

STATUS OF BROWN BEARS
AND OTHER
NATURAL RESOURCES
IN THE
McNEIL RIVER STATE GAME SANCTUARY AND REFUGE

Annual Report to Alaska State Legislature

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January 1997

Executive Summary

The McNeil River State Game Sanctuary and Refuge Management Plan was completed and made available for public distribution in June 1996. The interagency plan will provide guidelines for land use activities in the sanctuary and refuge.

The Board of Game, in October 1995, closed the refuge to brown bear hunting, effective July 1, 1996. One brown bear was killed during the fall 1995 hunting season. Four brown bear hunting permits, selected in May 1995, were valid for the spring 1996 season. There were no bears reported harvested during this period.

A total of 87 recognizable bears were observed in the sanctuary during the 1996 season; a small increase from the 1995 season but representing the 2nd highest total number since 1977. The total number of bear-use days increased about 11 percent from the previous season, reflecting a good return of sockeye salmon into Mikfik Creek. Bear use at McNeil falls reflected the 5 year average use.

Public use of the sanctuary averaged 9.2 persons/day, with 219 permittees (standby and drawing combined) visiting the sanctuary. A total of 1,502 applications were received for the 280 permits. All 15 special use permits were issued by the Department.

Sockeye salmon escapement index to Mikfik Creek totaled 10,500 fish. The chum salmon escapement index for McNeil River was 16,100 fish. No commercial harvest was directed at either of these stocks, and the entire run of both species entered their respective drainages. However, the McNeil chum escapement index remained significantly less than the minimum goal of 20,000 fish.

A UAF graduate student continued her research program investigating the relationship between chum salmon and brown bears in the sanctuary. Information from the first year is being analyzed and additional information will be collected during the next field season. A new research project was initiated by sanctuary staff to investigate whether relationships between individual bears can be determined from DNA collected through hair samples.

Introduction

The Alaska State Legislature passed legislation (AS 16.20.160) in May 1991, which expanded the McNeil River State Game Sanctuary and created the McNeil River State Game Refuge. The legislation became effective on January 1, 1993, when the Commissioner of Fish and Game certified the Paint River fish ladder as operational.

The sanctuary was established to (1) provide permanent protection for brown bears and other fish and wildlife populations and their habitats so that these resources may be preserved for scientific, aesthetic, and educational purposes; (2) manage human use and activities in a way that is compatible with the permanent protection of brown bears and other purposes described in (1) and, to manage uses and activities that would maintain and enhance the unique bear viewing opportunities within the sanctuary; and (3) provide opportunities that are compatible with (1) for wildlife viewing, fisheries enhancement, fishing, temporary safe anchorage, and other activities.

The refuge was established for similar, but somewhat different purposes. The differences are that human uses and activities in the refuge are to be managed to maintain and enhance the unique bear viewing opportunities within the sanctuary, that opportunities for brown bear hunting shall be determined by the Board of Game, and that mineral entry is allowed.

The statute requires the Commissioner of Fish and Game submit an annual report to the legislature regarding status of brown bears and other fish and wildlife resources within the

sanctuary and refuge and effects of fishing and fishery enhancement activities on these resources.

This report is provided in response to that requirement.

Land Status

All land in the newly established refuge and sanctuary extensions is state-owned or tentatively approved, except 14 sections that encompass Chenik Lake and Chenik Head. These sections were jointly selected by the state and Seldovia Native Corporation. They are not subject to refuge authority unless they become tentatively approved state land. Litigation between CIRI and Seldovia Native Corporation is still pending, and the Department of Fish and Game is not aware of any new developments in the court case regarding this property.

A private commercial interest is continuing efforts to obtain a lease for approximately 10 acres of land in the Chenik Head area. This site contains several nonpermitted buildings that serve as the headquarters for a private bear watching/wilderness retreat enterprise. The Department of Fish and Game has previously recommended that BLM deny the lease application until the land ownership question is resolved. Recent meetings between the private party and the Commissioner's office have taken place. Staff are not aware of any agreements that may have been reached as a result of those negotiations.

A section of the recently completed area land management plan addresses commercial facilities in the refuge. This plan, and the publicly developed and supported operational plan, contain

recommendations that address this issue and should be used to guide future decisions regarding commercial facilities. Independent decisions developed outside the public process negate efforts made by staff and the public in establishing responsible guidelines for land use activities.

Regulatory Changes and Management Plan

The Department of Fish and Game, through an interagency planning team consisting of representatives from state, federal, and local agencies, developed a McNeil River State Game Sanctuary and Refuge Management Plan. The draft plan was available for public review and comment in November 1995 with comments being accepted until February 15, 1996. The final plan incorporated public comments and was available for public distribution in September 1996.

