

# Special Areas Management Report

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## McNeil River State Game Sanctuary Annual Management Report 2012

Thomas Griffin  
Edward W. Weiss



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January 2012

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## 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 <sup>3</sup> /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

<i>all atomic symbols</i>	
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

<i>all commonly-accepted abbreviations;</i> <i>e.g., Mr., Mrs., AM, PM, etc.</i>	
<i>all commonly-accepted professional</i> <i>titles; e.g., Dr., Ph.D., R.N., etc.</i>	
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.
<i>et alii</i> (and others)	et al.
<i>et cetera</i> (and so forth)	etc.
<i>exempli gratia</i> (for example)	e.g.
Federal Information Code	FIC
<i>id est</i> (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

<i>all standard mathematical signs, symbols</i> <i>and abbreviations</i>	
alternate hypothesis	H <sub>A</sub>
approximately	~
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ <sup>2</sup> , 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 <sub>2</sub> , etc.
mean	$\bar{x}$
minute (angular)	'
not significant	NS
null hypothesis	H <sub>0</sub>
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 <sub>a</sub>
type II error probability	P <sub>b</sub>
variance	σ <sup>2</sup> or s <sup>2</sup>

**Cover Photo:** Brown bear (*Ursus arctos*) with freshly caught chum salmon at McNeil River Falls.  
McNeil River State Game Sanctuary. Photo © 2012 ADF&G, by Drew Hamilton.

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## **McNeil River State Game Sanctuary Annual Management Report 2012**

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ADF&G Commissioner: Cora Campbell  
Division of Wildlife Conservation Acting Director: Doug Vincent Lang  
Lands and Refuges Program Coordinator: Joe Meehan

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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](http://www.adfg.alaska.gov).

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## Table of Contents

<b>List of Figures</b> .....	<b>ii</b>
<b>List of Tables</b> .....	<b>ii</b>
<b>List of Appendices</b> .....	<b>ii</b>
<b>Executive Summary</b> .....	<b>iii</b>
<b>I. Introduction</b> .....	<b>1</b>
<b>II. Wildlife</b> .....	<b>2</b>
Brown Bear Monitoring Program.....	2
Index Counts.....	2
Individual Counts .....	3
Bear Use Days .....	3
Sex and Age Composition .....	5
Bear Photo Identification Project .....	7
Other Areas.....	7
Kamishak River Drainage.....	7
Chenik Creek .....	8
Historic Brown Bear Use Patterns.....	8
Other Wildlife.....	9
General Observations .....	9
Hunting & Trapping .....	10
Brown Bear.....	10
Other species .....	11
<b>III. Fisheries</b> .....	<b>13</b>
Commercial Fisheries .....	13
McNeil River Drainage .....	13
Mikfik Creek/Lake System.....	15
Sport Fishing .....	16
McNeil Lagoon.....	16
Kamishak River .....	16
Fisheries Enhancement.....	16
Paint River Fish Ladder.....	16
<b>IV. Public Use &amp; Land Management</b> .....	<b>18</b>
McNeil River Falls/Mikfik Creek .....	18
Kamishak River .....	19
Chenik Area.....	20
Bear-Human Conflicts.....	20
Land Use Permitting.....	20
<b>V. Fish &amp; Wildlife Research</b> .....	<b>23</b>
Mikfik Creek Video Research .....	23
McNeil River Brown Bear & Chum Salmon Research .....	24
<b>VI. Sanctuary Administration &amp; Management</b> .....	<b>25</b>
Staffing .....	25
Volunteers .....	25
Facilities .....	25
<b>VII. Acknowledgements</b> .....	<b>27</b>

## List of Figures

Figure 1. Location of the McNeil River State Game Sanctuary and Refuge in southwest Alaska. ....	1
Figure 2. Historic Index counts of brown bears at McNeil River Falls, McNeil River SGS, Alaska, 1983 - 2012. ....	4
Figure 3. Bear Use Days at McNeil River Falls, McNeil River SGS, Alaska, 1980 - 2012. ....	5
Figure 4. Average annual proportion of adult male and adult female bears observed at McNeil River SGS, Alaska, 1984 – 2012. ....	5
Figure 5. Average annual number of maternal females and sub-adult (both sexes) observed at McNeil River Falls, McNeil River SGS, Alaska, 1976-2012. ....	7
Figure 6. Brown bear harvest from areas surrounding the McNeil River SGS and SGR, Alaska, 1980-2011. ....	12
Figure 7. McNeil River chum salmon escapement 1976-2012, McNeil River SGS, Alaska. ....	14
Figure 8. NRCS Snotel site at Mikfik Lake, McNeil River SGS, Alaska. ....	21
Figure 9. 2012 Geoblock trail stabilization, Mikfik Creek east side sedge meadows. ....	26

## List of Tables

Table 1. Daily highs of systematic hourly index counts of brown bears at McNeil River Falls, McNeil River SGS, Alaska, 1993-2012. ....	4
Table 2. Composition of brown bears observed at McNeil River SGS, Alaska, 1976-2012. ....	6
Table 3. Reported harvests of selected big game and furbearer species within and around McNeil River SGS / SGR, 2000 - 2012. ....	12
Table 4. Aerial escapement estimates of salmon in the Mikfik Lake and McNeil River drainages, McNeil River SGS, Alaska, 2012. ....	15
Table 5. Visitor Use and Sportfish harvest reported from Kamishak River Drainages, McNeil River SGS, Alaska, 2012. ....	16
Table 6. Visitor Use at McNeil River SGS / SGR, Alaska, 1984-2012. ....	22

## List of Appendices

Appendix A. 2012 Daily Wildlife Observations, McNeil River State Game Sanctuary. ....	28
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## Executive Summary

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The McNeil River State Game Sanctuary (MRS GS) and McNeil River State Game Refuge (MRS GR) 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 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.

