

APPENDIX A

RELATIONSHIP BETWEEN ANGLER AND BEAR USE IN THE CLEAR CREEK AREA OF YELLOWSTONE LAKE

Grizzly bear (*Ursus arctos horribilis*) numbers within the Yellowstone ecosystem have declined significantly since 1959 (Knight 1983). One measure implemented within Yellowstone National Park (YNP) to reverse this trend, has been closure of prime bear habitat areas to human use (National Park Service EIS 1983). The goals behind these closures include: (1) minimize people/bear interactions that result in elimination of problem bears, and (2) prevention of bear displacement from prime food sources. (National Park Service EIS 1983).

Bear closures were used in several locations within YNP in 1983 including an area along the eastern shore of Yellowstone Lake. This 15,066 ha area has a high density of bear use associated with the cutthroat trout (*Salmo clarki*) spawning season. The U.S. Fish and Wildlife Service has operated a weir (fish trap) on Clear Creek, one of the spawning streams within this closure, annually since 1977 (Jones et al 1983). Bears, both grizzly and black (*Ursus americanus*), have used the creek in the vicinity of the weir to catch post spawning cutthroat trout for 6 of the 7 years of trap operation and are known to have used the weir as an aid to catch post-spawners during 2 of those years. In conjunction with fisheries research at Clear Creek, indirect data on bear use as well as information on angler use in this area has been collected. By analyzing these data, the interaction of human use and bear use in the area as well as the effectiveness of the 1983 closure can be evaluated.

METHODS

Bear use and related fisheries data were taken from trap log books kept at the Clear Creek weir. Bear use was measured as bear use days; one bear use day was recorded for each day that evidence of one or more bears was located in the vicinity of the Clear Creek weir. This included actual sightings as well as fresh tracks, scats, or other signs. Since more than one bear probably used the weir on most nights, bear use measurements were only an absolute minimum estimate of use and were not a measure of intensity. In an effort to minimize the attraction of the weir to bears, cleanliness procedures were strictly adhered to (Jones et al 1977). This included patrolling the stream from the weir to the mouth in order to collect all remains of dead trout. These procedures also insured that old bear sign was not recounted and that only new sign was found on a daily basis.

Angler use data was obtained from volunteer angler report (VAR) cards returned by anglers who fished in the Clear/Cub Creeks vicinity. This area was defined as a 1 km wide section of Yellowstone Lake shoreline that extended 2.6 km from Cub Creek to Elk Point. Angler use was measured in angler days; one angler day being recorded for each day that an angler fished in the Clear/Cub Creeks area.

RESULTS

Use of the weir by bears was concentrated in a period corresponding to the major portion of the downstream migration of cutthroat trout (Figure 1). Bear use began just prior to the peak of the downstream migration and continued until the weir was pulled. Approximately 85% of the bear use days for the years 1977-1983 fell within this time period. The starting and ending dates as well as the total length of this period varied from year to year. The length of this period ranged from 32 days (1983) to 52 days (1980), starting as early as June 22 (1977) and as late as July 11 (1983), and ending sometime between August 1 (1977) and August 17 (1978). To increase comparability of data, bear and angler use were both measured as a percentage of the total number of days in the major portion of the downstream migration.

Bear use of the Clear Creek area has increased since 1980 (Table 1) while during that same time period angler use and the number of spawning fish entering the creek has decreased (Table 1 and Figure 3).

DISCUSSION

An inverse relationship ($r=0.81$) exists between percent angler use and percent bear use in the Clear/Cub Creeks area (Figure 2). The greater the human impact in the area, the less the bears made use of it. A linear regression ($Y=A+[B*X]$) of the data shows that 65% of the variation in bear use is explained by the level of angler use. The years with the highest number of spawners entering the creek were also the years with the most anglers using the area (Figure 3). Although bears would be expected to follow the same pattern, bear use was lowest during the peak years of spawning numbers (Figures 2 & 3). This indicates that heavy human use may have been responsible for keeping bears out of the area.

As the number of anglers began to decrease after 1979, bear use began to increase. Park Service data on year-round bear use of the 8,490 ha area surrounding the Clear Creek weir (UTM: 556 to 566 east, 4920 to 4930 north) also showed an increase in bear use since 1980 (Figure 4) (Fowler 1984). These data included radio telemetry locations as well as sign and ground observations. In 1983, at least partly due to the closure, angler use reached its lowest level in 7 years.

