail	0	3.3	5.3	6.6	1.2	0.5	0.1
	0	0	2.1	t	0.3	0	0
Graminoid foliage	20.5	46.3	41.9	27.8	22.4	14.3	12.3
	61.0	52.2	45.9	40.4	13.8	6.8	12.0
Forb foliage	4.6	3.9	18.4	25.2	17.2	6.8	4.6
	0	0.5	38.5	42.2	18.7	5.5	0.8
Roots	6.6	3.6	4.3	7.2	7.3	12.1	19.3
	0	7.3	5.0	9.2	10.3	2.7	0
Berries	0	2.0	0.4	0.8	9.4	5.2	3.8
	0	0	0	1.1	11.6	4.0	7.8
Whitebark pine	0	9.9	12.9	8.8	17.6	39.0	39.2
seeds	0	0	0	0	10.3	77.4	79.3
Debris	3.7	4.9	3.8	6.5	8.1	9.1	5.6
	6.7	15.2	1.8	3.0	13.5	2.7	0.2