In 2012, bear viewing was very good for the third season in a row; as indicated by all three data indices. Bear index count numbers at McNeil River falls, the primary bear gathering and viewing location, averaged 53.9 bears, lower than the 2011 average (60.9) yet above the benchmark average of 48.6 bears. Between July 17 and July 19 staff observed over 60 bears at one time at McNeil River Falls, a high number which has only been counted in five out of the last twenty years of the program. Staff observed 103 individual bears this season at MRS GS; expending approximately 1,120 bear use days within the sanctuary. Both the long-term (1976-2012) average and the median number of individual bears annually identified (1976-2012) are 94.

The 2012 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 10,388 fish. This season was the 24th consecutive year the McNeil River chum salmon run failed to produce a significant harvestable surplus and chum salmon escapement into the system did not achieve the low end of the Sustainable Escapement Goal range of 24,000-48,000 chums. The number of spawning chum salmon documented upstream of McNeil River Falls in 2012 was considered poor and was one of the lowest observed during the past 20 seasons. The 2012 run timing of McNeil River chum salmon was somewhat later than previous years.

The bear-viewing program at MRS GS attracted 719 applicants from 17 different countries, who vied for 185 regular permits and 57 standby permits issued through a lottery. Fifty-three percent of applicants were Alaska residents and forty-seven percent were non-residents. The 198 Guided, Standby, and Special Access Permits purchased were distributed to 66% Alaska residents and 34% non-residents. The 180 participants in bear viewing during the 2012 season came from eight countries, including the United States of America, Germany, Australia, Spain, Italy, Switzerland, France and Malaysia. The MRS GS bear viewing permit program generated approximately \$59,150 in 2012 that was deposited into the state's General Fund.

In 2012, ADF&G staff continued to photograph and catalog bears under the MRS GS photo identification project (initiated in 2007). 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.

ADF&G Division of Commercial Fisheries (CF), continued working on a remote video project designed to estimate bear predation on chum salmon at McNeil River falls. The study was originally developed in 2009 with Western Washington University graduate student. The current project is a collaborative effort with an Alaska Pacific University professor and student who is reviewing the video images to document predation events. Preliminary results indicate the method may be useful towards estimating bear predation on pre-spawning chum salmon and in refining estimates of chum salmon spawning escapement into McNeil River. CF staff also worked out of the McNeil River camp in 2012 while collecting baseline genetic samples from wild pink and chum salmon stocks in McNeil River and nearby streams (e.g., Kamishak River, Amakdedori Creek).

A total of six ADF&G Special Area Permits and eleven Commercial Access Permits were issued during 2012. These included Special Areas and Commercial Access Permits issued to commercial operators for their camping, boat storage, sport-fish guiding, and bear viewing guide operations in the Kamishak River and Chenik Creek areas, as well as providing commercial access to McNeil River camp. It also included a Special Areas Permit issued to Cook Inlet Aquaculture Association (CIAA) for repairs to the Paint River Fish ladder. There were no mineral resource developments or activities permitted or reported to the Department within the McNeil River SGS or SGR during 2012.

During 2012, CIAA conducted additional concrete work to fill in areas of erosion and managed water flow through the Paint River fish ladder. The Paint River fish ladder was opened to allow water flow between July 1 and September 3; 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 are 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).

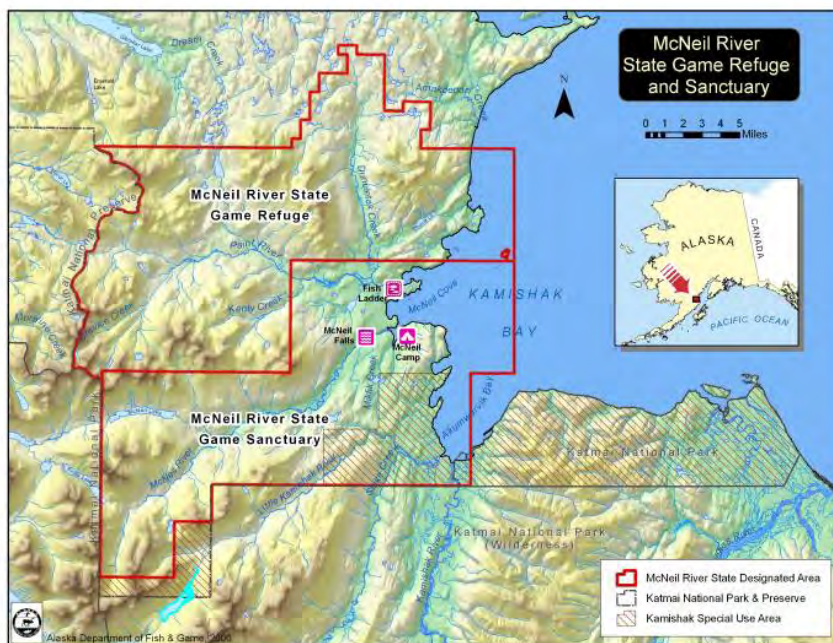


Figure 1. Location of the McNeil River State Game Sanctuary and Refuge in southwest Alaska.