The Board of Game met in October 1995 and considered a proposal to eliminate brown bear hunting within the refuge and adjacent area. After considerable discussion and debate by the board, a proposal was approved that closed brown bear hunting in the McNeil River State Game Refuge. That regulatory action became effective on July 1, 1996. No bears were reported harvested during the spring 1996 season.

A Board of Game regulation restricting the percentage of available visitor use permits issued to nonresidents to no more than 35 % went into effect on July 1, 1995. This regulation did not affect the 1995 permit drawing, as that procedure was completed prior to the effective date; however, it did influence the 1996 application process. A total of 10 permits, 1 regular and 9

standby, were not issued because there were an insufficient number of resident applications submitted for those permit periods. This regulation should be carefully reviewed during the next few seasons, to determine if it is negatively impacting the total number of persons visiting the sanctuary. If that is found to be the case, the Department should propose a revision to this regulation.

Brown Bear Status

Sanctuary staff record the number and sex of bears observed at Mikfik Creek, McNeil Falls, and other portions of the sanctuary during June, July, and August. The number of recognizable bears, excluding cubs, observed in the sanctuary during 1996 totaled 87 (Figure 1), which is the second highest number observed in the sanctuary (Table 3). The record number of 90 bears was observed in 1993.

The number of bears using the sanctuary has been relatively stable at high numbers during recent years, averaging 83.2 during the 1991-95 period. In comparison, the average number of identifiable bears was only 59 during the 1981-85 period.

A method used to determine bear use in the sanctuary is to record the number of bear-use days.

A bear-use day is any portion of a day that a recognizable adult or sub-adult bear (cubs are

excluded) is observed in the sanctuary. Sightings are made on an opportunistic basis, and therefore represents the minimum number of bear-use days for the area.

A total of 1,957 adult and sub-adult bear-use days were recorded for the 1996 season (Table 4). This represents an approximate 11% increase in bear use over the 1995 observations, and continues a two-year increasing trend for the total sanctuary area. The increase in bear use may be related to an increase in salmon escapement in Mikfik Creek and, to a lesser degree, in McNeil River. While McNeil falls had a small increase in bear use over the previous low use periods, bear use at Mikfik Creek almost doubled over 1995 activity. This is probably related to the availability of salmon in Mikfik Creek. The entire run of sockeye salmon escaped into Mikfik Creek and, due to extremely low water conditions and slightly later run timing this season, provided increased opportunities for feeding bears and public viewing. Division staff have previously observed that salmon abundance and availability appears to influence the number of bears using the sanctuary, and the 1996 season appeared to confirm that assertion. Even though salmon escapement levels in McNeil River were still below desired levels, the increased availability of sockeye salmon in Mikfik Creek did appear to increase bear use in the sanctuary.

Numbers of available chum salmon and related bear activity at McNeil Falls declined rapidly in late July, normally when a peak in activity is just starting. By early August, there were occasions when no bears were visible from the viewing platform. Maintaining substantial salmon returns to McNeil River is a critical factor in providing a quality viewing experience. The Division of Commercial Fisheries Management and Development has recognized this situation and is

continuing cooperative efforts with the Division of Wildlife Conservation in management of the area.

Maximum Daily Counts

In early 1993, during development of the McNeil River State Game Sanctuary and Refuge Operational Management Plan, the public advisory group determined that a consistent, reliable method of determining fluctuations in bear numbers was needed. To address that concern, a “bear threshold criterion” was established and identified as a predetermined level of change in the population that would trigger an assessment of potential factors that may be adversely affecting the bear population or the sanctuary viewing program. The necessary statistical test, developed by division statistical staff, is based on the proven Shewhart-CUSUM quality control test. The test will detect large, short-term declines and gradual, long-term drift in the average number of bears.

Maximum daily counts, consistently collected at McNeil Falls from 1983 to 1992, were averaged to establish a standard of 48.6 bears as the benchmark for maintaining bear numbers and viewing opportunity. The median maximum count will be compared annually with the predetermined lower level of change to determine whether the number of bears observed is within the range of normal fluctuations. If the median annual maximum count drops below the threshold level of 41

bears, an investigation of probable causes will be initiated. The 1996 median annual maximum count was 50 bears (Figure 2).

Public Use

A permit is required for access to the sanctuary from June 7 through August 25. A system in place since 1993 has required that both regular and standby permits be issued through a lottery process. This system was established to reduce staff time required to manage the previous standby system and to reduce the potential for members of the public to receive more than one permit per year.

