Special Areas Management Report

McNeil River State Game Sanctuary

Annual Management Report

2010

Thomas Griffin and Edward W. Weiss

March 2011

Alaska Department of Fish and Game **Division of Wildlife Conservation**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the reports by the Division of Wildlife Conservation. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

all commonly-accepted abbreviations; e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles; e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
Alaska Department of Fish and Game	ADF&G
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures):	first three letters (Jan,...,Dec)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
approximately	~
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mean	$\bar{x}$
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
plus or minus	±
population size	N
probability	P
sample size	n
second (angular)	"
standard deviation	σ or s
standard error (of the mean)	$s_{\bar{x}}$
type I error probability	P_a
type II error probability	P_b
variance	σ^2 or s^2

Cover Photo: Brown bear *(Ursus arctos)*. McNeil River State Game Sanctuary. Photo © 2010 ADF&G, by Thomas Griffin.

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The State of Alaska's wildlife refuges, sanctuaries, and critical habitat areas are managed by the Lands and Refuges program of the Division of Wildlife Conservation in the Alaska Department of Fish and Game. Funding for the program and and its publications comes from appropriations made by the Alaska Legislature.

Governor of Alaska : Sean Parnell
ADF&G Commissioner: Cora Campbell
Division of Wildlife Conservation Director: Corey Rossi
Lands and Refuges Program Coordinator: Joe Meehan

It is the mission of the Division of Wildlife Conservation to conserve and enhance Alaska's wildlife and habitats and provide for a wide range of public uses and benefits.

Special Area Management Reports address management activities and goals within specific Refuges, Critical Habitat Areas and Sanctuaries managed by the division. The Special Areas Management Reports are intended for biologists or other technical professionals, as well as to inform the general public about the special areas. Reports are available through the Alaska State Library and through the department's Internet website at www.adfg.alaska.gov.

This publication was reviewed and approved for publication by Joe Meehan, Lands and Refuges Program Coordinator, Anchorage, Alaska.

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Executive Summary

The McNeil River State Game Sanctuary (MRSGS) and McNeil River State Game Refuge (MRSGR) were created by the Alaska State Legislature in 1967 and 1991, respectively. The sanctuary was established primarily to provide permanent protection for brown bears and other fish and wildlife populations and their habitats and to maintain and enhance the unique bear-viewing opportunities within the sanctuary. The refuge was established for similar reasons and human use in the refuge is managed to maintain and enhance the bear-viewing opportunities within the adjoining sanctuary.

The sanctuary supports the largest gathering of brown bears in the world as they congregate to feed on migrating salmon. The Alaska Department of Fish and Game (ADF&G) operates a world-renowned bear-viewing and photography program in the sanctuary at McNeil River and nearby Mikfik Creek. This report provides a summary of the status of brown bears and other fish and wildlife resources within the sanctuary and refuge, the effects of fishing and fishery enhancement activities on these resources, land status and management issues, and known public use.

As many as 144 individual bears (1997) have been observed at MRSGS during summer and as many as 74 bears (2010) have been seen at one time at McNeil River Falls, the primary bear gathering and viewing location. Since 1997 the number of individual bears identified within the sanctuary dropped to 78 in 2004 (the lowest count since 1984), increased to 93 in 2008, and increased again to 105 in the 2010 season. Both the long-term (1976-2010) average and the median number of individual bears annually identified are 93.

One factor potentially contributing to lower numbers of bears at McNeil Falls during low-count years is a long-term trend of low chum salmon returns to McNeil River. The established chum salmon escapement goal in place for any given year has been met 19 times since 1978 (33 seasons) and only five times in the last ten years. The effect of this on bear numbers at McNeil River may also be exacerbated by reasonably strong returns of chum and sockeye salmon in nearby systems. Other Kamishak Bay systems experienced relatively good runs of chum salmon between 2000 and 2009 (except for 2007). This may have drawn bears away from the McNeil River system in search of a more abundant food sources during those years; however, these relationships are not well understood. Chum salmon runs were moderately strong in 2010, with all Kamishak Bay District streams except McNeil River achieving at least the low end of the respective escapement goal ranges. The Mikfik and Chenik sockeye salmon runs fell within or exceeded their respective escapement goal ranges in 2010.

The bear-viewing program at MRSGS again attracted people from around the world and 714 people applied for the 185 regular permits and 57 standby permits selected by lottery. During 2010, 176 people participated in the Sanctuary's bear-viewing program (June 7 through August 25), which includes Guided and Standby lottery permit winners and Special Access Permit holders. The permit program generated approximately $59,725 in 2010 that was deposited into the state's Fish and Game Fund.

The MRSGS photo identification project (initiated in 2007) progressed in 2010. This collection and storage of digital images of individual bears and their defining characteristics is intended to be a long term project that will enhance and improve management of the bear viewing program and assist in monitoring life histories of individual bears. Volunteers from Friends of McNeil River, a nonprofit sanctuary support organization, and ADF&G staff utilized cataloged photos of individual bears to create a field book that was available to guests and staff.

Western Washington University graduate student Ian Gill and his assistant Larry Aumiller continued research on the predator-prey dynamic between brown bears and the chum salmon at McNeil River Falls in an effort to calculate the number of salmon harvested by bears and to understand the factors affecting the success of individual bears, how they learn, and how this interaction affects the health of both populations. The estimate of salmon harvested by bears at McNeil Falls between July 1 and August 3 of 2010 is 8,696; compared to 7,651 during the equivalent sampling period in 2009, the first year of the study.

Under a Federal Aid Cooperative Endangered Species Conservation Fund grant sea otter carcass surveys continued along sanctuary and refuge shorelines to assist the US Fish and Wildlife Service in determining the cause of declining sea otter population in Southwest Alaska. Foot surveys from the north end of Amakdedori Beach to Horseshoe Cove were conducted throughout the season and a single survey of beaches on Augustine Island was made via helicopter.

A total of six ADF&G Special Area Permits and eleven Commercial Access Permits were issued during 2010 to commercial operators in support of their camping, sport-fish guiding and boat storage on the Kamishak River as well as providing commercial access to McNeil River camp. In addition, Special Areas Permits were issued to a commercial bear-viewing guide for a temporary bear viewing camp at Chenik Lake; as well as to Cook Inlet Aquaculture Association (CIAA) to complete maintenance and repairs to the Paint River Fish ladder. Existing permits were valid for: ADF&G-CF (Division of Commercial Fisheries) installation and operation of video escapement recorders at Chenik Lake and Mikfik Lake and a joint ADF&G-CF and Western Washington University graduate student research project at McNeil River Falls. There were no mineral resource development activities permitted or reported to the Department within the McNeil River SGS or SGR during 2010.

CIAA received grant monies in 2008 to conduct maintenance on the Paint River Fish ladder. Under the grant CIAA intended to make repairs, cover open cells, and perform other maintenance to prepare the ladder for formal operation and fish passage. During early 2010 CIAA performed maintenance repairs and improvements on the Paint River fish ladder. Work included the installation of gratework on open cells and periphery areas to prevent bears from falling into or accessing the ladder. Some additional work is still pending. Additionally, the Paint River Salmon Enhancement Project Operational Plan, drafted in 1993 but never approved, was updated. A working draft was presented to the Cook Inlet Regional Planning Team at its April meeting. While the document is not a complete plan for the Paint River facility and is intended to be periodically updated; the CIRPT voted to accept the document as an appropriate planning document for the time being. At this time there are no definitive plans to conduct any form of salmon enhancement in the form of stocking the Paint River system, but that option remains a possibility and CIAA is investigating potential options for pink and chum salmon enhancement. While no specific plans are in place, upon completion of the maintenance activities the ladder would be opened to water flow for evaluation purposes and potential salmon colonization.

I. Introduction

McNeil River, located in southwestern Alaska (Figure 1) supports the world's largest congregation of brown bears. The Alaska State Legislature established the McNeil River State Game Sanctuary in 1967 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 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 (AS 16.20.162(a)). Hunting, trapping and mineral entry are prohibited in the sanctuary.

The sanctuary was expanded and the adjoining McNeil River State Game Refuge was created in 1991; however, implementation of this legislation was delayed until January 1993 when the Commissioner of the Department of Fish and Game (the Department) certified the newly constructed Paint River fish ladder as operational. The refuge was created for purposes similar to those of the sanctuary; however, hunting and trapping were allowed to continue in the refuge at the discretion of the Alaska Board of Game (BOG) (AS 16.20.041). Additionally, human use in the refuge is managed to maintain and enhance the unique bear-viewing opportunities within the adjoining sanctuary and mineral entry in the refuge is permitted.

This report provides a summary of the status of brown bears and other fish and wildlife resources within the sanctuary and refuge, the effects of hunting, fishing, trapping, fishery enhancement activities and resource development on these resources; and public use and management issues. A condensed version of this report is submitted annually to the Alaska State Legislature by the Commissioner of the Department as required by the sanctuary and refuge enabling legislation (AS 16.20.041(f) and AS 16.20.162(f), respectively).

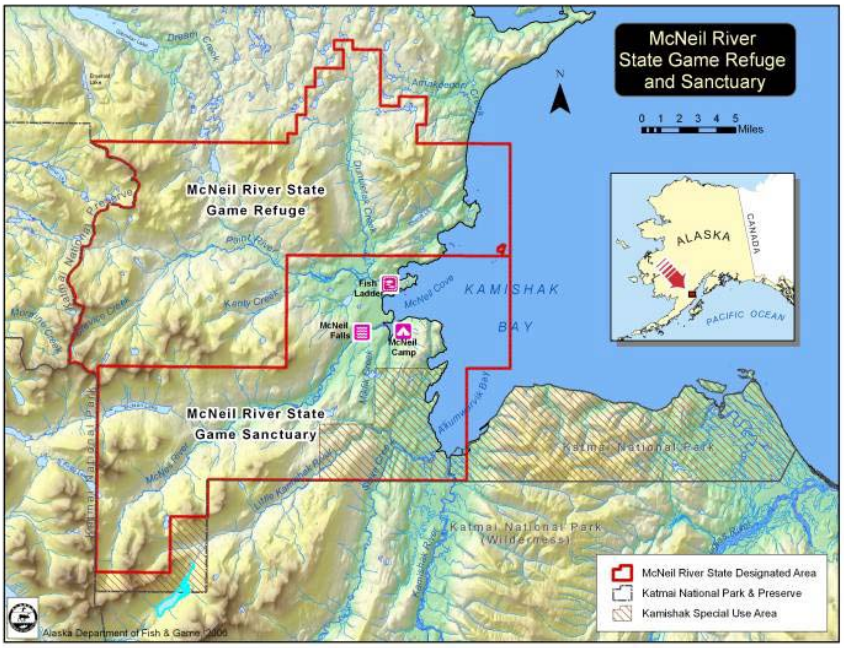

Figure 1. Location of the McNeil River State Game Sanctuary and Refuge in southwest Alaska.

II. Wildlife

Brown Bear Monitoring Program

The McNeil River SGS & SGR encompass approximately 388 square miles. The Department does not conduct bear surveys or have bear use data on the entirety of the sanctuary or refuge. The majority of the brown bear monitoring and use data is connected with the bear viewing program centered at McNeil River Falls. Some additional information is provided through self reporting by commercial sportfish and bear viewing guide services that operate in the area. Monitoring and reporting statistics and subsequent management decisions are based on the data gathered as part of the McNeil River bear viewing program at McNeil River Falls / Mikfik Creek area.

The number of bears at McNeil River Falls fluctuates daily and annually. Variability in bear use may be influenced by several factors including: food availability, the strength and timing of salmon runs in McNeil River and in the surrounding systems, changes in the regional bear population, as well as hunting and other human-caused mortalities. A public advisory committee assisted the Department with the development of the sanctuary and refuge operational management plans in 1993. It was concluded that managers needed a consistent and reliable method for monitoring the fluctuations in the number of bears at McNeil River Falls. This information allows for the proper management of the sanctuary in accordance with its legislative purposes. The ADF&G uses three different methods used to monitor bear use at MRSGS: *index counts* (the average of the seven highest hourly counts each season at McNeil River Falls), *individual counts* (the minimum number of individual bears observed during the season), and *bear use days* (the sum of the number of days each individual bear was present).

Index Counts

The index count monitoring program involves counting all bears in view from the viewing pad at McNeil River Falls once each hour from July 15 through August 5 between 11:00 a.m. and 7:00 p.m. The number of hourly counts (data points) that occur from year to year is variable due to the changing and opportunistic nature of the daily bear-viewing schedule. This monitoring program detects large, short-term declines or gradual, long-term declines in the average number of independent bears at McNeil River Falls and includes a Bear Threshold Criterion (BTC). The annual medians of the seven highest daily counts of bears at the falls from 1983 to 1992 were averaged to establish a standard of 48.6 bears as the benchmark for maintaining bear numbers and the quality viewing opportunities in the sanctuary. The BTC (40.8 bears) represents the lower limit of these medians and represents a statistically significant lower level in the observed number of bears. The average of the seven highest hourly counts is calculated and used as an index that is weighed against the BTC. A decline below this "criterion" may be indicative of adverse impacts to the purposes for which the sanctuary was established and would initiate an assessment of the possible causes.