## II. Wildlife

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### Brown Bear Monitoring Program

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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, Lower McNeil River and Mikfik Creek area. Some additional information is provided through self reporting by commercial sportfish and bear viewing guide services that operate within McNeil River SGS & SGR. 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 surrounding river 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 Department uses three different methods 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 between 11:00 a.m. and 7:00 p.m.; July 15 through August 5. Historically these index counts have only been done at the falls viewing pad July 15 through August 5. Since 2011, staff have implemented these hourly counts throughout the bear viewing day at all locations for the entire season in order to gather additional data on bear use and the quality of the bear viewing at locations in addition to the McNeil River falls viewing pad. For consistency with historical data these data are generally only analyzed for the period July 15 through August 5. The number of hourly counts that occur from year to year is variable due to the changing and opportunistic nature of the daily bear-viewing schedule. In order to obtain an index, the average of the seven highest hourly counts is calculated and that is weighed against 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. This index monitoring program allows the department to detect large, short-term declines or gradual, long-term declines in the average number of independent bears at McNeil River Falls. A decline below this BTC 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 2012 the average of the seven highest hourly counts was 53.9 bears; above the benchmark average of 48.6 bears. As noted above, historically these highest counts are derived from data collected between July 15<sup>th</sup> and August 5<sup>th</sup>, however, during 2012 one of the highest counts occurred outside this typical window (July 7) and was used in the resulting index. Bear index count numbers during 2012 continued a trend of higher numbers than those seen in the previous decade. All seven of the highest hourly counts for 2012 are above the lower BTC limit (40.8 bears) and also above the benchmark average (48.6 bears).

The 2012 average of 53.9 was lower than the 2010 average (59.9) and 2011 average (60.9); however these past three years were some of the highest averages recorded since 1993. Between 1993 and 2012 the highest and lowest averages of the seven highest hourly counts were 61 (2011) 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 2012, there has been an increase in the average of the seven highest hourly counts. Hourly Index counts for 2012 are presented in Table 1. Index numbers (medians pre 1995 and means post 1995; of the seven highest hourly counts) for 1983 – 2012 are presented in Figure 2.

Of note for 2012 is a three day period, July 17 – 19, where highest index count was over 60 bears (66, 63, 62 respectively). Hourly index counts over 60 bears have only been noted in five years (1997, 1998, 2010, 2011 and 2012) out the past twenty years (1993-2012).

### ***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 2Table 2. Composition of brown bears observed at McNeil River SGS, Alaska, 1976-2012.). Using unique identifying marks such as sex, age, size and shape, maternal status, claw color, scars, coat color, and behavior, record of individually identifiable bears visiting the sanctuary has been documented every year since 1976 (37 years). Only individual bears that are known or 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 103 individual bears identified at MRSGS during the 2012 season. This is consistent with the 104 individual bears observed in 2011 and the 105 observed in 2010; but represents a significant increase over the numbers observed during the previous decade. 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 2012 is 94 bears.

### ***Bear Use Days***

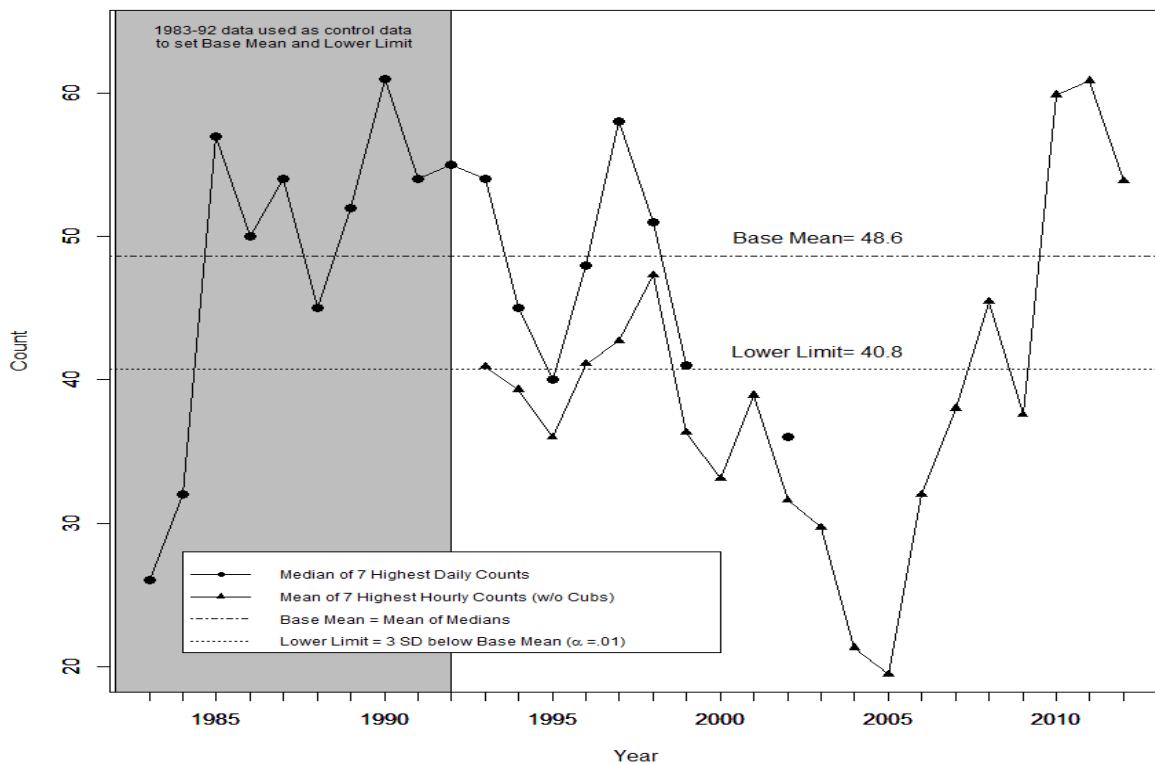
The quality of the bear viewing experience is not just a matter of the number of bears that visit the area in a season, but also the number viewed on a daily basis and how many days the bears stay in the Sanctuary. By summing the individual adult and sub-adult bears observed daily throughout the season 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, 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 *index counts* discussed above due to variability of bear identification among sanctuary staff and the variable 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 1,120 Bear Use Days at McNeil River Falls in 2012, which is below the long-term average (1980 to 2012) of 1,216, yet above the more recent 10-year average of 1,021. The lowest count was 709 Bear Use Days in 1980 (first year this data collected) and the highest count was 1,863 in 1989. It is worth noting that 2012 Bear Use Days (1,120) may have been higher if bear numbers had not been reduced due to high water events (due to heavy rain) on July 6 and July 12 at McNeil River Falls. Bear viewing activities primarily remained at Mikfik Creek (which is the common viewing practice) from early June through July 2<sup>nd</sup> because the viewing there was very good.