The number of people taken to a bear viewing area is limited to ten per day. In 1996, from June 7 to August 25, an average of 9.2 people per day visited bear viewing areas in the sanctuary (Table 1). A sanctuary goal is to maximize the number of bear viewers within the required permit guidelines. However, all time slots are not always filled despite use of standby permits, primarily because occasional periods of stormy weather dampen visitors' enthusiasm to view bears. Additionally, bear viewing is less reliable at both ends of the season, and some vacancies occur as people cancel their visits to the sanctuary.

In 1996, ADF&G received 1,502 applications for the 280 available permits (185 regular and 95 standby). This represents a slight increase over the 1995 period, but continues to be lower than the record high number of permit applications received in 1993 (Table 2). The 1991-1995

average number of applications was 1,778. Application numbers have fluctuated considerably, especially after a media presentation on the sanctuary. However, the continued decline in applications may represent a response to a regulation passed by the Board in 1993, which established a 4 year waiting period for successful permit winners. This regulation may prevent some regular applicants from applying.

A total of 219 people (standby and drawing permittees) visited the sanctuary in 1996. The number of visitors has shown a declining trend since 1990 (Table 2). We anticipate that use will stabilize around the 225 visitor level with the permit system now in place.

All 15 special permits were issued for the 1996 season. Additionally, the Commissioner visited the sanctuary in July to obtain personal information regarding management of the sanctuary. The demand for special permits continues to be high and the department receives numerous requests each year. The criteria developed by the department for issuing these permits provides consistency during the review of future proposals.

Brown Bear Hunting

The sanctuary is closed to brown bear hunting. In October 1995, the Board of Game closed the refuge to brown bear hunting, effective 1 July, 1996. Four permits were available for the spring 1996 brown bear hunt and no bears were reported harvested.

Bear Mortality

Since 1976 (initial year of record keeping), observed mortality of cubs (of all ages) has been about 1.4 per season. This includes mortality from all causes including infanticide, drowning, and separation from females.

Three bear mortalities were discovered in the sanctuary during 1996. On 29 June, the partially decomposed carcass of a 2 1/2 year old brown bear was found in Akjemguiga Cove (Paint River Cove). The cause of death was undetermined. Other bear carcasses have been found on this beach in previous years, and have been suspected as drowning mortalities from Paint River falls. On 15 July, a known female with three spring cubs was observed to lose one of the cubs when it fell from a cliff and died from head injuries sustained in the fall. On 14 August, the partial skeleton of a 2 1/2 year old brown bear was found in Amakdedulia Cove. Cause of death was undetermined.

Sport Fishing

Limited sport fishing occurs in McNeil Lagoon and Chenik Creek but is incidental to bear viewing activities. The only area that attracts significant sport fishing interest is the lower Kamishak River. Due to low sampling effort and questionnaire returns, the Division of Sport Fish's annual survey of sport anglers does not accurately portray angler effort on the Kamishak River.

To address this problem, the Department included an angler reporting requirement for lodges receiving special area operating permits for the Kamishak River portion of the sanctuary. Seven lodges operated in the area during July, August, and September. As of this date, only three of the lodges have completed their reporting requirements. The Department will request that the required information be provided as soon as possible. Future access permits will be denied if the operators do not comply with permit requirements.

Commercial Fisheries

There was no commercial fishing effort and consequently no salmon harvested in the McNeil Subdistrict this season. Sockeye salmon returns within the sanctuary were strong enough to provide good spawning escapements and a small harvestable surplus. However, the 1996 sockeye return to Mikfik Creek did not attract any commercial fishing effort, and the entire run entered the system to spawn. The estimated escapement index of 10,500 sockeyes exceeded the desired goal of 5,000-7,000 by 3,500 fish. Extremely low water conditions delayed or precluded the upriver migration of Mikfik sockeyes and no doubt increased the salmon consumption rate by bears.

Overall chum salmon returns to the Lower Cook Inlet management area were poor and the harvest was the lowest ever recorded. No chum salmon were commercially harvested, and like previous years, the entire chum salmon run to McNeil River was allowed into the system to spawn. Even so, the chum salmon escapement index of 16,100 was significantly below the minimum goal of 20,000

fish. This marks the seventh straight year that the McNeil River chum salmon run has failed to meet the desired escapement level despite the absence of significant commercial harvests (Table 5).

Fisheries Enhancement

Fisheries enhancement continues to play a major role in Lower Cook Inlet (LCI) salmon production. Enhancement and rehabilitation projects have made substantial contributions to commercial fishing harvests in the Kamishak Bay District. However, sockeye salmon returns to the Paint River enhancement project in 1996 were again poor, as they have been for the past several years. No commercial harvest occurred, since only about 200 fish returned. The run strength was insufficient to warrant opening the ladder to fish passage for a fifth straight year.