In 2010 the average of the seven highest hourly counts was 59.9 bears, which is above the benchmark average of 48.6 bears. In 2010, the numbers are considerably higher than previous years. All seven of the highest hourly counts for 2010 are clearly above the lower limit (40.8 bears) and also above the base average (48.6 bears). The 2010 average of 59.9 was the highest average recorded since 1997, when the average of the seven highest hourly counts was 55. Between 1993 and 2009 the highest and lowest averages of the seven highest hourly counts were 55 (1997) and 22 (2005), respectively. From 1998 to 2005, there was a relatively steady decline in the average of the seven highest hourly counts. From 2006 to 2010, there has been a steady increase in the average of the seven highest hourly counts. Hourly Index counts for 2010 are presented in Table 1. The index numbers (average of the seven highest hourly counts) for 1983 – 2010 are presented in Figure 2).

Of note for 2010 are two individual hourly counts of 74 bears each, observed on July 19 and July 21 at 2100 hours. These counts are record highs for McNeil River; however, they are not included in the index count for 2010 as they occurred outside the standard count hours. Also of note was a July 8-9, high-water event in McNeil River, during which bears utilized Mikfik Creek more than McNeil Falls. However, the bears returned to the falls starting on July 10 with increasing numbers over the course of July.

Individual Counts

A second method of monitoring bear use and the quality of the bear-viewing program at the MRSGS is by tallying the number of individually identifiable bears (adults, sub-adults, & cubs) observed by sanctuary staff daily and throughout the season (Table 2, Appendix A). Using unique identifying marks such as sex, age, size and shape, maternal status, claw color, scars, coat color, and behavior a record of individually identifiable bears visiting the sanctuary has been documented every year since 1976 (35 years). Only individual bears that are recorded a minimum of three times are included in this count. Hence, this method provides an intrinsically conservative estimate. This monitoring method records the presence of an individual bear within MRSGS, if observed during viewing, on a daily basis. While it does not provide the true count of all bears present at MRSGS, it does provide an additional index in evaluating the overall bear use and the quality of the bear-viewing program.

There were 105 individual bears identified at MRSGS during the 2010 season. This represents a significant increase from the 73 individual bears observed during 2009. This increase corresponds to an increase in the number of adult bears observed, rather than sub-adults or cubs. There were 22 more identifiable adults in 2010 than 2009. The 2010 count is also the highest number of individual bears counted since 1998, when the number was 128. Since 1976 the lowest count was 58 (1976) and the highest count was 144 (1997). The long-term average of individually identifiable bears from 1976 to 2010 is 93 bears.

Bear Use Days

The quality of the bear viewing experience is not just a matter of the number of bears that visit the area in a season, but also the number viewed on a daily basis and how many days the bears stay in the Sanctuary. By summing the individual adult and sub-adult bears observed daily throughout the season an index of the number of bear use days is calculated. While these counts include bears within all viewing areas within McNeil River SGS, only data from McNeil River Falls during June 15 through August 25 is used for the index and historical comparison (Figure 3). One bear or family group at McNeil River Falls seen during a day is counted as one Bear Use Day. This monitoring method may be less reliable than the *individual counts* and *index counts* discussed above due to count variability among sanctuary staff and the opportunistic timing of the counts. However, it can be used to further the interpretation of these other monitoring methods and it generally follows the same trends as the other methods. Bear Use Days are useful because they track how many days per season individual bears use the sanctuary. This data has been recorded since 1980, but no data were recorded in 1999, 2000, or 2001.

There were 1,547 Bear Use Days at McNeil River Falls in 2010, which is up from the low of 781 Bear Use Days in 2005 and the highest number post-1990. The lowest count was 709 Bear Use Days in 1980, which was the first year this data was recorded. The long-term average (from 1980 to 2010) of Bear Use Days is 1,211 and the 9-year average (9 years since there is no Bear Use Days data for 2000 and 2001) is 977.

Table 1. Hourly Index Counts of brown bears at McNeil River Falls, McNeil River SGS, Alaska, 1993-2010.

Date	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
July 15	-	-	-	38	40	**47**	28	**37**	25	30	**42**	**24**	**23**	**31**	31	25	**41**	**54**
16	-	-	-	**46**	32	42	28	31	**39**	26	**31**	**31**	**22**	**31**	**35**	32	**34**	**60**
17	-	-	-	29	47	46	35	31	**41**	32	**36**	**22**	**23**	**31**	**37**	29	**35**	53
18	**37**	30	29	**44**	43	**47**	26	32	**40**	**33**	**40**	**23**	**21**	30	**37**	39	**34**	**54**
19	**58**	**50**	**33**	**54**	**66**	**57**	36	**36**	**35**	**35**	**40**	**28**	**20**	**33**	32	41	**39**	**69**
20	**55**	**37**	**40**	**40**	**52**	32	**37**	23	**37**	26	**38**	**27**	**24**	**37**	**42**	**46**	**40**	**54**
21	**46**	**43**	28	**47**	**50**	10	35	28	**40**	**40**	30	21	13	21	**40**	40	21	**70**
22	**54**	26	**48**	**49**	44	18	**38**	**37**	32	25	**37**	**22**	16	26	**36**	**42**	10	54
23	**49**	**43**	29	**47**	**63**	35	**42**	**36**	30	**41**	27	17	**18**	**31**	30	**42**	14	50
24	30	**52**	31	33	**52**	43	32	**36**	**42**	32	20	20	13	25	21	40	25	32
25	18	18	**39**	40	**51**	46	29	**36**	33	30	25	11	2	27	29	**53**	**40**	21
26	28	**37**	30	31	**54**	**63**	35	**32**	24	30	21	7	8	25	**36**	**51**	21	41
27	**34**	**44**	**39**	37	49	**50**	31	23	29	22	24	6	7	**31**	33	34	30	**58**
28	24	33	28	33	27	**51**	**37**	23	23	**34**	17	12	8	27	33	38	32	49
29	28	32	12	21	30	**48**	36	24	20	**36**	14	9	6	25	29	**42**	33	44
30	21	25	**32**	29	27	39	**41**	28	15	31	16	10	8	20	17	33	29	35
31	19	20	**35**	26	15	34	**42**	19	11	**33**	-	14	7	20	22	**42**	18	31
August 1	13	16	23	22	17	35	**42**	15	7	25	-	9	-	14	15	30	14	23
2	7	16	16	18	24	31	29	20	5	21	-	12	-	11	14	18	10	28
3	-	-	-	18	21	23	27	25	3	19	-	10	-	10	16	19	8	19
4	-	-	-	11	11	12	16	14	3	11	-	4	-	10	16	19	-	12
5	-	-	-	10	-	18	23	4	1	9	-	7	-	6	6	20	9	19
Average of 7 high days	**48**	**44**	**38**	**47**	**55**	**52**	**40**	**36**	**39**	**36**	**38**	**25**	**22**	**32**	**38**	**45**	**38**	**60**

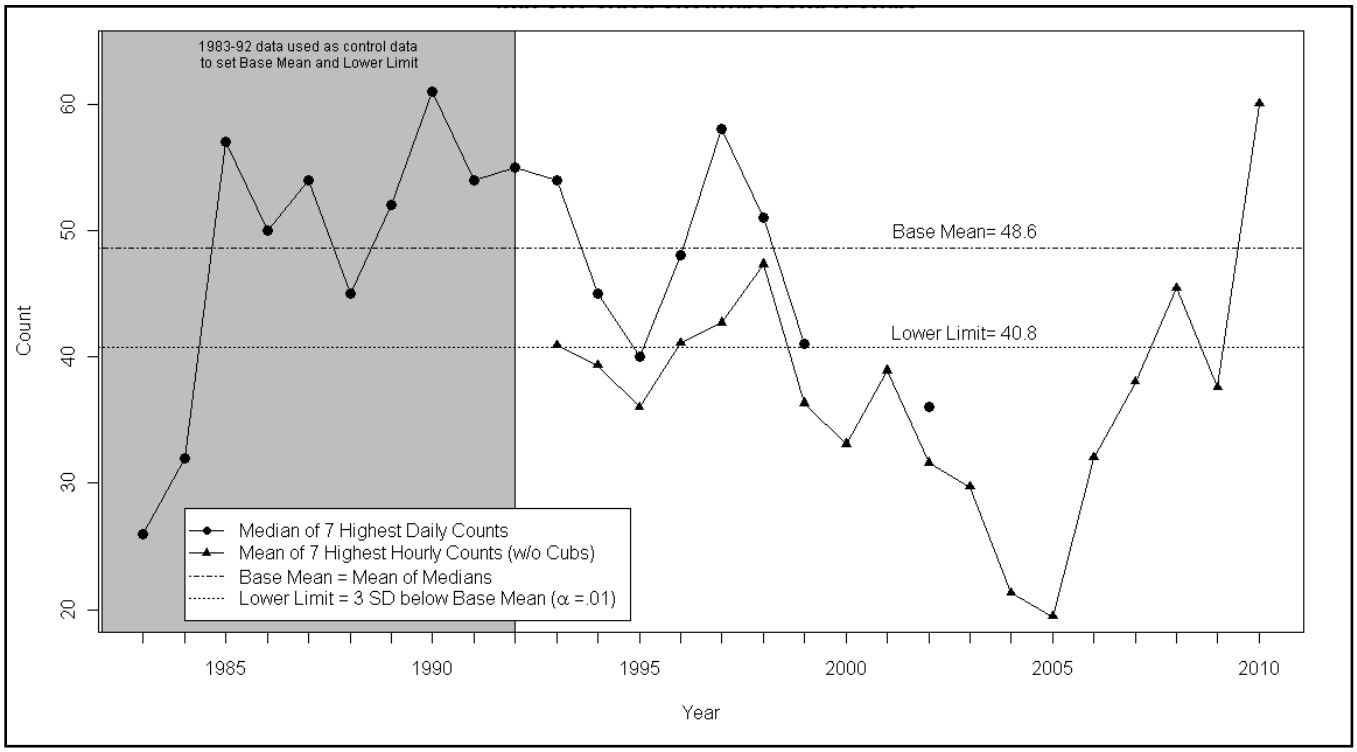

Figure 2. One-sided Shewhart control chart for the annual average of seven highest daily and hourly bear counts at McNeil River Falls, McNeil River State Sanctuary, Alaska, 1983 - 2010 (α = 0.01).

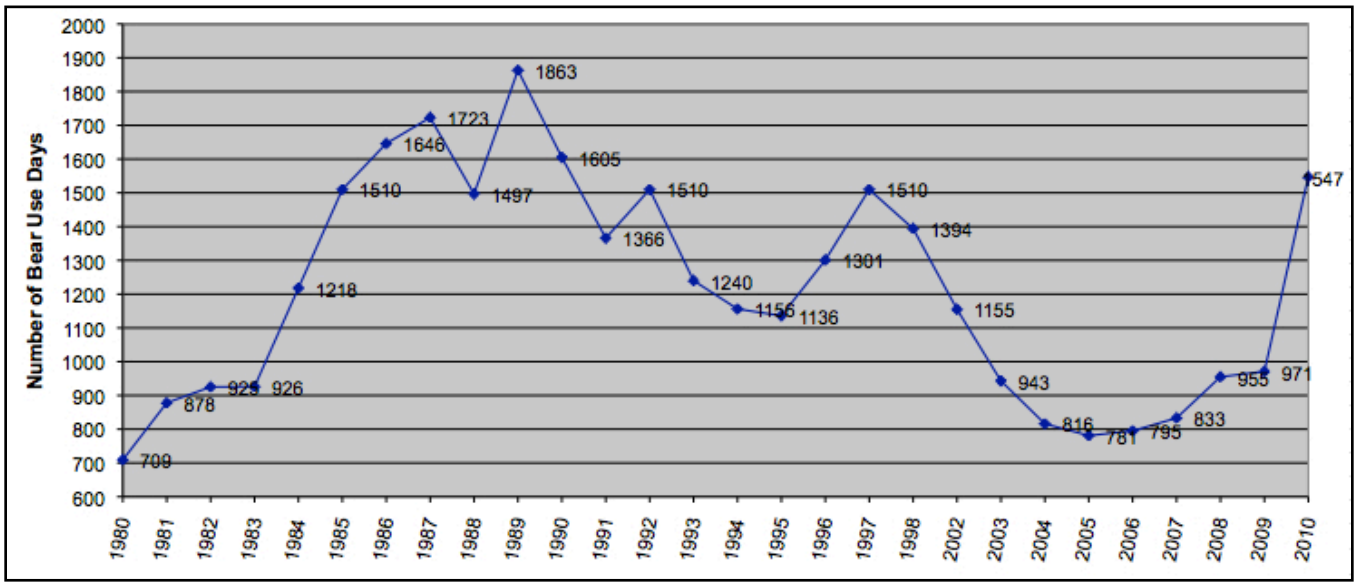

Figure 3. Bear Use Days* at McNeil River Falls, McNeil River State Game Sanctuary, Alaska, 1982 - 2010.
*** A**nnual summation of individual adult and sub-adult bears observed at McNeil Falls during each bear-viewing day June 15 through August 25.