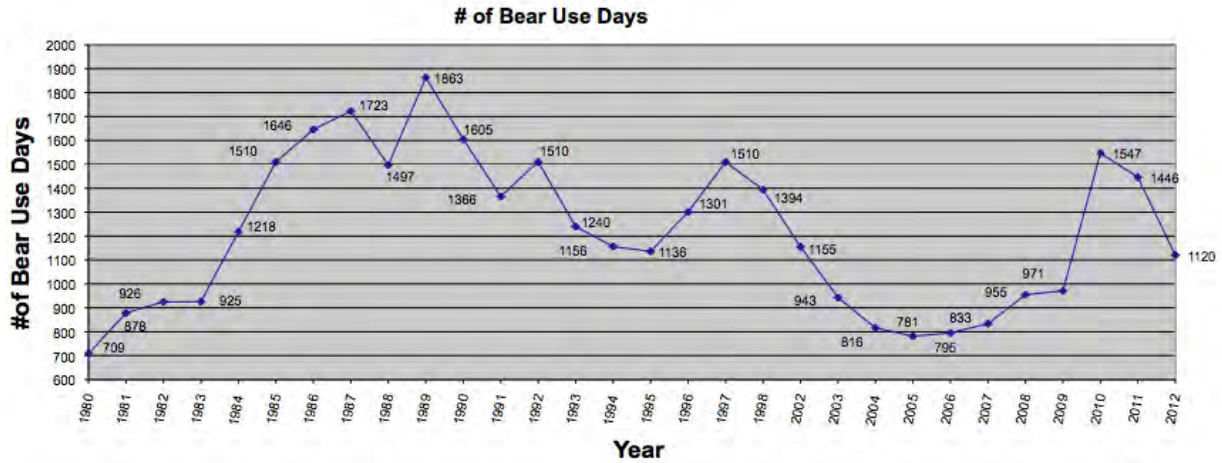
**Table 1. Daily highs of systematic hourly index counts of brown bears at McNeil River Falls, McNeil River SGS, Alaska, 1993-2012.**

Date	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	*2012
July 15	-	-	-	38	40	47	28	37	25	30	42	24	23	31	31	25	41	54	50	48
16	-	-	-	46	32	42	28	31	39	26	31	31	22	31	35	32	34	60	54	50
17	-	-	-	29	47	46	35	31	41	32	36	22	23	31	37	29	35	53	42	63
18	37	30	29	44	43	47	26	32	40	33	40	23	21	30	37	39	34	54	61	66
19	58	50	33	54	66	57	36	36	35	35	40	28	20	33	32	41	39	69	74	62
20	55	37	40	40	52	32	37	23	37	26	38	27	24	37	42	46	40	54	62	43
21	46	43	28	47	50	10	35	28	40	40	30	21	13	21	40	40	21	70	65	35
22	54	26	48	49	44	18	38	37	32	25	37	22	16	26	36	42	10	54	60	24
23	49	43	29	47	63	35	42	36	30	41	27	17	18	31	30	42	14	50	47	32
24	30	52	31	33	52	43	32	36	42	32	20	20	13	25	21	40	25	32	37	21
25	18	18	39	40	51	46	29	36	33	30	25	11	2	27	29	53	40	21	39	26
26	28	37	30	31	54	63	35	32	24	30	21	7	8	25	36	51	21	41	38	31
27	34	44	39	37	49	50	31	23	29	22	24	6	7	31	33	34	30	58	26	20
28	24	33	28	33	27	51	37	23	23	34	17	12	8	27	33	38	32	49	43	26
29	28	32	12	21	30	48	36	24	20	36	14	9	6	25	29	42	33	44	45	25
30	21	25	32	29	27	39	41	28	15	31	16	10	8	20	17	33	29	35	38	18
31	19	20	35	26	15	34	42	19	11	33	-	14	7	20	22	42	18	31	24	19
August 1	13	16	23	22	17	35	42	15	7	25	-	9	-	14	15	30	14	23	22	14
2	7	18	16	18	24	31	29	20	5	21	-	12	-	11	14	18	10	28	11	10
3	-	-	-	18	21	23	27	25	3	19	-	10	-	10	16	19	8	19	7	9
4	-	-	-	11	11	12	16	14	3	11	-	4	-	10	16	19	-	12	5	10
5	-	-	-	10	-	18	23	4	1	9	-	7	-	6	6	20	9	19	9	11
Average of 7 high days	48	44	38	47	55	52	40	36	39	36	38	25	22	32	38	45	38	60	61	54