The Paint River Lakes were first stocked with sockeye fry in 1986 in an effort to develop a new sockeye salmon return to the drainage, which is blocked to upstream salmon migration by a steep waterfall at tidewater. From 1991 to 1996, approximately 600,000-750,000 sockeye fry have been stocked annually in the Paint River Lakes. Although construction of the Paint River fish ladder was completed in October 1991, the number of returning adults has only ranged from 200 to 800 fish. Consequently, the structure has never been opened to allow fish passage upstream through the ladder system. The low returns may be related to the current low productivity potential and high predation within both lake systems.

Cook Inlet Aquaculture Association continues to evaluate other suitable sockeye salmon broodstocks from the west side of Cook Inlet as potential replacements for the Tustumena sockeye stock that has been repeatedly released into the Paint River Lakes. Pink and chum salmon broodstock development is also being evaluated but is currently on hold until an adequate funding source is secured.

The Tustumena sockeye stock has also been used to stock Chenik Lake for many years. This sockeye salmon enhancement project has contributed substantially to the LCI commercial seine fishery. For example, in 1988 a new historic high record return to Chenik Lake was documented at 173,000 sockeye salmon, catches of which represented over 50% of the entire LCI commercial sockeye harvest. However, in recent years this contribution has declined significantly.

Due to expected weak returns to the Chenik Lake enhancement project, the Chenik Subdistrict remained closed to fishing this season. Unfortunately, the closure failed to boost returns, as escapement past the Chenik Creek weir totaled only 2,990 fish. The 1996 sockeye salmon outmigration from Chenik Lake totaled approximately 12,700 smolts.

Results of sockeye salmon returns to other enhancement projects in the Kamishak Bay District were somewhat more encouraging in 1996. Kirschner Lake and the relatively new Bruin Lake stocking project produced a combined commercial harvest totaling 32,000 fish.

Research Activities

The brown bear-chum salmon graduate research program, started in 1995, continued this season.

The primary intent of this research is to improve the quantification and description of chum salmon consumption by brown bears at McNeil River State Game Sanctuary. The primary hypotheses being investigated are:

- 1) Bears catch fewer fish in the morning than in the late afternoon and evening;
- 2) Adult bears catch more fish than subadults, and male bears catch more fish than females;
- 3) The demography of bears fishing at MRSGS has changed from more females during the 1980's to more males at the present time;
- 4) Environmental factors such as tide stage, water level, precipitation, and daylight affect
- the number of fish caught by bears.

A goal for data collection during this season was to extend the sampling window at the falls, in order to increase the number of observations during less frequently sampled periods of the day. However, data collection was restricted by the necessity of primarily maximizing the visitor experience while secondarily optimizing data collection. Observations were collected from 12:00 to 18:00 hours daily from 5 July to 6 August. In addition, observations were collected from 07:00 to 22:00 hours on every third day, in order to increase the times of day sampled. Bears fishing at night have previously been observed at the sanctuary, although catch has not been quantified. Three all-night observation periods were completed to collect this

supplementary information. Visitors were invited to participate in these additional sampling sessions.

Salmon consumption observations were collected systematically on 33 days for a total of 334.5 hours of observation. During this period, a total of 7648 fish were observed caught (Table 5).

Preliminary review of data and subjective observations indicate three differences between this and last year:

- 1) Water levels were exceptionally low, allowing bears access to fish which were actively spawning;
- 2) Low water levels concentrated fishing activity in the middle and far side of the river;
- 3) All night observations suggest that more fish may be caught nocturnally than previously thought.

Data analysis will continue over the winter to test the hypotheses. One additional year of data collection is anticipated with a similar sampling schedule.

A new research project was initiated at the sanctuary during 1996. The purpose of this study is to genetically identify individual bears from the McNeil sanctuary population, using DNA fingerprinting techniques, and use this information to determine if social behavior is effected by biological relationships.

Hair samples were obtained from barbed-wire wrapped posts placed in specific locations in the sanctuary. A total of 54 hair samples were collected from known and unknown bears. The

samples have been sent to the Alaska Crime Lab for analysis on a volunteer and time available basis. To continue this project, funding sources must be identified to provide for hair sample analysis on a scheduled basis.

Volunteers

The 1996 season marks the fourth year for the non-department volunteer work party program. This program has created an opportunity for volunteers to assist staff in preparing the camp and trails prior to arrival of the first permittees. As in earlier years, the volunteers were from various local conservation groups. Work accomplished included trail upgrades, cabin cleaning, painting, treating cabin exteriors, camp site upgrades and fire wood collection. This program continues to be a very successful cooperative venture.