Sex and Age Composition

Changes in the sex and age composition of a wildlife population can be indicative of other changes in the species' habitat and environment. The sex and age ratios of adult bears using McNeil River and Mikfik Creek have changed in the last several years (Figure 4 & 5; Table 2). While males have typically outnumbered females, this difference has become more pronounced in the last 20 years. The percentage of male bears observed throughout the season has steadily increased from the 1984-1988 (5-year) average of 53% to the 2006-2010 (5-year) average of 68%.

There were 7 maternal females and 14 cubs observed within the viewing ares areas during 2010 (Table 2). It is noteworthy that the 5-year averages (Figure 6); starting from 1981-1985 and going through 2006-2010, exhibit an overall decline in maternal females in the past several decades. The number of sub-adult bears observed in 2010 was 8. In looking at the data, it can be observed that the average number of sub-adults declined steadily from the 1981-1985 (5-year) average of 14 to the 2001-2005(5-year) average of 5, and then increased between the 2001-2005 (5-year) average of 5 and the 2006-2010 (5-year) average of 10.

Table 2. Composition of brown bears observed at McNeil River State Game Sanctuary, Alaska, 1976-2010.

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Year	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
Females w/cubs	9	10	8	9	6	8	7	7	9	16	14	14	14	19	16	15	16	11	11	14	20	19	15	11	7	5	10	12	7	10	8	9	10	5	7
Single Adult Females	5	8	6	8	8	10	9	15	16	12	11	13	13	14	16	12	19	19	15	12	14	19	19	**14**	**14**	12	8	16	12	13	14	7	9	16	20
Single Adult Males	16	18	18	19	23	26	20	22	22	27	31	34	34	42	37	41	39	48	45	49	46	55	54	**48**	**48**	53	45	45	39	41	40	46	45	40	56
Adult Sex Unknown	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	0	0	0	0	0	0	0	0	0	0
Total Adults	31	36	32	36	38	44	36	44	47	55	56	61	61	75	69	68	74	78	71	75	80	93	88	**73**	**69**	70	63	73	58	64	62	62	64	61	83
Sub-Adult Females	4	3	4	2	6	9	11	9	8	2	7	7	9	4	5	6	6	8	9	3	6	5	6	**4**	**4**	4	4	2	4	2	6	2	2	2	3
Sub-Adult Males	0	5	4	0	0	1	1	4	5	10	7	8	8	5	5	4	2	4	3	5	1	3	3	**2**	**2**	2	2	2	1	3	8	5	1	1	1
Sub-Adult Sex Unknown	3	4	5	3	4	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	0	0	0	0	0	0	7	6	1	4
Total Sub-Adults *(1)*	7	12	13	5	10	15	15	14	13	12	14	15	17	9	10	10	8	12	12	8	7	8	9	**6**	**6**	6	6	4	5	5	14	14	9	4	8
Total Adults & Sub-Adults *(2)*	38	48	45	41	48	59	51	58	60	67	70	76	78	84	79	78	82	90	83	83	87	101	97	**79**	**75**	76	69	77	63	69	76	76	73	65	91
Total Cubs	20	21	20	17	12	14	16	12	17	28	26	30	31	42	34	30	31	24	22	25	35	43	31	20	15	11	21	26	15	18	15	17	16	8	14
Total Bears	58	69	65	58	60	73	67	70	77	95	96	106	109	126	113	108	113	114	105	108	122	144	128	**99**	**90**	87	90	103	78	87	91	93	89	73	105

Notes: *(1)* Defined as 5.5 years old and younger from 1977 through the present.

(2) Only the bears that are recognizable as individuals (Known Bears). In addition bears that are recognizable but seen less than three times and not regular users of Mikfik Creek, McNeil River or McNeil Cove are not included. Hence these figures represent the minimum number of bears present at the sanctuary.

Underlined Bold Numbers represent average of data four years prior and after (No data was recorded in 1999 & 2000).

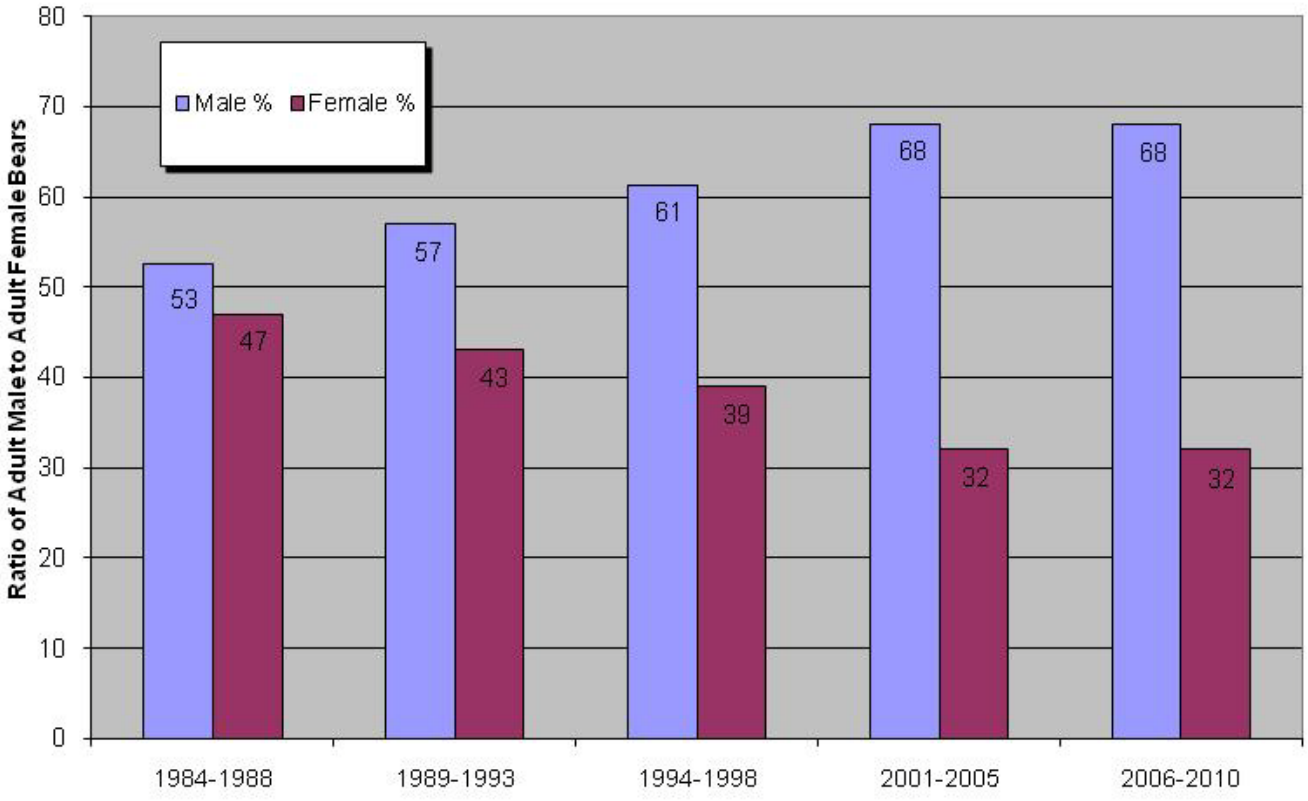

Figure 4. Average annual proportion of adult male and adult female bears observed at McNeil River State Game Sanctuary, Alaska, 1984 – 2010.

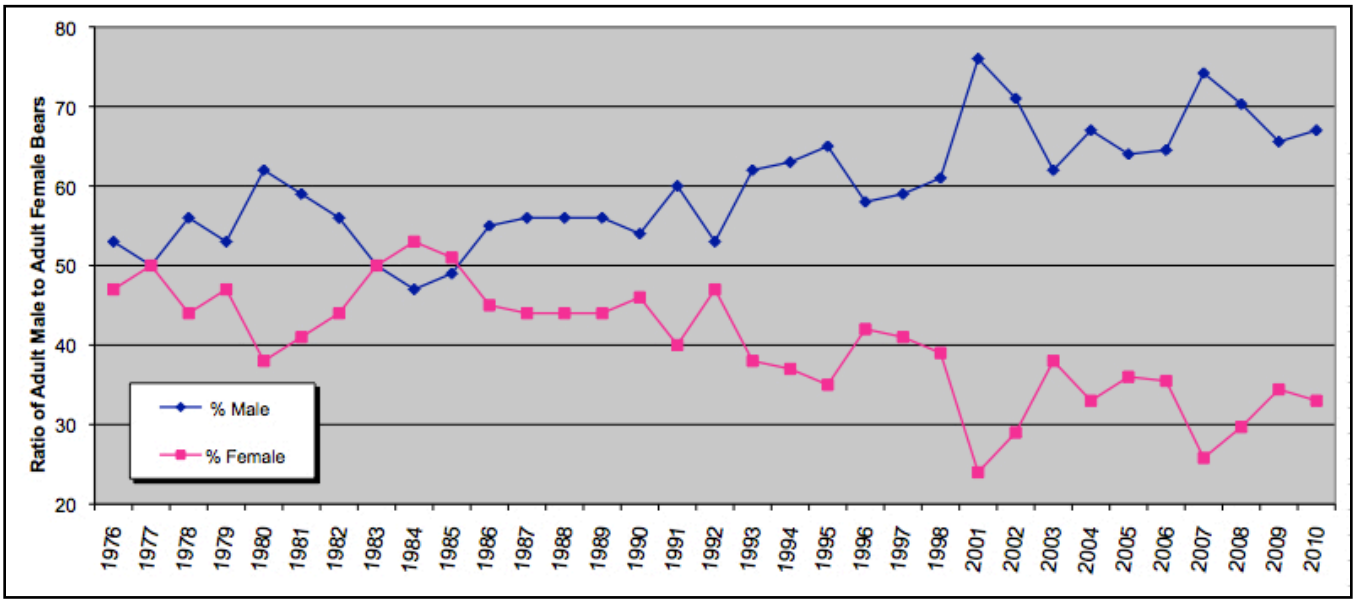

Figure 5. Annual proportion of adult male and adult female bears observed at McNeil River State Game Sanctuary, Alaska, 1976-2010.

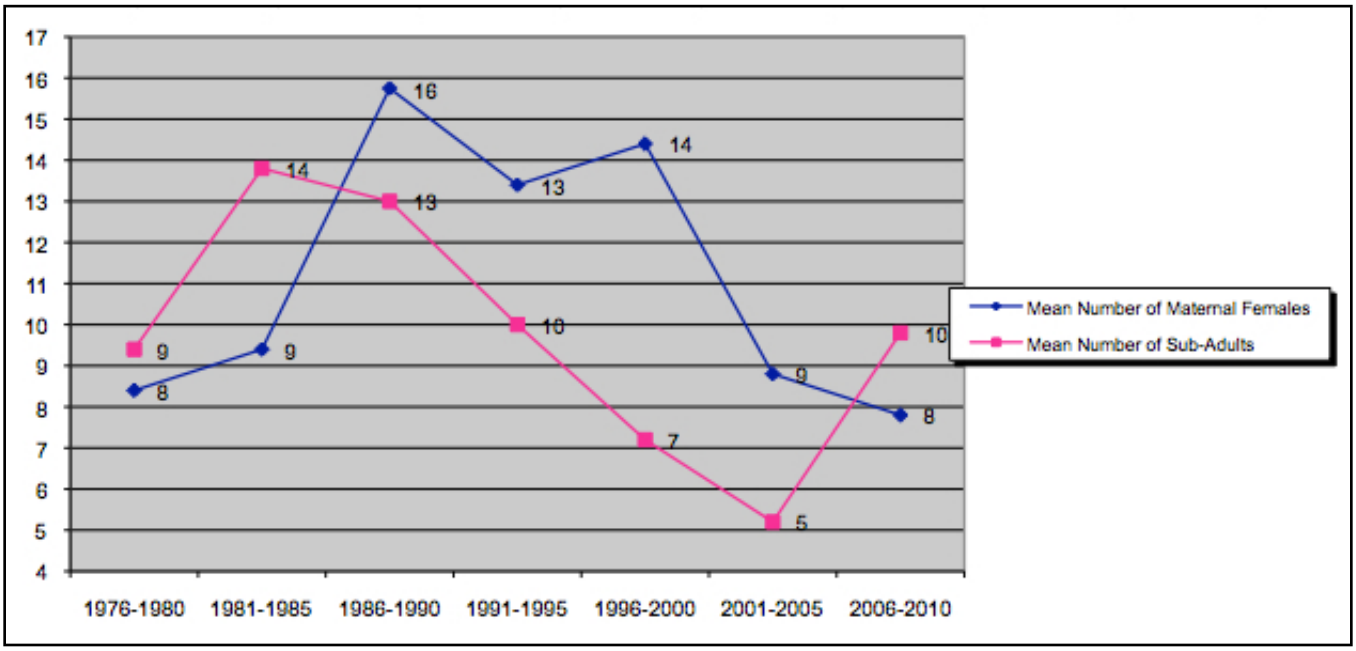

Figure 6. Average annual number of maternal females and sub-adult (both sexes) observed at McNeil River Falls, McNeil River State Game Sanctuary, Alaska, 1976-2010.