\* 2012 = one of the 7 highest hourly counts was 45 Bears on 7/10/2012.



**Figure 2. Historic Index counts (annual mean of seven highest systematic daily counts) brown bears at McNeil River Falls, McNeil River SGS, Alaska, 1983 - 2012 ( $\alpha = 0.01$ ).**

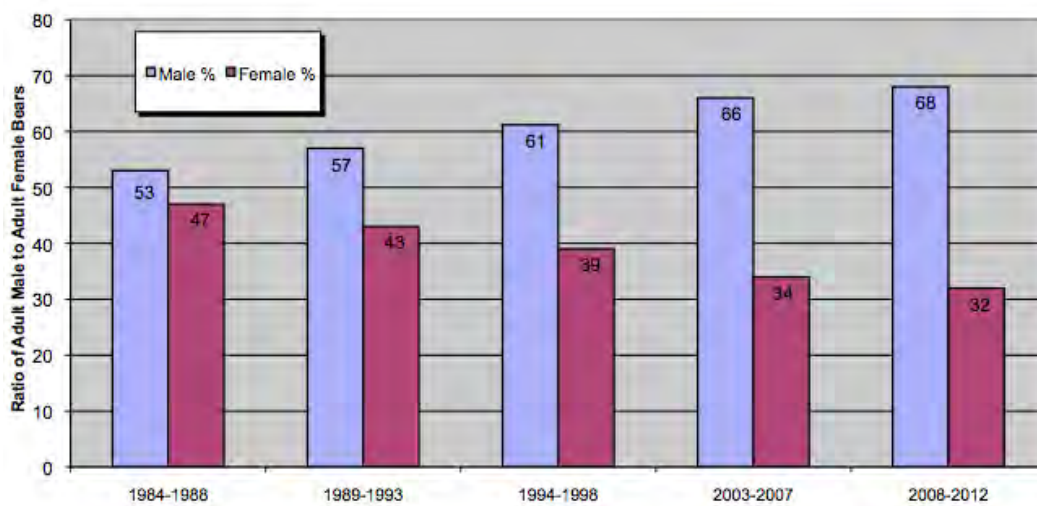


**Figure 3. Bear Use Days\*** at McNeil River Falls, McNeil River SGS, Alaska, 1980 - 2012. \* Annual summation of individual adult and sub-adult bears observed at McNeil Falls during each bear-viewing day June 15 through August 25.

### 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 2008-2012 (5-year) average of 68%.

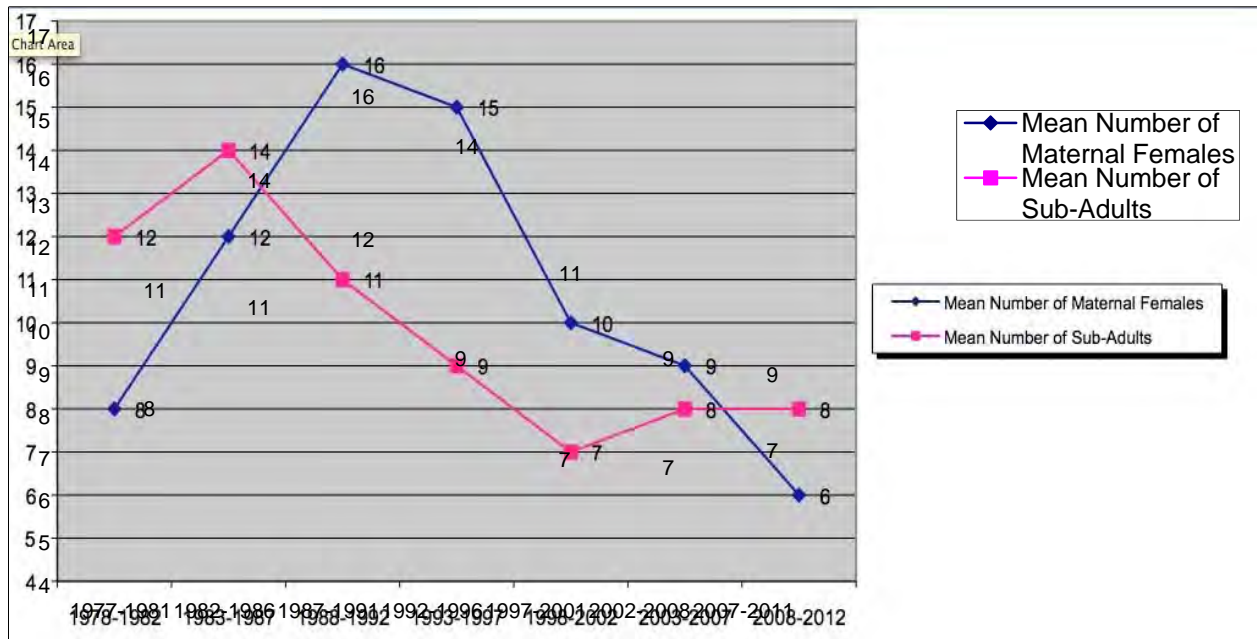
There were 2 maternal females and 4 cubs observed within the viewing areas during 2012 (Table 2). It is noteworthy that the 5-year averages (Figure 6); starting from 1988-1992 and going through 2008-2012, exhibit an overall decline in maternal females in the past several decades. The number of sub-adult bears observed in 2012 was 8. In looking at the data, it can be observed that the average number of sub-adults declined steadily from the 1983-1987 (5-year) average of 14 to the 1998-2002 (5-year) average of 7, and then increased slightly for the next two 5- year averages (2003-2007 and 2008-2012) to 8 bears.