Land Use Permitting

Seven permits were issued for the establishment of sport fishing guide camps on the Kamishak River within the sanctuary. These camps appear to be operating in a manner compatible with sanctuary guidelines. Reporting requirements regarding number of clients and total fish caught are typically late in arriving at the Anchorage regional office, and only three were available at this time. Additional compliance monitoring will be necessary in upcoming seasons. Two camps were erected on-site during 1996, and they were again located on the bluff away from the river to minimize damage to streamside vegetation. The additional fishing activity was done on a day-use basis only.

Bear-Human Conflicts

There were no known adverse interactions between bears and people in the sanctuary or refuge during the 1996 field season.

McNeil River State Game Sanctuary Brown Bear Numbers 1976-1996

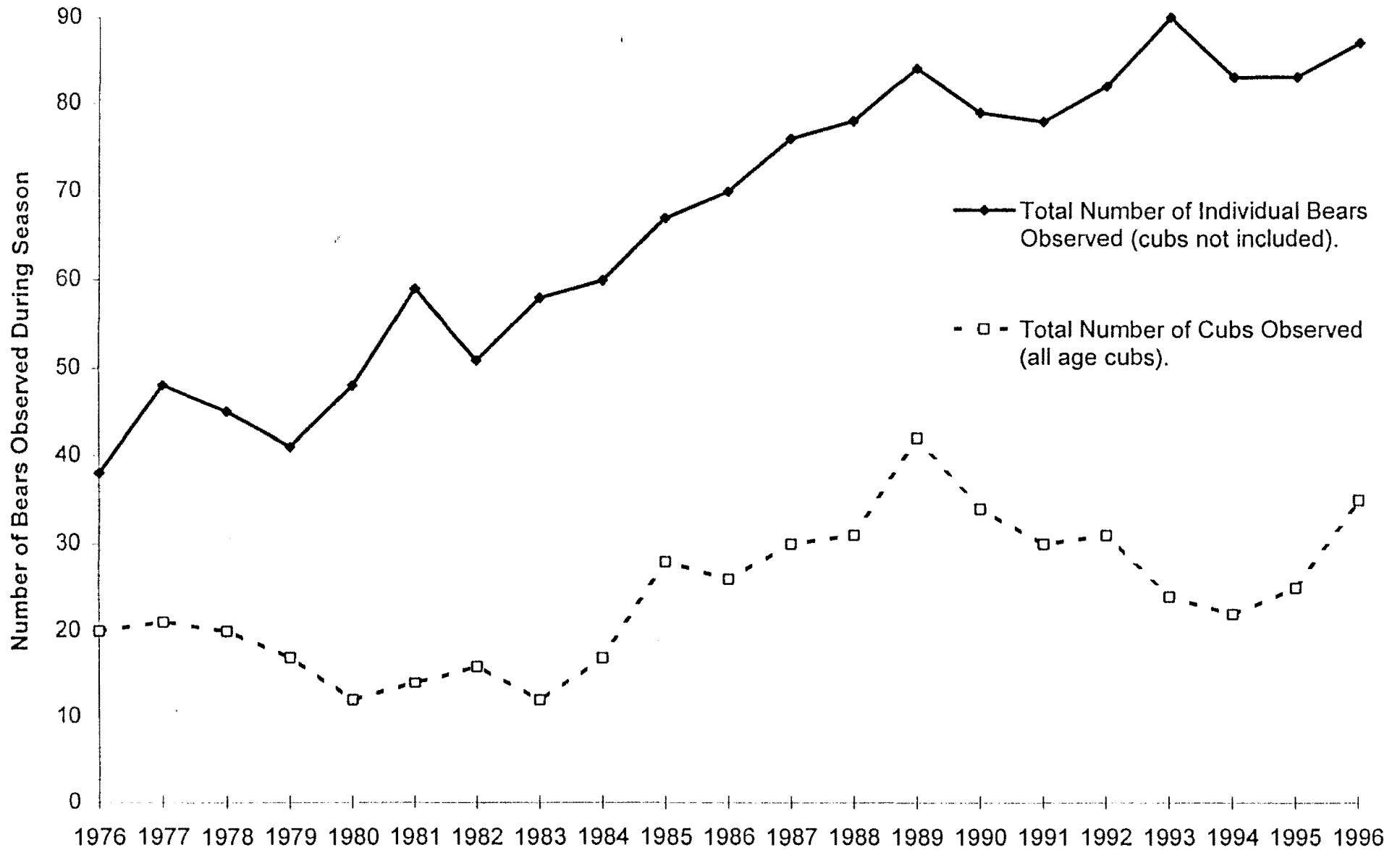
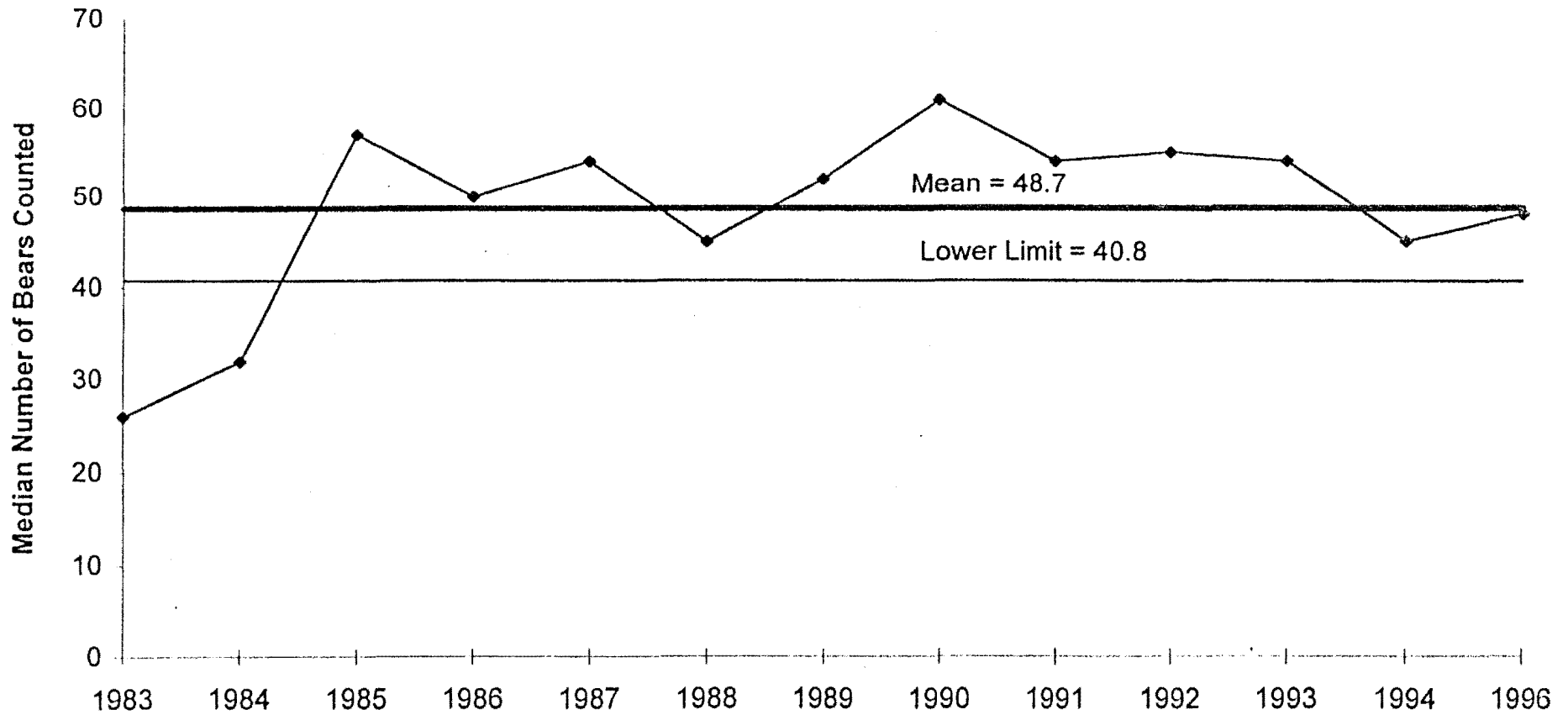