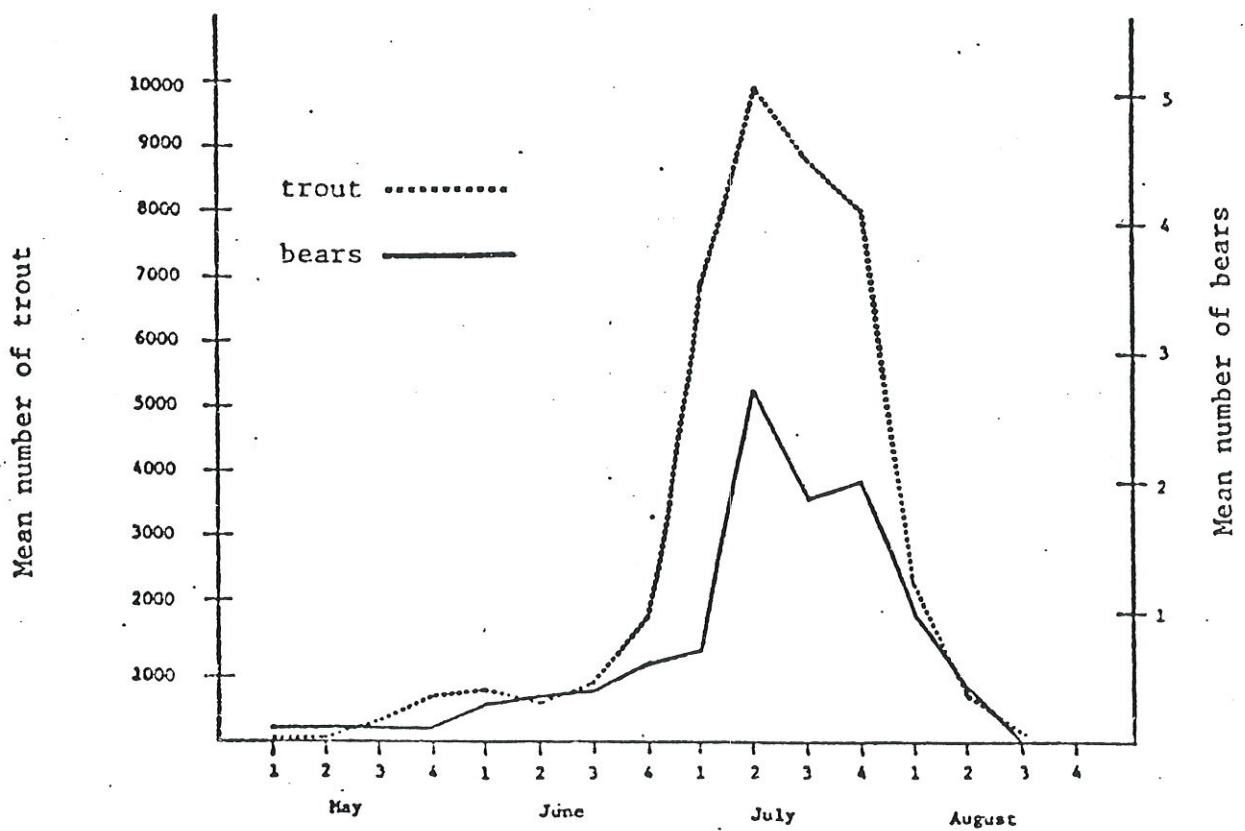


Figure 1. Relationship between mean number of downstream migrating trout and mean number of bears at the Clear Creek weir, YNP, 1977-1983.

Table 1. Comparison between bear and angler use of the Clear Creek area, YNP, during the period of the major portion of the downstream trout migration

<u>Major portion of downstream migration</u>						
Year	Dates	Number of days	Bear use days	Percent bear use ¹⁾	Angler days	Percent angler use ²⁾
1977	June 22 - August 1	41	11	27	17	42
1978	July 7 - August 17	42	3	7	39	93
1979	July 2 - August 3	33	0	0	29	88
1980	June 24 - August 14	52	7	14	24	46
1981 ³	July 1 - July 11	11	7	64	5	45
1982 ⁴	-	-	-	-	-	-
1983 ⁵	July 11 - August 11	32	30	94	6	19

- 1) The percentage of bear use days out of the total number of days during the major portion of the downstream trout migration.
- 2) The percentage of angler days out of the total number of days during the major portion of the downstream trout migration.
- 3) Trapping operation shut down early due to continued use of the area by bears.
- 4) Weir pulled early due to high water levels.
- 5) Clear Creek area closed to visitor use from April 1 - August 12.