Bear Photo Identification Project

The field portion of the photo identification project was initiated in 2007. In 2008, 2009 and 2010, Sanctuary staff continued the task of photo documenting identifiable bears observed at McNeil throughout those three seasons. Digital images of individual bears and their defining characteristics were collected using a Canon 30D SLR camera with a Canon 100-400mm zoom lens. The collection and cataloging of bear photo data is intended to be a long term project that will assist McNeil staff in the following ways: expedite and enhance the process of bear identification; improve communication between staff members; enhance the process of tabulating the number of individual bears; enhance the process of tracking the history of individual bears; assist in sharing information and tracking the movements of individuals; assist in the identification of male and female characteristics; and, provide basic life history information.

In 2006 Friends of McNeil River (FOMR) and McNeil River staff had the idea to utilize future cataloged photos of individual bears to create a field book that would augment the visitor experience. A first edition was printed in 2009. Then, utilizing photos from 2007, 2008, and 2009, a second edition was printed for use in the 2010 season. FOMR volunteers, current and former ADF&G Sanctuary staff, and past Sanctuary visitors/photographers participated in the project. The book contains information about MRSGS and MRSGR, maps (regional, Sanctuary trails, and camp), bear safety, plant, mammals, birds, descriptions and identifying photos of more than 30 brown bears, as well as space for keeping notes.

Other Areas

The Department currently does not conduct bear surveys or monitoring in other areas of the McNeil River State Game Sanctuary or Refuge. Some information is available through opportunistic surveys and commercial guide reporting from the Chenik Lagoon area and from the Kamishak River and Little Kamishak / Strike Creek areas.

Kamishak River Drainage

The lower stretches of the Kamishak River, Little Kamishak River, and Strike Creek are within the McNeil River State Game Sanctuary. Bears fish these waters, graze in the Kamishak sedge flats, and dig

clams in the Kamishak River mud flats. The Department does not conduct bear surveys in these drainages. However, commercial sportfishing guide services operate in the area from approximately early July to mid September and brown bears are typically observed on a daily basis. Based on reporting by the four guide services operating in 2010 the average number of bears seen per day on the Kamishak River from 7/17/10 through 9/12/10) was 8.

Chenik Creek

The Department does not conduct bear surveys in the Chenik Creek drainage, however, during 2010 sanctuary manager Tom Griffin, visited Chenik Creek once and made these opportunistic observations. Between 1930 and 2100 hours July 13, 2010 he observed 17 bears fishing at one time with the following composition: 1 female and 2 cubs of year (COY), 1 female and 1 COY, 1 female and 2 yearlings, 1 female and 3 large cubs (age not determined), 3 sub-adults, 1 young adult male, and 1 large adult male.

A long time private bear-viewing guide operating in the Chenik Creek area in 2010, also consistently observed 15-20 bears at a time fishing in the lower Chenik Creek / lagoon area during July visits. He reported, on occasion, seeing over 20 bears fishing at one time. Through multiple visits he estimated a minimum of 28 different bears using the area, the majority of these being females with cubs, lone females or sub-adults. Only five of the 28 were reported to be mature males. It is interesting to note that only one female plus COY was observed by Sanctuary staff fishing at McNeil River Falls on July 13.

Historic Brown Bear Use Patterns

The number of individual bears observed at McNeil River increased from a 24 year low of 78 bears in 2004 to 105 individual bears in 2010. The brown bear monitoring program at McNeil River indicates 1) an increase in the number of bears observed over the last six years and 2) a shift in the sex composition of bears viewed. The reasons for these changes are not well understood but do not appear to be influenced by the sanctuary viewing program; sanctuary, refuge, or fisheries management actions; current hunting practices; or land use activities in the region. In 2002 Department staff conducted a preliminary assessment of historic bear-use at McNeil River including overall numbers and changes in sex and age composition, brown bear harvest from surrounding areas, and salmon escapement at McNeil River and surrounding systems. While results suggest some correlations may exist, more in-depth research is needed to better understand the effects that salmon escapement in McNeil River (and nearby drainages) have on McNeil River bears. Likewise, more information is needed to better understand the effects of legal hunting outside the sanctuary on bears that may frequent McNeil River.

As discussed in more detail in the Fisheries section below, McNeil River has experienced a long-term trend of low chum salmon returns that frequently fails to achieve escapement goals. The commercial seine fishery in waters of McNeil River Subdistrict has been closed for the duration of the chum salmon return every season since 1997 and virtually no commercial harvest of this stock has occurred since 1988. Periodic low salmon returns may result in a short-term increase in bear-use as they expend more effort and time catching enough fish to meet their nutritional requirements. Long-term fish shortages may alter established use patterns as bears seek alternative sources for salmon or other sources of food. In addition to the size of the salmon run, the timing of the run also appears to influence the number of bears utilizing McNeil River. An evenly distributed run will generally attract more bears to the falls while a similarly sized run that arrives in a relatively short period will not afford a larger number of bears the opportunity to catch fish, thus they seek food elsewhere. Comparatively strong chum salmon returns throughout Lower Cook Inlet in ten of the past eleven years (with the unique exception of the McNeil River system) and strong sockeye salmon returns to some nearby Bristol Bay drainages may have also contributed to the prior decline in bear use by attracting bears away from McNeil River in the past. This, however, does not explain the high bear numbers at McNeil during 2010 when the McNeil River chum run was relatively poor.

Observations at McNeil River also indicate that during periods of prolonged salmon shortages, the most dominant bears (generally larger males) occupy the most successful fishing spots and preclude use by less dominant bears. The least dominant bears (sub-adults and maternal females) typically fish in the less desirable locations downstream of the falls. In this area, they frequently consume partially eaten fish or fish scraps discarded by the more satiated bears upstream. During periods of diminished runs, overall fishing effort is less successful, particularly in the less desirable locations. Additionally, the dominant bears occupying the desired locations typically consume the entire fish, as they are not reaching satiation, leaving no opportunity for scavenging bears downstream.

In addition to commercial fishery closures, various management actions including artificial enhancement of the chum salmon population were also considered at one time or another. However, sanctuary managers felt that these actions would have minimal or no effect on the McNeil River bear population or, in the case of fisheries enhancement, would be neither feasible nor consistent with management goals of the sanctuary. Managers did feel that further study of potential bottlenecks to the freshwater production of McNeil River chum salmon might provide insight into future management actions to benefit resources in the Sanctuary. In 2003, a survey was conducted to evaluate the availability of spawning habitat above and below McNeil Falls. The Department also conducted a chum salmon radio telemetry study during 2005-2006 to determine spawning distribution and estimate the average stream life of McNeil River chum salmon. Results from the telemetry study were used in a retrospective analysis of historical escapements above and below McNeil Falls. That analysis resulted in an increase in the escapement goal range for McNeil River chums in 2008, intended to stimulate greater utilization of underused spawning habitat upstream of the falls when the run recovers (see Fisheries section below).

Other Wildlife

General Observations

During the 2010 season Sanctuary staff recorded general wildlife observations, including birds, terrestrial mammals, and marine mammals opportunistically. Daily observations are summarized in Appendix B.

There were many bird sightings and identifications over the course of the 2010 season. Some were species generally seen early in the season (Tree Swallows, American Robins, Thrush), and others are common throughout the season (Golden-crowned Sparrows, Brant, Yellowlegs, and Warblers). Less common birds were also observed by Sanctuary staff, including Glaucous Gulls on June 17, Sabine's Gulls, and Black Oystercatchers. Wandering Tattlers are observed occasionally and this year there was a July 8 sighting on the center rock of McNeil Falls. Often Wandering Tattlers go unnoticed because their coloring blends so well into the McNeil conglomerate. Twice over the course of the season Ptarmigan were sighted, once on the water trail and once on the McNeil Falls trail. Many Bald Eagles were observed at various points throughout the sanctuary, including one Ground-nesting Bald Eagle, and up to 34 bald eagles were seen on Mikfik Creek at one time on June 16.

Marine mammal sightings during the 2010 season were limited exclusively to Harbor Seals. Harbor seals were seen consistently within the lagoon throughout the season during high tides. On June 17, as many as 8 seals were observed in Mikfik creek, several as far upstream as the Mikfik riffles. Harbor Seals were also observed in the lower McNeil River on July 10, 20, and 23.

Once again a Red Fox family took up residence within the vicinity of camp between the staff and public outhouses to the delight of the visitors and staff. As many as 3 kits were seen with this family group. It is suspected, though not with certainty, that this is the same family group that took up residence

last year, as well. The fox and kits provided excellent watchable wildlife moments and many hours were spent by visitors watching and photographing the antics of the family group. It was even suggested that the fox viewing rivaled the bear viewing on the days when the family group was active.

There were also a few Arctic Ground Squirrels sighted in and around camp, but not many, most likely due to predation by the Red Fox family.

As detailed below within the Mikfik Creek Video Research section, Commercial Fisheries Division staff recorded 1,356 hrs of video connected with the video monitoring of sockeye salmon escapement into Mikfik Lake. In addition to the escapement data, reviewers documented wildlife transiting the cameras view including: brown bear, moose, fox, eagles, beavers, various waterfowl, and river otters. Brown bears transited the field of view of the camera in 142 instances. Most of the bears were observed between July 19 and August 2nd.

Figure 7. Watchable Wildlife Moment: Red Fox family antics viewed from camp as photographed by visitor Bud Marschner in 2010.

Hunting & Trapping

The MRSGS is closed to hunting and trapping by Alaska state statute (AS 16.20.162(b)), and the MRSGR, while open to hunting and trapping of other species, has been closed to brown bear hunting by the Alaska Board of Game since July 1996. The approximately 388 square miles that comprise the MRSGS and MRSGR are part of a much larger area of approximately 5,585 square miles in which brown bears are protected from hunting. The larger area includes Katmai National Park lands and state-owned lands south of the sanctuary (including the Kamishak Special Use Area, managed by the Alaska Department of Natural Resources) that are closed to brown bear hunting; the national park by federal regulations and the state-owned lands by Board of Game action.

Reported harvest data from units within and surrounding the MRSGS / SGR complex for the period 2000 – 2009 are summarized in Table 3. Data for 2010 is still being gathered.

Brown Bear

Brown bear hunting, as well as hunting and trapping for others species are open on lands within harvest units north and west of MRSGS and MRSGR. During alternate regulatory years brown bear hunts are open during the fall of odd-numbered years and the spring of even-numbered years. Historic levels of reported bear harvests from areas surrounding McNeil Sanctuary and Refuge are presented in Figure 8 and Table 3. The area represented includes 2,100 mi^2 currently open to hunting.

The long-term average harvest from areas surrounding McNeil River SGS (outside the sanctuary) from the period 1980/81 thru 2008/09 is 78 brown bears every two years (39 bears annually). Average two-year harvest by decade was 62 in the 1980s, 77 in the 1990s and 94 in the 2000s. The harvests in the past six years were 102 (2004-2005), 93 (2006-2007), and 73 (2008-2009). Though brown bear harvests have increased since the early 80s, bear densities on the Alaska Peninsula have also increased. The lack of historic population data and information about hunting effort make it difficult to compare rates at which the population has been harvested. However, current harvest rates are sustainable based on recent population surveys and harvest indices.

Many brown bears have large home ranges, which include the protected lands and lands open to hunting to the west and north of the sanctuary and refuge. Historically, several bears marked at McNeil during early studies were later harvested by hunters in areas that were open to brown bear hunting. Other studies and staff observations also demonstrate that some bears using McNeil seasonally are vulnerable to harvest. Based on the available information, legal hunting of bears outside the sanctuary is not a significant factor affecting the regional bear population. The effects of these harvests on bear use at McNeil River are unknown; however, at this time these harvests do not appear to affect the number of bears using the McNeil River.

Other species

As noted above the refuge portion of the MRSGS/SGR complex is open for the legal harvest of species other than brown bear through hunting or trapping. Other furbearing or big game species that may be in the area include: black bear, caribou, moose, beaver, lynx marten, otter, wolf, wolverine, coyote, red fox, mink, weasel, muskrat, ground squirrel, and marmot. However, the ADF&G only maintains harvest records on the first nine of these.

Harvest reporting and sealing records indicate that hunting and trapping for species other than perhaps moose in the MRSGR is almost non-existent. A few moose are taken from the reporting unit that contains the MRSGR; however, this unit also includes lands outside of the refuge.