Figure 1.

Prepared by ADF&G - Wildlife Conservation 10/3/96

One-Sided Control Chart for Maximum Daily Bear Counts* (7 highest counts) at McNeil River Falls ($\alpha=0.01$)



* Includes all age cubs.

Figure 2.

Table 1. McNeil River Sanctuary Permit comparisons

Regular Permits

Standby Permits

Date	Number* issued	Paid for and used	Paid for but not used	Not paid for	Date	Number* issued	Paid for and used	Paid for but not used	Not paid for
June 7-10	10	9	0	1	June 9-12	5	1	0	4
11-14	10	8	2	0	13-16	3	3	0	0
15-18	7	4	1	2	17-20	4	2	1	1
19-22	10	7	0	3	21-24	5	2	0	3
23-26	7	7	0	0	25-28	5	1	1	3
27-30	9	7	2	0	Jun 29-Jul 2	5	4	0	1
July 1-4	10	6	1	3	3-6	4	2	0	2
5-8	10	10	0	0	7-10	4	1	1	2
9-12	10	9	0	1	11-14	5	2	0	3
13-16	7	5	0	2	15-18	5	3	0	2
17-20	10	10	0	0	19-22	5	2	0	3
21-24	10	10	0	0	23-26	5	3	0	2
25-28	7	3	0	4	27-30	5	5	0	0
Jul 29- Aug 1	10	8	1	1	Jul 31-Aug 3	5	3	0	2
2-5	10	9	0	1	4-7	5	2	0	3
6-9	7	7	0	0	8-11	5	5	0	0
10-13	10	10	0	0	12-15	3	2	0	1
14-17	10	10	0	0	16-19	4	0	0	4
18-21	10	10	0	0	20-23	4	2	0	2
22-25	10	7	0	3					
Average	9.2	7.8	.4	1	Average	4.5	2.4	.2	2
%		85	4	11	%		53	3	44

*=normally 10 regular permit and 5 standby permits are issued in each time period except those 5 slots where 3 of the 10 regular permits are reserved for special permits. In addition in 1996 some permits (1 regular and 9 standby) were not issued because of insufficient applications from Alaska residents.

Table 2. Visitor use of McNeil River State Game Sanctuary (MRS GS)

Year	Number of Applicants	Number of Visitors ^a	Total User Days in Sanctuary ^a	Total Permit Days for July/Aug ^b	Comments on Season Length
1976		76	256	232	6/28-8/19
1977		122	365	311	6/29-8/14
1978		143	390	345	6/28-8/25
1979	669	75	185	91	6/28-8/25
1980	532	116	52	356	6/13-8/25
1981	397	133	519	434	6/17-8/27
1982	485	132	556	420	6/24-8/23
1983	625	178	738	454	6/11-8/25
1984	992	159	574	377	6/5-8/27
1985	832	216	816	449	6/10-8/25
1986	806	255	967	430	6/9-8/25
1987	1,757	252	1,054	473	6/9-8/23
1988	1,094	304	1,328	498	6/1-8/29
1989	1,306	264	1,183	488	5/22-8/26
1990	1,481	299	1,435	524	6/8-8/25
1991	1,818	249	1,415	526	6/1-8/27
1992	1,672	245	1,210	478	6/1-8/25
1993	2,150	225	1,128	516	6/7-8/25
1994	1,766	228	1,086	484	6/7-8/25
1995	1,486	212	1,074	475	6/7-8/25
1996	1,502	219	1,158	494	6/7-8/25

97 1474

^aIncludes June visitation^b560 maximum possible (56 days x 10)

Table 3. Sex and age composition of brown bears at McNeil River State Game Sanctuary: 1977-1996

	'77	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96
Total Females w/cubs	10	8	9	6	8	7	7	9	16	14	14	14	19	16	15	16	11	11	14	20
Single Adult Females	8	6	8	8	10	9	15	16	12	11	13	13	14	16	12	19	19	15	12	14
Single Adult Males	18	18	19	23	26	20	22	22	27	31	34	34	42	37	41	39	48	45	49	46
Adult Sex Unknown	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Adults	36	32	36	38	44	36	44	47	55	56	61	61	75	69	68	74	78	71	75	80
SubAdult Females	3	4	2	6	9	11	9	8	2	7	7	9	4	5	6	6	8	9	3	6
SubAdult Males	5	4	0	0	1	1	4	5	10	7	8	8	5	5	4	2	4	3	5	1
SubAdult Sex Unknown	4	5	3	4	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Sub-Adults+	12 ^d	13	5	10	15	15	14	13	12	14	15	17	9	10	10	8	12	12	8	7
Total Adults and Sub-Adults *	48	45	41	48	59	51	58	60	67	70	76	78	84	79	78	82	90	83	83	87
Total Cubs	21	20	17	12	14	16	12	17	28	26	30	31	42	34	30	31	24	22	25	35
Total Bears	69	65	58	60	73	67	70	77	95	96	106	109	126	113	108	113	114	105	108	122

^d -- defined as 5.5 years old and younger from 1977 through the present

* Only the bears that are recognizable as individuals and given names are included. Hence these figures represent minimum number of bears present at the sanctuary.

Table 4. Total Bear Use Days for Areas of McNeil River State Game Sanctuary for June, July, and August.