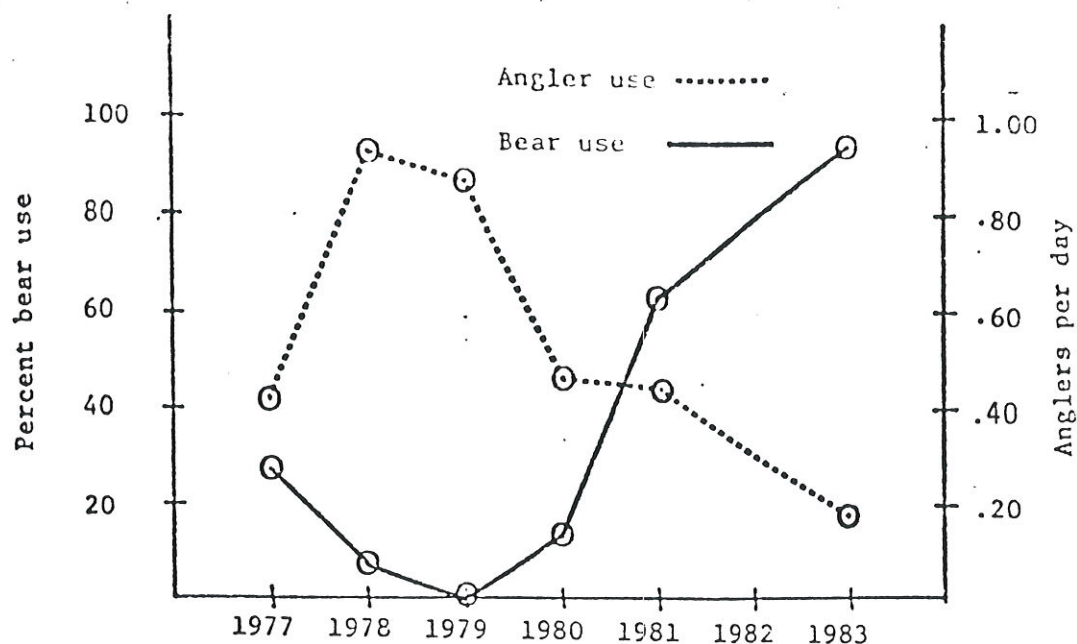


Figure 2. Relationship between anglers and bear use in the vicinity of the of the Clear Creek weir, YNP, 1977-1983.

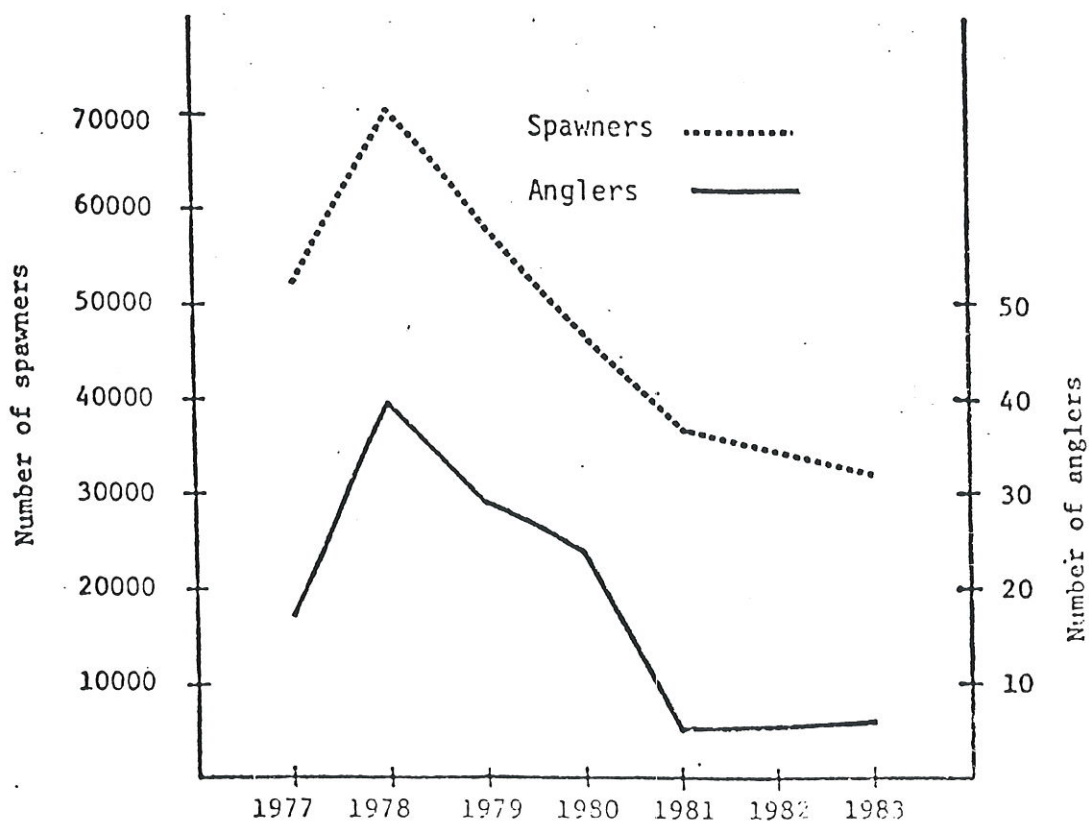
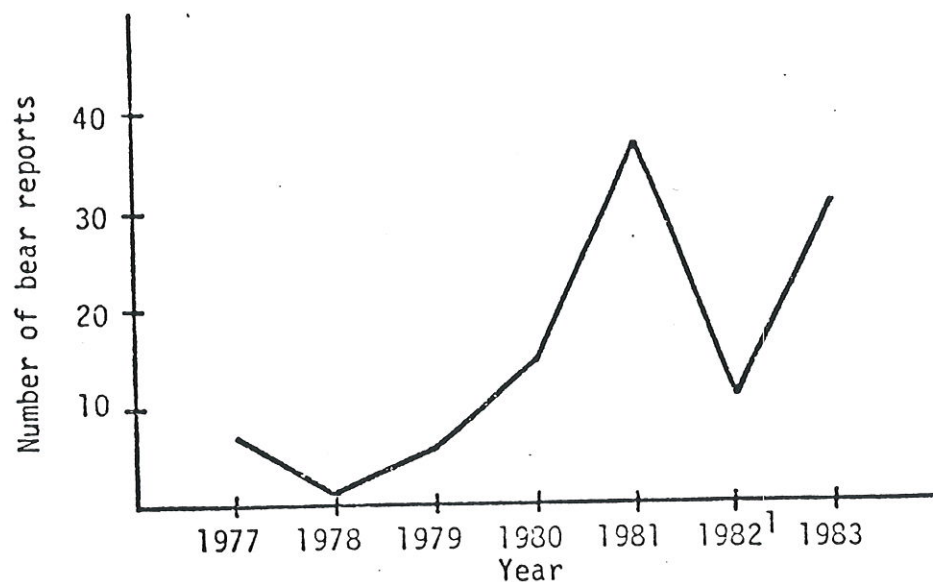