**Figure 4. Average annual proportion of adult male and adult female bears observed at McNeil River SGS, Alaska, 1984 – 2012.**

**Table 2. Composition of brown bears observed at McNeil River SGS, Alaska, 1976-2012.**

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	2011	2012
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	5	2
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	<u>14</u>	<u>14</u>	12	8	16	12	13	14	7	9	16	20	22	24
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	<u>48</u>	<u>48</u>	53	45	45	39	41	40	46	45	40	56	56	65
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	<u>0</u>	<u>0</u>	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Adults</b>	<b>31</b>	<b>36</b>	<b>32</b>	<b>36</b>	<b>38</b>	<b>44</b>	<b>36</b>	<b>44</b>	<b>47</b>	<b>55</b>	<b>56</b>	<b>61</b>	<b>61</b>	<b>75</b>	<b>69</b>	<b>68</b>	<b>74</b>	<b>78</b>	<b>71</b>	<b>75</b>	<b>80</b>	<b>93</b>	<b>88</b>	<b>73</b>	<b>69</b>	<b>70</b>	<b>63</b>	<b>73</b>	<b>58</b>	<b>64</b>	<b>62</b>	<b>62</b>	<b>64</b>	<b>61</b>	<b>83</b>	<b>83</b>	<b>91</b>
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	<u>4</u>	<u>4</u>	4	4	2	4	2	6	2	2	2	3	2	4
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	<u>2</u>	<u>2</u>	2	2	2	1	3	8	5	1	1	1	2	2
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	<u>0</u>	<u>0</u>	0	0	0	0	0	7	6	1	4	6	2	
<b>Total Sub-Adults (1)</b>	<b>7</b>	<b>12</b>	<b>13</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>15</b>	<b>14</b>	<b>13</b>	<b>12</b>	<b>14</b>	<b>15</b>	<b>17</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>8</b>	<b>12</b>	<b>12</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>14</b>	<b>14</b>	<b>9</b>	<b>4</b>	<b>8</b>	<b>10</b>	<b>8</b>
<b>Total Adults &amp; Sub-Adults (2)</b>	<b>38</b>	<b>48</b>	<b>45</b>	<b>41</b>	<b>48</b>	<b>59</b>	<b>51</b>	<b>58</b>	<b>60</b>	<b>67</b>	<b>70</b>	<b>76</b>	<b>78</b>	<b>84</b>	<b>79</b>	<b>78</b>	<b>82</b>	<b>90</b>	<b>83</b>	<b>83</b>	<b>87</b>	<b>101</b>	<b>97</b>	<b>79</b>	<b>75</b>	<b>76</b>	<b>69</b>	<b>77</b>	<b>63</b>	<b>69</b>	<b>76</b>	<b>76</b>	<b>73</b>	<b>65</b>	<b>91</b>	<b>93</b>	<b>99</b>
<b>Total Cubs</b>	<b>20</b>	<b>21</b>	<b>20</b>	<b>17</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>12</b>	<b>17</b>	<b>28</b>	<b>26</b>	<b>30</b>	<b>31</b>	<b>42</b>	<b>34</b>	<b>30</b>	<b>31</b>	<b>24</b>	<b>22</b>	<b>25</b>	<b>35</b>	<b>43</b>	<b>31</b>	<b>20</b>	<b>15</b>	<b>11</b>	<b>21</b>	<b>26</b>	<b>15</b>	<b>18</b>	<b>15</b>	<b>17</b>	<b>16</b>	<b>8</b>	<b>14</b>	<b>11</b>	<b>4</b>
<b>Total Bears</b>	<b>58</b>	<b>69</b>	<b>65</b>	<b>58</b>	<b>60</b>	<b>73</b>	<b>67</b>	<b>70</b>	<b>77</b>	<b>95</b>	<b>96</b>	<b>106</b>	<b>109</b>	<b>126</b>	<b>113</b>	<b>108</b>	<b>113</b>	<b>114</b>	<b>105</b>	<b>108</b>	<b>122</b>	<b>144</b>	<b>128</b>	<b>99</b>	<b>90</b>	<b>87</b>	<b>90</b>	<b>103</b>	<b>78</b>	<b>87</b>	<b>91</b>	<b>93</b>	<b>89</b>	<b>73</b>	<b>105</b>	<b>104</b>	<b>103</b>
<p><b>Notes:</b> (1) Defined as 5.5 years old and younger from 1977 through the present.</p> <p>(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.</p> <p><u><b>Underlined Bold Numbers</b></u> represent average of data four years prior and after (No data was recorded in 1999 &amp; 2000).</p>																																					



**Figure 5.** Average annual number of maternal females and sub-adult (both sexes) observed at McNeil River Falls, McNeil River SGS, Alaska, 1976-2012.