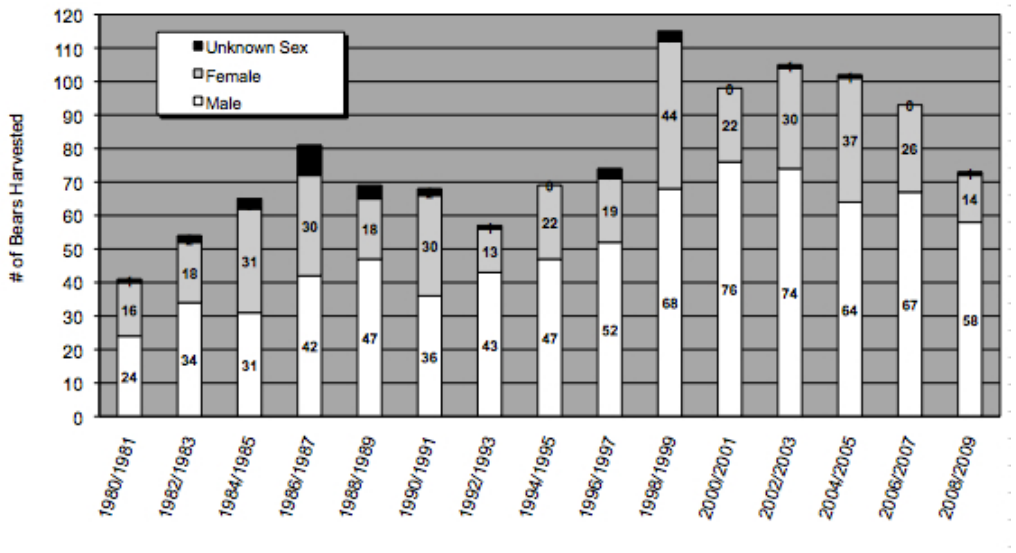

Figure 8. Brown bear harvest from areas surrounding the McNeil River State Game Sanctuary and Refuge, Alaska, 1980-2009 (harvest from GMU/UCUs: 9A/201, 301, 401, 501; 9B/301; and 9C/101, 201,301, 601, 702, and 703). Two consecutive regulatory years* are lumped.

Table 3. Reported harvests of selected big game and furbearer species within and around McNeil River SGS / SGR, 2000 - 2010.

YEAR	Brown Bear		Black Bear		Caribou		Moose		Beaver		Lynx		Marten		Otter		Wolf		Wolverine	
	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**
2000	6	98	0	0	0	114	0	16	0	12	0	1	0	0	0	0	**0**	**3**	**0**	**1**
2001			0	3	0	97	1	19	0	0	0	0	0	0	0	0	**0**	**1**	**0**	**2**
2002	6	105	0	1	0	39	3	18	0	0	0	0	0	1	0	0	**0**	**1**	**0**	**4**
2003			0	7	0	53	1	14	0	9	0	3	0	6	0	10	**0**	**10**	**0**	**20**
2004	3	102	0	1	0	33	2	15	0	0	0	0	0	0	0	2	**0**	**1**	**0**	**2**
2005			0	6	0	51	2	17	0	1	0	1	0	0	0	0	**0**	**8**	**0**	**0**
2006	4	93	0	2	0	25	0	10	0	0	0	4	0	2	0	1	**0**	**2**	**0**	**7**
2007			0	2	0	0	2	16	0	0	0	1	0	1	0	3	**0**	**3**	**0**	**4**
2008	4	73	0	1	0	5	0	18	0	4	0	3	0	0	0	0	**0**	**4**	**0**	**2**
2009			0	1	0	6	1	11	0	2	0	13	0	1	0	1	**1**	**2**	**0**	**1**
2010* **	-	-	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** Harvest numbers for McNeil River SGS & SGR are based on data from reporting areas that extend slightly outside of the McNeil River SGS/SGR complex. McNeil River SGS is closed to hunting & trapping and McNeil River SGR is closed to the hunting of brown bear.**

**** Harvest numbers for Surrounding Areas is inclusive of data from McNeil River SGS & SGR as the reporting areas include lands both within and outside of the McNeil River SGS/SGR complex. McNeil River SGS is closed to hunting & trapping and McNeil River SGR is closed to the hunting of brown bear.**

***** Harvest data for 2010 is still being gathered and is incomplete (numbers subject to change).**

III. Fisheries

The McNeil River SGS / SGR contain a number of river and stream systems that support both anadromous and resident fish populations. The Kamishak River drainages support all five species of Pacific salmon as well as Dolly Varden. The McNeil River drainage contains Dolly Varden (*Salvelinus malma*), chum salmon (*O. keta*), some coho salmon (*O. kisutch*), pink salmon, and small numbers of Chinook salmon (*O. tshawytscha*). The Mikfik Creek / Lake drainage contains sockeye salmon (*Oncorhynchus nerka*) and Dolly Varden. Chenik Creek / Lake system supports sockeye salmon, some coho salmon, lake trout (*Salvelinus namaycush*) and Dolly Varden. The Paint River system contains rainbow trout (*Oncorhynchus mykiss*), Arctic grayling (*Thymallus arcticus*) and lake trout and has the potential for supporting a number of anadromous salmon species through fisheries enhancement. These fish resources contribute to annual sportfishing and commercial fishing effort and harvests within the Lower Kamishak district.

Commercial Fisheries

Periodic aerial surveys are flown to index the escapement of sockeye and chum salmon to Mikfik Creek and McNeil River, respectively. In 2010, poor weather (strong easterly winds combined with fog/mist/rain) on July 5th and high glacial turbidity in McNeil River on July 9th precluded effective aerial surveys. No commercial fishing effort targeted sockeye salmon in McNeil River Subdistrict this season, and the subdistrict was closed for the duration of the chum run. Consequently, the entire Mikfik sockeye and McNeil chum salmon runs entered their respective freshwater drainages this season.

McNeil River Drainage

The 2010 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 10,520 fish (Table 4). This season was the 22nd consecutive year the McNeil River chum salmon run failed to produce a significant harvestable surplus, and chum salmon escapement into the system also failed to achieve the low end of the SEG range of 24,000-48,000 chums (Figure 8). The number of spawning chum salmon documented upstream of McNeil River Falls in 2010 was considered good compared to previous years of this decade, and was the highest observed during the past five seasons. Chum salmon were consistently seen above the falls during aerial observations from July 1 through the last survey on August 5th. A peak daily aerial estimate of 2,550 chums upstream of McNeil River Falls occurred on July 15. By comparison chum returns to other Kamishak Bay District systems in 2010 were reasonably strong for the 10th time in the past 11 seasons, contributing to a district-wide commercial harvest of 70,800 chums, the fifth highest total since 1988. The run timing of McNeil River chum salmon seemed somewhat earlier than previous years.

For McNeil River to realize its full productive capacity, favorable spawning habitats upstream of McNeil Falls need to be consistently seeded by spawners. Approximately 10 km of quality spawning habitat exists upstream of McNeil Falls, compared to less than 1 km below McNeil Falls. At least three factors interact to determine how many chum salmon ascend McNeil Falls: 1) the density of fish below McNeil Falls, 2) river discharge, and 3) the number of bears at McNeil Falls. Of these, only number one can be affected by the Department, through openings and closures of the commercial fishery.

In an effort to better understand factors affecting the freshwater production of chum salmon at McNeil River, the Department hired a graduate student intern in 2005 and 2006 to conduct a two year radio telemetry project to estimate freshwater streamlife, document spawning distribution and estimate predation by bears (Peirce 2007). The study determined that

- The average streamlife of a McNeil River chum salmon was less than the streamlife estimate used for other Lower Cook Inlet chum stocks.

- The average streamlife for fish spawning above McNeil Falls was much higher than the streamlife for fish spawning below McNeil Falls.
- Ninety percent of the tagged fish above McNeil Falls lived long enough to spawn, whereas, 47% of the tagged fish below McNeil Falls were killed by bears before getting a chance to spawn during 2005-2006.
- The study also corroborated aerial survey observations regarding the inconsistent use of quality spawning habitat above McNeil Falls.

Using this information, Division of Commercial Fisheries staff conducted an in-depth retrospective analysis of historical chum salmon escapements above and below McNeil Falls (Otis and Szarzi 2007) as part of the escapement goal review for the 2007 Lower Cook Inlet (LCI) Alaska Board of Fisheries meeting. As a result of the retrospective analysis and some minor adjustments in the methods used to estimate annual escapement, the Department increased the McNeil River chum salmon sustainable escapement goal (SEG) range from 13,750-25,750 up to 24,000-48,000 fish and implemented the new range beginning with the 2008 field season. This change takes into account the lower streamlife estimate now used in the Area-under-the-curve (AUC) model. Once the run recovers, the increase is intended to stimulate greater future utilization of the currently underused spawning habitat available above McNeil Falls, which in turn, should provide higher and more consistent stream-wide production. The Department has also installed a water level monitoring device immediately upstream of McNeil Falls every year since 2007. It will take years to build an adequate time series of discharge data, however, this information should help to evaluate the role discharge plays in affecting escapement above McNeil Falls.

AUC remains the best available method for deriving the total annual escapement index for McNeil River chum salmon, as well as most other pink and chum salmon stocks in LCI. The AUC method calculates the area under the escapement curve, points for which are determined by periodic aerial surveys, and then divides the resulting total "fish-days" by an average streamlife (SL) factor to estimate the total annual escapement. Streamlife, defined as the number of days salmon resided in the survey area and were available to be counted by aerial surveyors, is one of the key parameters in the AUC model. The AUC method resulted in a cumulative estimated escapement of 10,520 chum salmon for McNeil River in 2010.

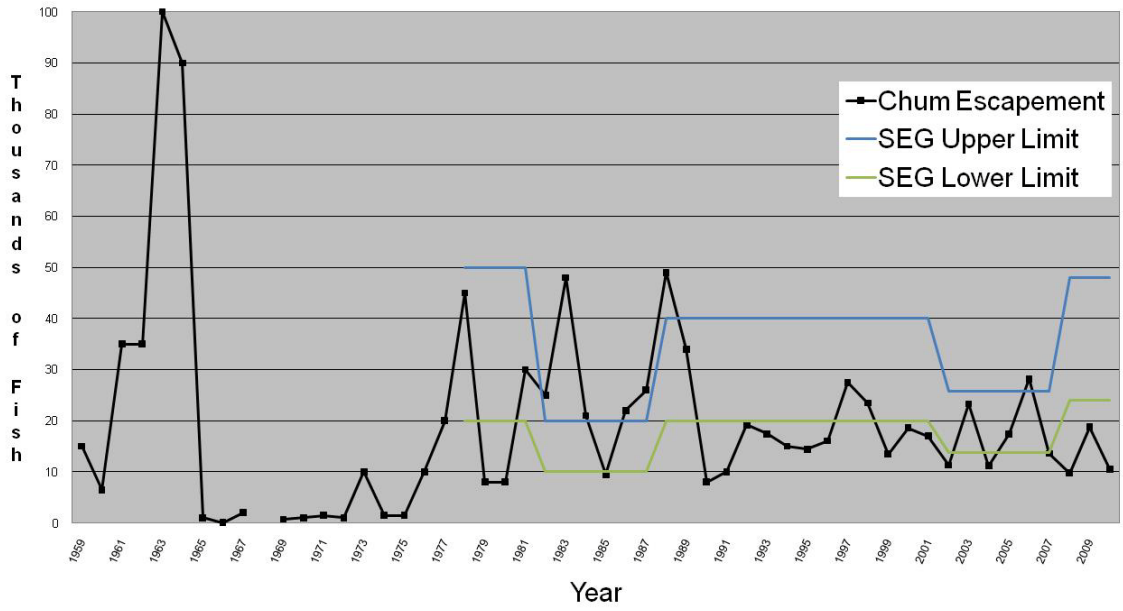

Figure 9. McNeil River chum salmon escapement 1959-2010, McNeil River State Game Sanctuary, Alaska.

Table 4. Aerial escapement estimates of salmon in the Mikfik Creek and McNeil River drainages, McNeil River SGS, Alaska, 2010.

Survey Date	Mikfik Sockeyes (Daily)[a]	McNeil Chums (Daily)[a]
6/1/10	0	
6/4/10	0	
6/7/10	0	
6/10/10	0	
6/14/10	4,040	
6/17/10	5,740	
6/21/10	11,330	
6/24/10	3,530	150
6/28/10	6,630	510
7/1/10	2,200	1,380
7/5/10	0	550
7/9/10	1,540	200
7/12/10		652
7/15/10		4,230
7/19/10		3,340
7/22/10		6,655
7/26/10		3,970
8/5/10		3,260
Escapement Index	**11,330[b]**	**10,520[c]**

[a] All individual daily estimates are from individual aerial surveys and are considered to be conservative.
[b] The escapement index for Mikfik sockeyes is the peak daily count from all the aerial surveys flown that year.
[c] The escapement index for McNeil chums was derived by dividing the area under the escapement curve by a 13.8-day stream life factor and then applying a run-timing expansion factor to account for fish entering the system after aerial surveys were terminated.