Figure 3. Relationship between number of anglers and number of spawners entering Clear Creek, YNP, 1977-1983.



- 1) Clear Creek cabin was closed on July 1st therefore the number of ground observations for 1982 may be low.

Figure 4. Total number of bear reports (sign, ground observations, and radio telemetry locations) in the Clear Creek area, YNP, 1977-1983.

During this same time period bear use increased to its highest level in 7 years. This would indicate that keeping human use of prime bear habitat as low as possible would maximize bear use of these areas. If the increase in bear use over the years was due to the decrease in angler use, then the 1983 Clear Creek closure fulfilled both of its goals. It greatly reduced the potential for people/bear interactions and prevented high visitor use from displacing bears from a rich food source.

There are, however, a few other factors which should be considered. Increased bear use since 1979 may simply reflect a learned response to the presence of the weir, a reaction to the rich, highly concentrated, and easily accessible food source, and not a response to lower angler use. Trout are already an important seasonal food source of some Park bears. Mealey (1975) reported that for bears which utilized spawning migrations for a food source, cutthroat trout made up 33.9% (1973) and 34.4% (1974) by volume of their total diet during the month of July. For bears parkwide, trout made up 5.4% by volume of their total diet and ranked 5th in parkwide total consumptive use (Mealey 1975). Trout are also easily digested, ranking below only elk (Cervus canadensis) and bison (Bison bison), in digested Kcal/g for important Park bear foods (Mealey 1975). When a food source of this quality is concentrated, as at the weir, a high density of bear use would be expected. Even if the increased bear use over the years were due only to the concentrated food source, the 1983 closure still accomplished one of its goals. It eliminated people/bear interactions in an area where the potential for such interaction was high.

CONCLUSION

The increase in bear use since 1979 was probably due to the combination of a concentrated food source along with declining angler use of the area. The decrease in angler use since 1978 appeared to be related to the declining number of spawning trout entering Clear Creek since that time. A more valid way of monitoring the actual effects that a closure has on bear use of an area must be designed. These data indicate that a relationship exists between high visitor use and low bear use in the vicinity of the Clear Creek weir. It appears that closures are an effective way to insure that high visitor use does not displace bears from prime food sources.

LITERATURE CITED

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