### ***Bear Photo Identification Project***

The field portion of the photo identification project was initiated in 2007. From 2008 to 2012, Sanctuary staff continued the task of photo documenting identifiable bears observed at McNeil. 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 the 2012 season, ADF&G staff Drew Hamilton continued to update, catalog and sort individual bear photographs.

### ***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 2012 the average number of bears seen per day on the Kamishak River from 7/18/12 through 9/18/12 was 7.7.

## ***Chenik Creek***

The Department does not conduct bear surveys in the Chenik Creek drainage; however two local Homer guides did view bears in the lower Chenik Creek/Chenik Lagoon area in 2012. One bear-viewing guide reported that he observed up to 10-12 individual bears in July with the following composition: one female with 2 cubs of the year, one female with one cub of the year, two sub-adults, two adult females and three large adult males. Another longtime guide was bear-viewing in the Chenik Creek area between June 30 and July 5 and reported viewing up to 10-12 individual bears with a high count of 6 bears in view at one time during his visit. He commented that he did not see as many maternal females with cubs as he saw in 2011.

## ***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, then slightly decreased to 103 bears in 2012. The brown bear monitoring program at McNeil River indicates 1) an increase in the number of bears observed over the last seven years and 2) a continued 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 bear use of McNeil River SGS & SGR. Likewise, more information would be 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 the escapement goal. 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 twelve of the past thirteen years (with the unique exception of the McNeil River system) and strong sockeye salmon returns to some nearby Bristol Bay drainages may have contributed to the prior declines 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 not be 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**

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### ***General Observations***

During the 2012 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 2012 season. Some were species that are regularly seen in the MRS GS, including Wilson's Snipe, Golden-crowned Sparrows, Savannah Sparrows, American Robins, Hermit Thrush, Tree Swallows, Common Redpoll, Glaucous-winged Gulls, Mew Gulls, Brant, Green-winged Teal, Common Ravens, Common and Red-breasted Mergansers, Greater Yellowlegs, Northern Pintails, Northern Harriers and Bald Eagles. Less frequently seen birds were also observed, including Swans, Bank Swallows, Cormorants, Sabine's Gulls, Bonaparte's Gulls, Merlin and Peregrine Falcons. Willow Ptarmigan were again observed on the McNeil River trail, while Pigeon Guillemots and White-winged Scoters were observed in McNeil Cove.

Marine mammal sightings during the 2012 season were limited exclusively to Pacific Harbor Seals. These Harbor Seals are generally seen at high tide throughout the season in McNeil River lagoon, McNeil Cove, and the lower tidal areas of McNeil River and Mikfik Creek.

As for terrestrial mammals, a Gray Wolf (*Canis lupus*) was observed in the Mikfik area on June 15 and 21st. On August 20, a Gray Wolf was also seen on the north side of lower McNeil River opposite Enders Island. Several Arctic Ground Squirrels and Red Fox were observed in and around camp.

This season, it was also noted by staff that some of the vegetation surrounding camp and on the adjacent hillsides was not greening up and instead appeared partially to wholly defoliated. This became more noticeable over time. After some investigation this was attributed to limited foliage on the Sitka alders and willows. McNeil staff collected leaf samples and observed caterpillars on several sampled alder leaves, but the species identity of the caterpillars was not determined. Entomologist Jim Kruse and Forest pathologist Robin Mulvey of the US Forest Service were contacted post season to discuss the potential causes of defoliation. Defoliation observations and data gathered through aerial and ground surveys by Forest Health Protection (USFS) and cooperators in the general area of the outbreak over the past 2-3 years suggest that larval stages of the autumnal moth (*Epirrita autumnata*) or the Bruce spanworm (*Operophtera bruceata*) are likely culprits. However, there are a multitude of hardwood defoliators in Alaska, including a variety of geometrid, tortricid and sawfly larvae with diverse hardwood

hosts; as well as other agents such as Alder canker, caused by the native fungus *Valsa melandiscus*. Alder canker has affected at least 150,000 acres of alder throughout south-central and interior Alaska, and is most severe on thin-leaf alder. Therefore, ground checks are imperative to accurately identifying the causal agents. It is also important to distinguish between defoliation and stem dieback/mortality. Defoliated plants can generally recover after a few consecutive years of defoliations (outbreaks commonly persist for 3-5 years), whereas mortality of affected stems causes longer-term damage to the host. McNeil staff will continue observations and are exploring the possibility of a site visit by USFS experts during the 2013 season to determine the cause of the defoliation if it continues.

As detailed below within the Mikfik Creek Video Research section, Commercial Fisheries Division staff recorded 1,671 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, eagles, beavers, wolverine, various waterfowl, and river otters. Brown bears transited the field of view of the camera in 64 instances. Bear observations were fairly evenly spread throughout the season, with a slight increase in late-July and early-August.