Mikfik Creek/Lake System

The 2010 Mikfik Creek/Lake estimated escapement as determined through aerial surveys, at 11,330 sockeye salmon, fell within the SEG range of 6,300 - 12,150 (Table 4). The majority of these fish were observed in the intertidal waters of McNeil Lagoon and lower reaches of Mikfik Creek. However, a video camera attached to a digital video recorder (see below), used to document sockeye salmon escapement into Mikfik Creek/Lake again this season, showed a cumulative total of only 5,221 fish actually escaping into the lake, representing about 5,800 fewer fish than were estimated by aerial surveys system wide. Since aerial surveys encompass estimates both upstream and downstream of the video camera, the disparate figures suggest a high predation rate by bears below the camera site. Post-season evaluation indicated that run timing of sockeye salmon into Mikfik Lake was fairly typical, with 85% of the escapement reaching the lake by June 27th, despite a later than normal run entry into McNeil Lagoon (10 to 14 days).

Chenik Creek/Lake System

Chenik Lake, located approximately 5.5 miles north of McNeil Lagoon, is the site of another sockeye salmon stock. The stream mouth of Chenik Creek, which drains the lake, was partially blocked as a result of the 1964 earthquake. A Cook Inlet Aquaculture Association (CIAA) fishery enhancement project modified the stream mouth in 1981-82 and again in 1986 in an effort to allow easier fish access to the creek. Hatchery-raised sockeye salmon fry were stocked into Chenik Lake annually between 1986 and 1996 (except for 1994), and the lake was also fertilized in an effort to increase sockeye numbers. Unfortunately, due to an outbreak of Infectious Hematopoietic Necrosis Virus (IHNV), the return of adult sockeyes to the system dropped to very low levels between 1994 and 2002, but more recent returns resulting exclusively from natural production rebounded considerably. In fact, commercial fishing effort directed at this stock was allowed each year from 2004 through 2010, with resulting annual commercial harvests ranging from just under 5,500 sockeye salmon (2010) to over 171,000 fish (2008). Additionally, the established sockeye salmon sustainable escapement goal (SEG) for Chenik Lake of 1,880 – 9,300 sockeye salmon has been slightly exceeded each year beginning in 2003, with the 2010 escapement cumulatively estimated by remote video as 17,500 sockeye salmon.

Sport Fishing

A limited amount of sport fishing occurs within the McNeil River SGS &SGR. This occurs primarily in the Kamishak River area. There is also a small amount of effort in the McNeil Lagoon area associated with the bear viewing program.

McNeil Lagoon

Sporadic sport fishing occurs in McNeil Lagoon associated with staff or visitors in camp for bear-viewing activities. Fishing effort was low in 2010. Visitors and ADF&G staff harvested approximately 5 sockeye salmon, 8 chum salmon, and 5 coho salmon.

Kamishak River

The only area in the sanctuary that attracts significant sport fishing interest is the Kamishak River area including the Little Kamishak River and its tributary, Strike Creek. The target species are coho, chum, and pink salmon and Dolly Varden. Fishing activity at the Kamishak River and tributaries typically begins in mid-July and ends in mid-September. During the 2010 season, four lodges and transporters reported a total of 289 visitor use (angler) days during 83 days within the sanctuary for sportfishing. Wildlife viewing, primarily brown bears, was also a significant part of their activities. These anglers reported catching 3,134 fish, of which 36% were Dolly Varden and 55% were coho salmon. Nearly all Dolly Varden were released as were most pink and chum salmon. Seventy-seven percent of coho salmon were also released.

Table 5. Visitor Use and Sportfish harvest reported from Kamishak River Drainages, McNeil River SGS, Alaska, 2010.

# of Days in Sanctuary	# of Guide Days	# of angler Days	# of Non-angler Days	COHO SALMON		CHUM SALMON		PINK SALMON		DOLLY VARDEN		# of bears
				Kept	Released	Kept	Released	Kept	Released	Kept	Released	
83	116	289	0	407	1331	10	251	0	24	9	1104	697

Fisheries Enhancement

Fisheries enhancement continues to play a major role in Lower Cook Inlet salmon production and commercial harvests. The results of enhancement and rehabilitation of Kamishak Bay District sockeye stocks have, at times in the past, made significant contributions to commercial salmon harvests.

Paint River Fish Ladder

Paint River Lakes were first stocked with sockeye salmon fry in 1986 in an effort to test the feasibility of developing a new sockeye salmon return to this salmon-barren drainage. Paint River, located approximately two miles north of McNeil River is blocked to upstream fish migration by a steep waterfall at tidewater. The Paint River fish ladder was envisioned to potentially provide access to unutilized salmon spawning and rearing habitat upstream of the falls. Construction of the Paint River fish ladder was completed in October 1991, and it was formally declared operational in 1993. From 1986 to 1996 (except for 1987), and also in 2002, between 0.5 million and 2.2 million sockeye salmon juveniles were stocked annually in the Paint River Lakes. However, the number of returning adult sockeye salmon resulting from these stocking efforts were disappointing and only ranged from 30 (in 2000) to 2,000 (in 2005). Consequently, the structure was never opened to allow fish passage upstream through the ladder. In 2010, no adult sockeye salmon were expected to return to the mouth of the Paint River, consequently no aerial surveys to assess this location were conducted.

In 2008 Cook Inlet Aquaculture Association (CIAA), responsible for building and operating the Paint River Fish Ladder, informed the Division of Wildlife Conservation that grant monies to conduct maintenance on the Paint River Fish ladder had been acquired. Under the grant CIAA intended to make repairs, cover open cells, and perform other maintenance to prepare the ladder for formal operation and fish passage. During 2010 CIAA performed maintenance repairs and improvements on the fish ladder to reduce potential bear problems associated with the operation of the ladder and other needed maintenance work. Work included the installation of gratework over open cells in the lower end of the ladder and periphery areas to prevent bears from falling into or accessing the ladder.

The Paint River Salmon Enhancement Project Operational Plan, drafted in 1993 but never approved, was also updated. A working draft was presented to the Cook Inlet Regional Planning Team at its April 2010 meeting. While the document is not a complete plan for the Paint River facility and is intended to be periodically updated; the CIRPT voted to accept the document as an appropriate planning document for the time being. At this time there are no definitive plans to conduct any salmon stocking of the Paint River system, but that option remains a possibility and CIAA is investigating potential options for pink and chum salmon enhancement. While no specific plans are in place, upon completion of the maintenance activities the ladder would be opened to water flow for evaluation purposes and potential salmon colonization.

IV. Public Use & Land Management

To protect the bears, their habitat and the unique visitor experience, access to the McNeil River SGS is restricted requiring an access permit issued by ADF&G for entry into the sanctuary. Under regulations developed by the Department of Fish and Game and adopted by the Alaska Board of Game (5AAC 92.065 and 5AAC 93.030) the ADF&G Division of Wildlife Conservation uses the following types of permits to manage visitation to the sanctuary: Viewing Permits, Special Access Permits, Nonviewing Permits, Transporter Permits and Commercial Guide Permits.

The McNeil River SGR is open to most public uses provided the activity does not damage refuge resources, disturb wildlife or disrupt existing public uses. Allowed activities generally include legal hunting, trapping, fishing, wildlife watching, hiking, boating, snow machining, and camping; except that the MRSGR is closed brown bear hunting. Other activities and Land uses are managed through ADF&G Special Areas Permit issued by the Division of Habitat. Land use permits are also issued by the Alaska Department of Natural Resources.

McNeil River Falls/Mikfik Creek

Public use and access to the sanctuary, with the exception of the McNeil Cove spit and beach, requires an access permit from the Department (5 AAC 92.065). Since 1973, bear-viewing at established sites on McNeil River and nearby Mikfik Creek has been limited to ten people daily between June 7 and August 25, and Viewing Access Permits for this period are issued by lottery. Ten regular and three standby permits are issued for each of the established four-day permit periods. Currently, 185 regular permits (Guided Viewing Access Permits) and 57 standby permits (Camp-Standby Viewing Access Permits) are issued in the lottery. An additional 15 guided viewing permits are issued as Special Access Permits at the Commissioner's discretion for scientific, educational, media and other purposes. The maximum number of people able to visit the sanctuary each season under the existing permit program is 257 people.

Guided Viewing Permits allow visitors to visit the sanctuary and the bear viewing sites in the sanctuary (McNeil River or Mikfik Creek) during a specified time period. A Camp-Standby Viewing Permit allows visitors to visit the sanctuary, view bears and wildlife in the vicinity of the campground and along a limited portion of the beach, and to go to the bear viewing sites (McNeil River or Mikfik Creek) when there are vacancies in the guided group. Special Access Permits are available to individuals that have a special need to visit the Sanctuary. These needs may include (but are not limited to) scientists, land managers, educators, public or artistic media representatives, film makers, or others acting in an official capacity and who would benefit professionally by visiting McNeil River. These permits are only issued to individuals whose work will benefit the McNeil River Sanctuary and/or the general efforts to conserve bears.

The lottery application fee is $25.00 per person. If selected in the lottery, each Guided Viewing Permit holder is assessed a permit fee of $150 for Alaskan residents and $350 for non-Alaskan residents. Camp-Standby Viewing Permit holders are assessed a permit fee of $75 for each Alaskan resident and $175 for each non-Alaskan resident. The Special Access Permit application fee is $50.00 per person. If selected by the Commissioner of the Department of Fish and Game to receive a Special Access Permit, there is a use fee of $150.00 for each Alaskan Resident and $350.00 for each Non-Alaskan Resident.

In 2010, the ADF&G received 714 applications for McNeil River Guided and Standby bear viewing permits. Payments were received for 142 Guided Viewing Access permits, 37 Standby Viewing Access permits, and 14 "Resale" permits. There were 11 Special Access (Sci-Ed/Commissioner) permits granted by the Commissioner. Overall, there were 176 permit holders (Guided Viewing, Camp Standby, and Special Access) who visited the sanctuary (Table 6) in 2010. The 5-year annual visitation average is 173. The average number of permits used each day (permittees that bear viewed) at the sanctuary was 7.4 (out of a maximum of 10.0), which is slightly higher than the low of 6.6 in 2002. This number was in part the result of 20 guided permit holder no shows, 7 standby permit holder no shows, and 20 standby permits that were not filled.

The 11 Special Access permits issued in 2010 included permits issued to: ADF&G Hunter Education and Wildlife Education volunteers; US Fish and Wildlife Service representatives from the Kodiak National Wildlife Refuge; Western Association of Fish and Wildlife Agencies (WAFWA) raffle winners; and a representative of the S.E. Alaska Fish and Game Advisory committee.

The number of applicants to MRSGS fluctuates annually. Historically there was a general decline starting in 1993 when the Board of Game started requiring a 4-year waiting period for successful applicants to reapply. This general decline stopped in 1999 when the Board of Game reduced the waiting period to one year and then applicant numbers increased for the next three years. Since 2002 applicant numbers have generally declined, though there was a noticeable increase in 2007 that was likely the result of the Board of Game's proposal to open hunting in the McNeil Special Use Area. These decreases in visitation are generally attributed to national and international economic conditions and possibly the increased availability of commercially guided bear-viewing operators in the region.

In 2010, $59,725 was generated from the McNeil River sanctuary permit program and all revenues were deposited in the Fish and Game Fund.

During 2010, eight Commercial Transporter Permits were issued to commercial operators for the purposes of transporting clients to the ADF&G McNeil River camp for bear viewing.

Kamishak River

Lodges and air charter services conduct sport fishing and wildlife viewing trips within the Kamishak River drainages within the MRSGS and adjacent Katmai National Park. This area is also part of the Kamishak Special Use Area, which is managed by the Department of Natural Resources. Businesses store riverboats on the lower reaches of the river and one of the businesses maintains a temporary guide camp on the lower Kamishak River; both activities require an ADF&G Special Area Permit. The primary management concern is the food-conditioning of Kamishak River bears, which also visit Mikfik Creek and McNeil River. Food-conditioning of bears would not be consistent with the purposes for which the sanctuary was established and would jeopardize the bear-viewing program at McNeil River.

Businesses that hold ADF&G Special Area Permits for boat storage at this location are required report the number of guides, clients, fish harvested/released, as well as the number of bear observed on a data sheet titled “Annual Report for Guides, Transporters, and Lodges”.

Four commercial sport fishing guide services operated in the Kamishak River area of the MRSGS in 2010 and spent 405 visitor use days in the sanctuary, which included 116 guide use days. Three of these operators held Special Area Permits for the storage of boats and operations in the Kamishak River area. Their primary activity was sport fishing; however, they also engaged in wildlife viewing activities, primarily viewing of brown bears.

Chenik Area

One commercial bear viewing guide service from Homer brought clients to the Chenik area in 2010. This service obtained a special area permit for a temporary tent camp at Chenik Lake again in 2010 and reported a total of 76 visitor use days, including 15 guide use days. Private groups were also known to have visited the Chenik area in 2010.

Bear-Human Conflicts

As detailed above there were 1,100 user days associated with the ADF&G’s bear viewing program at the McNeil River camp. An additional 350 user days were reported by area guides utilizing the Kamishak River and Chenik Creek areas of the MRSGS / MRSGR. All 1,450 user days represent activities, primarily bear viewing and sport fishing, spent in close proximity to brown bears. Staff document adverse bear-human interactions associated with the ADF&G bear viewing program. Commercial sportfishing and bear viewing entities perform self reporting to the ADF&G on any adverse interactions. During the 2010 season, there were no reported adverse interactions between bears and people in the MRSGS or MRSGR.