	McNeil Falls			Lower McNeil River			Mikfik Creek			All other areas (flats, bluffs, etc.)			Total Bear Use		
	adult/ sub-ad	all cubs	Total	adult/ sub-ad	all cubs	Total	adult/ sub-ad	all cubs	Total	adult/ sub-ad	all cubs	Total	adult/ sub-ad	all cubs	Total
1980	709	140	849	14	15	29	46	21	37	162	56	218	924	218	1142
1981	878	224	1102	-	-	-	18	21	39	77	63	140	973	308	1281
1982	925	142	1067	21	9	30	28	2	30	83	33	116	1054	186	1241
1983	926	172	1098	-	-	-	8	0	8	100	41	141	1032	213	1245
1984	1218	274	1492	50	9	59	43	0	43	123	39	162	1432	322	1754
1985	1514	451	1965	37	31	68	150	56	206	195	100	295	1888	642	2530
1986	1649	494	2143	34	42	76	192	126	318	214	172	386	2061	825	2886
1987	1723	465	2188	9	12	21	235	86	321	161	152	313	2126	715	2841
1988	1515	417	1932	30	40	70	201	28	229	142	48	190	1873	524	2397
1989	1863	699	2562	119	80	199	156	71	227	174	189	363	2300	1032	3332
1990	1606	551	2157	76	57	133	229	159	388	264	251	515	2089	936	3025
1991	1393	388	1781	1	0	1	428	120	548	246	138	384	2039	631	2671
1992	1510	480	1990	3	6	9	385	115	500	178	139	317	2075	738	2813
1993	1240	86	1326	94	57	151	234	26	260	358	164	522	1921	227	2248
1994	1165	125	1290	95	59	154	212	29	241	208	103	311	1661	307	1968
1995	1137	147	1284	113	64	177	229	6	235	298	120	418	1741	329	2070
1996	1301	229	1530	90	40	130	419	105	524	153	75	234	1957	449	2406

- Each time a recognizable bear is seen in an area of the sanctuary, it is counted as one bear use day for that area. Hence if 10 different bears are seen at McNeil falls 10 days in a row, that equals 100 bear use days for McNeil falls. The total bears column may be less than the sum of the first four columns if a bear is counted using more than one area in the same day. Bears are noted opportunistically and figures reflect not only actual bear use but to some degree the amount of time spent viewing.
- McNeil falls sightings are made from the viewing pad and include any recognizable bear no matter where it is or how far down stream it is.
- Lower McNeil River sightings are made from the mouth of McNeil River, generally from Enders Island. Viewing occurs here in mid to late August after bear activity ceases at McNeil falls. Little or not time was spent viewing here from 1980-1983.
- Mikfik Creek is defined as the area up creek from the last area of tidal influence, including the area referred to as the "riffles".
- All other areas includes anywhere in McNeil cove that is not included in the first three categories. This includes the sedge flats, beach, by camp, or on any of the bluff areas. Through the years notations of bear use in these areas has been very casual as very little time comparatively is spent systematically bear watching away from the first three areas.

Table 5. McNeil River Bear/Chum Salmon Statistics

Year	Actual no. of salmon caught by bears ¹	Total hours observed	\bar{x} salmon caught/human hour of observation	Adjusted number of salmon caught by bears ²	Aerial live counts index ³	Number of bears ⁴	No. of days observations made	Bear use days ⁴	\bar{x} No. of days recognizable bears are at falls
1985	6,592	310.00	21.3	17,381	9,500	66	51	1,514	22.9
1986	14,527	419.00	34.6	26,019	22,000	70	47	1,649	23.6
1987	15,463	360.75	42.9	35,006	26,000	70	51	1,723	24.6
1989	13,231	286.25	46.0	34,592	34,000	77	47	1,863	24.2
1990	6,851	240.00	28.5	20,520	8,000	77	45	1,606	20.9
1991	5,615	291.75	19.2	15,974	10,000	74	52	1,393	18.8
1992	7,864	274.25	28.7	22,500	19,200	81	49	1,510	18.6
1993	5,786	292.50	19.8	16,474	17,430	85	52	1,240	14.6
1994	4,355	277.50	15.7	11,555	14,955 ⁵	80	46	1,165	14.6
1995	3,563	317.00	11.2	8,960	14,411 ⁵	75	50	1,137	15.2
1996	7,648	334.5	22.9	16,723	16,100 ⁵	84	52	1301	15.5

¹ This number is influenced by the actual hours we observe which varies year to year.

² $(\bar{x} \text{ fish per hour}) \times (16 \text{ hour day}) \times (\text{number of days observations are made})$. The hours 2300 to 0700 are excluded entirely.

³ Provided by Commercial Fisheries Division.

⁴ Includes adult and subadults, (no cubs) seen at least once during the viewing day from the gravel pad at McNeil Falls from July 1 through August 31.

⁵ Aerial live count index is derived, by CFMD staff using the cumulative total count method in 1994, 1995 and 1996. This method uses a model based in part on chum salmon stream life and generally provides a higher live count index than earlier methods.