Land Use Permitting

The ADF&G Wildlife Conservation Division has a Special Area Permit and an Alaska Department of Natural Resources Interagency Land Management Assignment (5 year term, 2009 – 2014) for operation and maintenance of the McNeil River camp, trails, and bear viewing operation. The ADF&G Division of Commercial Fisheries holds a Special Area Permit (five year term, 2008 – 2012) for the installation and operation of a video fish escapement recorder and maintenance of the cabin at Chenik Lake. They also hold a Special Area Permit for the installation and operation of a video fish escapement recorder at Mikfik Lake.

A total of six Special Areas Permit and eleven Commercial Access Permits were issued during 2010. These included the permits for the commercial operators in the McNeil River, Kamishak River and Chenik Creek areas; as well as Special Area Permits issued to CIAA to complete maintenance and repairs to the Paint River Fish ladder. No other Special Area or Access Permits were issued. There were no mineral resource development activities permitted or reported to the Department within the McNeil River SGS or SGR during 2010.

Table 6. Historic Visitor Use at McNeil River State Game Sanctuary, Alaska, 1984-2010.

Year	Footnotes	# of Applicants	# of Bear Viewing Visitors 6/7-8/25*	Total Bear Viewing Days in Sanctuary 6/7-8/25**	Total Sanctuary Bear Viewing Visitor Days 6/7-8/25***	Total Sanctuary Visitor Days 6/7-8/25****	Total McNeil Falls Bear Viewing Visitor Days 7/1-8/25 (560 possible)*****	Season Length
1984	A, F	992	159			574	377	6/5 - 8/27
1985	A	832	216			816	449	6/10 - 8/25
1986	A	806	255			967	430	6/9 -8/25
1987	A, G	1,757	252			1,054	473	6/9 - 8/23
1988	A	1,094	304			1,328	498	6/1 - 8/29
1989	A	1,306	264			1,183	488	5/22 - 8/26
1990	A	1,481	299			1,435	524	6/8 - 8/25
1991	B, E	1,818	249			1,415	526	6/1 - 8/27
1992	C, E, H	1,672	245			1,210	478	6/1 - 8/25
1993	D	2,150	225			1,128	516	6/7 - 8/25
1994	D, I	1,766	228			1,086	484	6/7 - 8/25
1995	D, I	1,486	212			1,074	475	6/7 - 8/25
1996	D, I	1,502	219			1,158	494	6/7 - 8/25
1997	D, I	1,474	228			1,197	489	6/7 - 8/25
1998	D, I	1,159	219			1,096	504	6/7 - 8/25
1999	D, I, J	1,223	208			1,122	398	6/7 - 8/25
2000	D, J, K, L, M	1,322	198			1,051	424	6/7 - 8/25
2001	D, J, K, L, M, N	1,329	186			1,012	437	6/7 - 8/25
2002	D, J, K, L, M, N	1,434	175			930	351	6/7 - 8/25
2003	D, J, K, L, M, N, O, P	1,314	188			995	451	6/7 - 8/25
2004	D, J, K, L, M, O, P	860	201			1,034	462	6/7 - 8/25
2005	D, K, L, M, O, P	960	195			983	431	6/7 - 8/25
2006	D, K, L, M, O, P	783	183			970	420	6/7 - 8/25
2007	D, K, L, M, O, P	1156	157	540	781	832	356	6/7 - 8/26
2008	D, K, L, M, O, P	932	167	617	863	913	413	6/7 - 8/26
2009	D, K, L, M, O, P	725	181	639	948	1266	452	6/7 - 8/25
2010	D, K, L, M, O, P	714	176	593	932	1100	433	6/7 - 8/25

Footnotes Table:	
A =	No limit on standby or camp numbers.
B =	1st come, 1st served for standby with no camp limit.
C =	1st come, 1st served for standby with camp limit of 15.
D =	All permits (regular & standby) by lottery including June.
E =	Unlimited permits prior to June 15 then 10 a day.
F =	$5 application fee instituted in 1993.
G =	$10 application fee and $40 user fee instituted.
H =	$20 application fee and new user fees ($100 Resident/$250 Non-resident) instituted.
I =	Visitors to the sanctuary must wait four years to re-apply.
J =	Lower staffing levels prevented late arriving or early departing visitors from joing the group.
K =	$25 application fee and new user fees ($150 Resident/$350 Non-resident) instituted.
L =	Number of standby permits drop from 5 to 3 per period (95 to 57 annually).
M =	Visitors to the sanctuary must wait one year to re-apply.
N =	A major air taxi operator retires, leaving only one primary carrier to serve MRSGS.
O =	Includes Resale permits (Unissued permits were reissued and used).
P =	Includes "fill in" permits.
*=	Sum of all Guided, Standby, & Special Access Permittees that visited McNeil River State Game Sanctuary.
**=	Sum of all Guided, Standby, & Special Access Permittees that bear viewed each day of season.
***=	Sum of all Guided, Standby, & Special Access Permittees in Santuary each day of season.
****=	Sum of all Guided, Standby, & Special Access Permittees & Non-Viewing permittees (staff subs not included) each day of viewing season.
*****=	Sum of all Guided, Standby, & Special Access Permittees each day during approximate McNeil Falls season.

V. Fish & Wildlife Research

This section summarizes new or ongoing fish and wildlife research projects within the MRSGS/SGR.

Mikfik Creek Video Research

A remote video escapement recorder (RVER) was installed at the outlet of Mikfik Lake for the 12th consecutive season. This project has already proven invaluable to both inseason and post-season fisheries management and research in Lower Cook Inlet, demonstrating that remote video and time-lapse recording technology has the capability to largely supplant aerial surveys as a means for collecting escapement data on small clear streams that do not warrant the expense of weirs or sonar.

When originally configured over a decade ago, the Mikfik video system consisted of a single remote video camera and a time-lapse videocassette recorder (VCR) logging one frame per second onto analog VHS tapes. While this system produced images of sufficient quality to facilitate reliable fish counts, it had shortcomings. Weekly flights were necessary to refresh videotapes, the analog tapes were fragile and cumbersome to review, and tracking individual fish was difficult at one frame per second. The next evolution of the Mikfik system, used from 2002 through 2005, recorded up to five digital frames per second and stored the images on a computer hard drive. However, relatively high power consumption by the computer resulted in recording downtime and led to the development of alternative equipment. The present setup, first implemented at Mikfik Creek in 2006, uses a time-lapse digital video recorder (DVR) in place of the personal computer. The new configuration reduced the power issues that affected the computer-based version; however, harnessing adequate solar/wind power at the Mikfik Creek site was continuously challenging due to the localized geography and the resulting wind patterns. Beginning in 2009, the DVR and its accompanying power generation equipment were relocated a short distance from the camera to a more exposed site on the shore of Mikfik Lake, making power generation for this equipment far less problematic (more wind). Images were delivered to the relocated DVR via a wireless transmitter/receiver configuration, and because the power requirements of the camera and wireless transmitter were modest, power generation at the camera site was provided by a relatively simple solar panel and battery arrangement that proved very successful.

In an effort to facilitate near real-time escapement monitoring and eventually reduce the number of flights necessary to maintain the system, transmission of recorded images via satellite back to Homer on a daily basis was previously tested with mixed success. The Department believes these problems can be successfully resolved and plans to continue investigating this promising technology, ultimately incorporating it into the Mikfik remote video recording system and potentially applying it to similar projects throughout the management area.

In 2010, the video system at Mikfik Creek/Lake was installed on June 4 and shut down on August 12. The system operated continuously during daylight hours (~20 hrs/d) and successfully recorded images approximately 90% of the time that it was programmed to operate between June 4 and August 12 (1,356 hrs). The peak of the run into Mikfik Lake occurred during June 18-24, with a daily average of 600 sockeye salmon escaping over that 7- day period. Unfortunately, due to a mechanical failure, no images were recorded between July 8-15, resulting in approximately 161 hrs of “down time”, but fish passage during this post-peak period was believed to be minimal based on the July 9 aerial survey and the extremely low number of fish observed after the camera failure.

As was the case in 2001 and 2003 – 2009, a single camera mounted on the original (west bank) light pole was used to collect all video images of fish passage in 2010. Recordings were made using a compression rate of five frames per second, which has proven to provide excellent image quality. Fish were very easy to see, and the new DVR facilitated efficient and convenient video review to estimate escapement. Upon review of

the images collected at Mikfik Creek, 5,221 sockeye salmon were counted into the lake, representing 5,800 fewer fish than were estimated by aerial surveys system wide. Since aerial surveys encompass estimates both upstream and downstream of the video camera, the disparate figures suggest a high predation rate by bears below the camera site. In order to remain consistent with the historical Mikfik Creek database and with the methods used to derive the Mikfik sockeye salmon SEG, aerial survey data were used to generate the 2010 spawning escapement index (11,330 sockeyes). LCI staff are currently studying the best approach for integrating the video counting estimates into the historical escapement database and for developing a new escapement goal tailored to video-based escapement monitoring.

One advantage of using a remote video counting tower to count salmon escapement at Mikfik Creek is the opportunity to incidentally monitor other wildlife in the area. During 1,356 hrs of recorded video between June 4 and August 12, reviewers documented 142 instances where brown bears transited the field of view of the camera, an average of approximately 2.5 bears per day of successful video operation (n=57 d). Most of the bears were observed between July 19 and August 2nd. Nearly all sightings were of individual bears, but a few sightings were of females with one or two cubs. Other wildlife observed included moose, fox, eagles, beavers, various waterfowl, and river otters.

McNeil River Brown Bear & Chum Salmon Research

Western Washington University graduate student Ian Gill (former McNeil River Wildlife Technician) and his assistant Larry Aumiller (former McNeil River Sanctuary Manager) spent June 28 through August 1, 2010 researching the fishing behavior of brown bears. Ian has been assisted in and out of the field by his graduate advisor Jim Helfield and by Ted Otis (ADF&G Division of Commercial Fisheries Research Biologist).

Between June 28 and August 1, researchers made observations at McNeil Falls between 1600 and 2200 hours and used the same six discreet sections of McNeil Falls developed in 2009. On the hour counts were made of all bears in view, and the number of chum salmon caught by bears in each area was also recorded. Additionally, they observed 26 individual bears during their visits to McNeil Falls and recorded the fishing behaviors of each individual. The maximum number of bears in view recorded on the hour was 74 at 2100 hours on both July 19 and July 21. Bears fishing at McNeil Falls caught a grand total of 8,696 chum salmon in 2010 as compared to 7,651 chum salmon caught during the same hours in 2009.

The researchers also made further progress this season to develop a functional low-light video system for McNeil Falls that could document bear activity around the clock. The video system in 2010 included three 84 W solar panels, three 12-volt batteries, and three low-lux video cameras. However, the technical challenges posed by the remote location proved to be insurmountable, yielding little useful nighttime data.

In general, data from 2010 was consistent with observations made in 2009. Bear densities at McNeil Falls seemed to increase from the early morning to the late evening, then drop off after midnight. Likewise, predation rates (chum caught per hour) generally increased throughout the day, and decreased after dark. However, when predation rates are normalized for bear abundance (fish per hour/average bears in view that hour), there are no clear patterns on either daily or seasonal scales. In other words, fish per bear quantities seem to vary randomly, though in reality this variable is likely strongly related to salmon abundance in stream. Further details regarding bear-salmon predation at McNeil Falls will be provided in Gill's thesis.

Sea Otter Carcass Surveys

In August of 2005 the Southwest Alaska population of northern sea otters was listed as threatened under the ESA. The listed population ranges from Kamishak Bay in lower Cook Inlet to Attu Island in the western Aleutians. Disease is one of several lines of investigation being explored to understand the reasons for the decline in the listed population. Since 2001 the U.S. Fish and Wildlife Service (the Service) has been developing a sea otter stranding network in Alaska in order to obtain baseline data on health and disease of this nearshore-sentinel species. Data obtained from dead otters is compared to health assessments of live-captured otters to determine impacts (if any) disease may have on the population. The Service has had great success in receiving carcasses from areas adjacent to large human population but lacks data from many areas in the state due to their remote location.

In September of 2006 an Unusual Mortality Event was declared for northern sea otters in Alaska. This was prompted by a large number of animals dying from Streptococcus bovis endocarditis/septicemia (SBE/S) in the area of Kachemak Bay. In the summer of 2008 the Service had numerous reports from Kamishak Bay about dead sea otters. The ADF&G camp at McNeil Cove responded to this event by retrieving dead otters and shipping them to the Service in Anchorage for necropsy. Every carcass was examined by a veterinarian familiar with marine mammal necropsy techniques or a board-certified veterinary pathologist. Samples from dead otters were submitted for testing at the Wildlife Health Center located at U.C. Davis for histological examination. It was discovered that these otters were succumbing to Streptococcus bovis endocarditis/septicemia (SBE/S). Prior to 2008 the Service had no data from Kamishak Bay to assess whether SBE/S was a factor for listed otters from this area.

In response to this event ADF&G invited Verena Gill, a wildlife biologist with the Service's Marine Mammals Management office, to visit McNeil in July 2008 and assess the potential for collaboration between the two agencies. During this time over twenty miles of coastline were surveyed, 3 sea otter carcasses were retrieved and processed, staff were trained in collection procedures, and a procedure for future systematic beach walks was established.

In 2009 Verena Gill (USFWS) and ADF&G secured Federal Aid funding (Cooperative Endangered Species Conservation Fund (Section 6 ESA – 75% plus 25% state match) for a three year (2009-2011) project to search for and gather northern sea otter carcasses in the Kamishak Bay area and to have necropsy, histology, and diagnostic analysis conducted. The project consists of the following: Foot surveys from Contact Point (Amakdedori Beach) to the Kamishak River and around Augustine Island for an annual survey of winter kill sea otters in Kamishak Bay; Systematic weekly beach surveys in and adjacent to McNeil Cove looking for dead sea otters found; sending tissues samples to UC Davis for further analysis; and entering data into an existing Access database.

The initial 2010 systematic beach survey from the north end of Amakdedori Beach to McNeil camp began on May 27 and concluded on May 29. During that survey, 9 possible sea otter carcasses were found (3 confirmed and 6 suspected). From June 14 through August 12, there were eight subsequent systematic beach surveys north or south from camp. No carcasses or skulls were found on any of these surveys. Furthermore, no samples were sent in for analysis from the original 9 possible sea otter carcasses as no soft tissue was found. No necropsies were performed for the same reason. Although no carcasses were in good enough condition for in-depth analysis, the lack of dead sea otters is an informative data point.

VI. Sanctuary Administration & Management

Staffing

Sanctuary Manager Tom Griffin completed his eleventh season at McNeil River, his first as manager. Assistant Sanctuary Manager Tony Carnahan and Drew Hamilton (Wildlife Technician III) both completed their first season as McNeil River staff members. Staff arrived at the McNeil River camp on May 25, 2010 and pulled camp on August 26, 2010. We were very fortunate to have John Hechtel (retired ADF&G bear researcher) and Doug Hill (previous McNeil River Sanctuary Manager) as fill-in guides when regular staff were on leave, June . In addition to their normal duties at the sanctuary, the McNeil staff completed two training courses in the 2010 season: Fire Arms Safety training and the ADFG Boating Safety Course. Tom Griffin also completed Wilderness First Responder training.

Volunteers

A crew of 6 volunteers arrived May 30 and departed June 5, 2010. There were four men and two women who performed a variety of tasks prepping camp and sanctuary trails for the 2010 season. Volunteers assisted with a number of tasks around camp including chopping/stacking firewood, cleaning and preparing the buildings and assisting staff with building and equipment maintenance projects. Volunteers and staff also spent several days on trail maintenance activities. Since two of the staff were new this season, staff took advantage of the volunteer crews presence for training purposes, allowing the new ADF&G wildlife technicians to practice their guiding and interpretation skills in the sanctuary before the arrival of the permitted visitors.

Facilities

A number of facility management and maintenance activities occurred during the 2010 season. A few final finishing items were completed on the toolshed /cabin that was razed and reconstructed in 2009. Finishing items included completion of inside paneling, shelving and organization in tool shed, completion of outside stain and repair of bear damaged drain pipes. Rotting portions of the outside sheathing on staff cabin #2 and the Cook Shack were also repaired and chipping and bubbling paint or varnish was removed and reapplied. During the camp setup, Ed Weiss with the help of several of the volunteers replaced the rotting bathhouse floor and support joists, as well as put a metal roof on the bath house. In conjunction with the floor replacement the stove was also moved to the back corner to provide more room and improve safety. The bottom of the fiberglass boat used to transport visitors across the lagoon was also sanded, patched and refinished with fiberglass. In the sanctuary itself, ADF&G staff Tom Griffin, Tony Carnahan, Drew Hamilton, and the volunteer crew, widened the 1-mile McNeil Falls Trail from the trailhead to the falls. Tony Carnahan and research assistant/volunteer Larry Aumiller replaced substandard and leaking windows; two in the Cook Shack and one in Staff Cabin #2.

VII. Acknowledgements

Sanctuary Manager Tom Griffin, Assistant Sanctuary Manager Tony Carnahan, and ADF&G-DWC Wildlife Technician Drew Hamilton collected data on bear use and visitor activities. Tom Griffin drafted this report. Ed Weiss (ADF&G-DWC) prepared land management, public and commercial use narratives; edited and finalized this report. Lem Butler and Meghan Riley (ADF&G-DWC) provided big game and furbearer harvest data. Lee Hammarstrom and Ted Otis (ADF&G-CF) prepared the narrative on fish escapement, commercial fisheries, fish enhancement, and fish research. Gary Fandrei (CIAA) provided information about Cook Inlet Aquaculture Association Paint River fish ladder activities. Mike Bouwkamp (ADF&G-DWC) provided bear viewing applicant information. Megan Marie (ADF&G-DOH) provided Special Area Permit information. Verena Gill (USFWS) provided sea otter carcass survey information. Earl Becker and Aaron Christ (ADF&G-DWC) provided the Shewhart Control Chart.

Appendix A. List of Bears identified at McNeil River SGS, 2010.

Individual Bears McNeil River SGS 2010

	Adult Males	Adult Females	Females w/young	Sub-Adults
1	Jordan	Kate "Sloth"	Sow w/1 yearling (6/29)	Blonde wall bear (female)
2	Otto	Waterfalls	Sow w/1 big cub (7/4)	Blonde camp bear (?)
3	Dusty	Ursus lupus	Grizzled sow w/2 yearlings	Fluffy (female)
4	I-Man	Yolanda	Diamond Eyes w/2 coy	Yellow collar (female)
5	True Coat	XL	Sow w/3 coy (7/25)	Cheeky (male)
6	Leo (left ear curled)	Holderman	Sow w/2 coy (7/29)	YC buddy (?)
7	Boog	Ivory Girl	Sow w/3 yearlings (8/20)	Well Furred (#1)(possible sibling of #2)
8	Aardvark	Mouse		Well Furred (#2)(possible sibling of #1)
9	Ian	Jughead		
10	Chekov	Short Round		
11	Chops	Canis Arctos		
12	Ears	Chrisco		
13	Holden	Shed-head		
14	Derek	Gimpy		
15	Elvis	Lady Gaga		
16	Pop-eye	Simba		
17	Seal skin	Blondie		
18	Spots	Camp Rat		
19	L	Horseshoe girl		
20	Rocky	Sweater girl		
21	Luther			
22	Dog Bone			
23	Hook-eye			
24	Braveheart			
25	Ted			
26	Wolfgang			
27	Beggar			
28	Teddy's Boy (TB)			
29	Smirk			
30	Ripley			
31	Droop			
32	2 Face			
33	Not-ears			
34	Donny			
35	Bob			
36	Silver Back			
37	Horseshoe			
38	Plunger			
39	Scraper			
40	Cliff			
41	Young White Claws			
42	White Collar			
43	Ted-Like			
44	Ghost Bear			
45	Ivan			
46	Pintail			
47	Dr. Seuss			
48	Head-bob (Bobber)			
49	Panda			
50	Cornelius			
51	PH			
52	Mottled			
53	Brand Back			
54	Wolf			
55	Ears Jr.			
56	Two Stripe			
57				

Totals	56	20	7	8
	Total Males: 56	Total Females: 27		**83 + 8 subs + 14 cubs = 105 bears**

Appendix B. 2010 Daily Wildlife Observations, McNeil River State Game Sanctuary.

Date	Comments
5/25/2010	Tree Swallows (*Tachycineta bicolor*), Golden-crowned Sparrows (*Zonotrichia atricapilla*), American Robin (*Turdus migratorius*), Warblers, Thrush, Snipe
5/26/2010	550 Brant (*Branta bernicla*) seen on the Lagoon/outside spit, Tree Swallows, Golden-crowned Sparrows, American Robins, Warblers, **1** Arctic Ground Squirrel
5/27/2010	250 Brant seen in the Lagoon, Tree Swallows, Golden-crowned Sparrows, American Robins, Yellow-rumped Warblers (*Dendroica coronata*), Wilson's Warbler (*Wilsonia citrina*)
5/28/2010	Red Fox, 30 Brant, Bald Eagle (*Haliaeetus leucocephalus*), Savannah Sparrow (*Passerculus sandwichensis*), Tree Swallows, Wilson's Warbler
5/29/2010	American Robins, Golden-crowned Sparrows, Ground-nesting Bald Eagle
5/30/2010	Wilson's Warbler, Yellow Warbler (*Dendroica petechia*), Golden-crowned Sparrow, Hermit Thrush (*Catharus guttatus*), American Robins
5/31/2010	2 Swan, 3 Mergansers, 170 Brant, 3 Pintail
6/1/2010	2 Bald Eagles, 100 Brant, Yellow Warblers, Wilson's Warblers, American Robins, Thrush
6/6/2010	50 Brant, fresh moose track seen in Upper Mikfik
6/7/2010	American Robins, Golden-crowned Sparrows, Crows, Tree Swallows
6/8/2010	60 Brant
6/9/2010	1 Northern Harrier (*Circus cyaneus*)
6/10/2010	Red Salmon (first of the year), Yellow Warbler, 5 Bald Eagles
6/12/2010	Mergansers, Yellow Warbler, 8 Bald Eagles, Red Salmon, American Robins, Harbor Seal, Golden-crowned Sparrow
6/14/2010	14 Bald Eagles seen at 12:42p. in the Mikfik streambed
6/15/2010	Yellowlegs, 2 Oystercatchers seen on Sea Otter Survey, Yellow Warbler, Wilson's Warbler, Savannah Sparrow, Golden-crowned Sparrow, Swainson's Thrush (*Catharus ustulatus*)
6/17/2010	Harbor Seals seen in the Mikfik riffles, Bald Eagles, American Robins, Yellow Warbler, Golden-crowned Sparrow, Plovers, Brant, 34 Bald Eagles seen at Mikfik, 8 Seals seen at Mikfik creek at high tide, 4 Ravens, Glaucous-winged Gulls (*Larus glaucescens*), Black-billed Magpies (*Pica hudsonia*)
6/18/2010	18 Bald Eagles at Mikfik, Ravens, Magpies, Gulls, Storm-Petrel
6/19/2010	150 Brant
6/21/2010	150 Brant, Savannah Sparrow, Yellowlegs,
6/22/2010	Ground Squirrel, 1 Seal, 50 Brant in the mudflats
6/23/2010	40 Brant in the Lagoon, Eagle with dead eaglet reported by visitor (Ground nest disturbed? By ground predators?), 1 Arctic Ground Squirrel in camp, Warblers, Northern Harrier in camp
6/24/2010	Pigeon Guillemot (*Cepphus columba*), Starry Flounder (*Platichthys stellatus*), Vole
6/28/2010	Arctic Ground Squirrel in camp, Yellow Warblers in camp, Oystercatcher in Polly Cove
6/29/2010	Arctic Ground Squirrel in camp, Yellow Warbler, Merlin (*Falco columbarius*), Northern Harrier, Harbor Seals
7/2/2010	Arctic Ground Squirrel, Yellow Warbler
7/3/2010	37 Brant
7/4/2010	Red Fox, Wilson's Warbler, Bald Eagles, Arctic Ground Squirrel
7/5/2010	Arctic Ground Squirrel, Yellow Warbler
7/8/2010	Yellow Warbler, Brant, Arctic Ground Squirrel in camp, 1 Wandering Tattler (*Heteroscelus incanus*) at McNeil Falls

7/10/2010	4 Harbor Seals, 40 Brant
7/11/2010	3 Yellowlegs in the Mikfik area
7/12/2010	Peregrine Falcon (*Falco peregrinus*) on the water trail
7/13/2010	5 Ptarmigan on the McNeil River trail
7/14/2010	25 Cormorants and 15 Cormorant nests between Amakdedulia Cove and Akjemguiga Cove, 2 Hoary Marot (*Marmota caligata*) between Chenik and Akjemguiga Cove, 6 Arctic Ground Squirrels and 4 Magpies on the bluffs on the coast between Chenik and McNeil Cove. All observations on Sea Otter survey walk from Chenik.
7/16/2010	2 Ptarmigan on the McNeil River trail
7/18/2010	Red Fox
7/20/2010	Wood Frog, Red Fox, Harbor Seals
7/23/2010	Red Fox and kits (1 adult with 3 kits), Harbor Seals, Yellow Warbler, Wilson's Warbler, 2 Redpoll
7/24/2010	Red Fox and kits, Red-breasted Merganser (*Mergus serrator*), Wood Frog
7/28/2010	12 Semipalmated Plover (*Charadrius semipalmatus*)
8/11/2010	Yellowlegs, Northern Harrier
8/16/2010	Red Fox, Northern Harrier, Bank Swallow (*Riparia riparia*), Dark-eyed Junco (*Junco hyemalis*), Yellowlegs, Northern Harrier
8/17/2010	Northern Harrier
8/22/2010	Red Fox, Arctic Ground Squirrel