## **Hunting & Trapping**

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The MRS GS is closed to hunting and trapping by Alaska state statute (AS 16.20.162(b)), and the MRS GR, 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 MRS GS and MRS GR 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 MRS GS / SGR complex for the period 2000 – 2011 are summarized in Table 3. Data for 2012 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 MRS GS and MRS GR. 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 7 and Table 3. The area represented includes 2,100 mi<sup>2</sup> currently open to hunting.

The long-term average harvest from areas surrounding McNeil River SGS (outside the sanctuary) from the period 1980/81 thru 2010/11 is 78 brown bears every two years (39 bears annually). The tally for 2012 has not yet been completed. Average two-year harvest by decade was 62 in the 1980s, 77 in the 1990s and 94 in the 2000s. The harvests in the recent past were 102 (2004-2005), 93 (2006-2007), 73 (2008-2009) and 80 (2010-2011). 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 McNeil River State Game Refuge portion of the MRSGR/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.

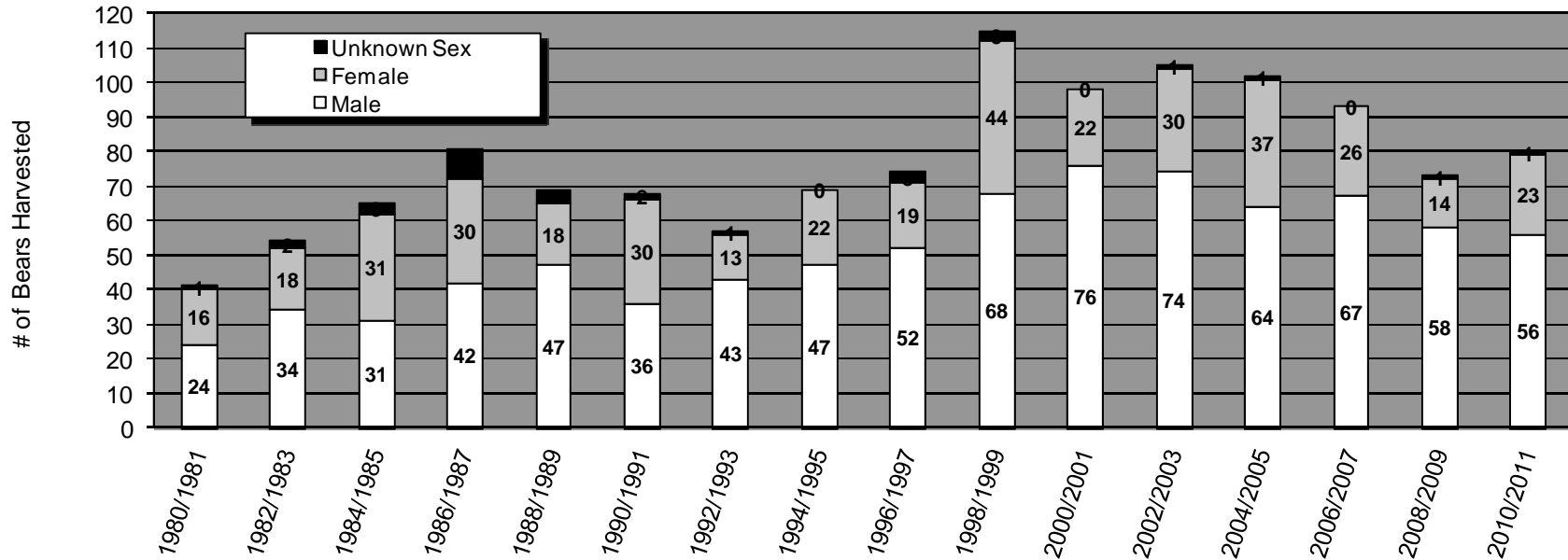


Figure 6. Brown bear harvest from areas surrounding the McNeil River SGS and SGR, Alaska, 1980-2011 (harvest from GMU/UCUs: 9A/201, 301, 401, 501; 9B/301; and 9C/101, 201,301, 601, 702, and 703). Two consecutive regulatory years\* are lumped. This graph does not include harvest data for 2012 as the data is still being compiled.

Table 3. Reported harvests of selected big game and furbearer species within and around McNeil River SGS / SGR, 2000 - 2012

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	6	98	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	6	105	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	3	102	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	4	93	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	4	73	0	1	0	6	1	11	0	2	0	13	0	1	0	1	1	2	0	1
2010	0	80	0	1	0	0	0	6	0	13	0	27	0	0	0	8	0	2	0	2
2011	0	80	0	1	0	1	0	14	0	5	0	28	0	0	0	0	0	4	0	0

\* 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.

### III. Fisheries

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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 trout. The McNeil River drainage contains Dolly Varden trout (*Salvelinus malma*), chum salmon (*Onchorynchus keta*), some coho salmon (*O. kisutch*), pink salmon, and small numbers of Chinook salmon (*O. tshawytscha*). The Mikfik Creek / Lake drainage contains sockeye salmon (*O. nerka*) and Dolly Varden trout. Chenik Creek / Lake system supports sockeye salmon, some coho salmon, lake trout (*S. namaycush*) and Dolly Varden trout. The Paint River system contains rainbow trout (*O. 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

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Periodic aerial surveys are flown to index the escapement of sockeye and chum salmon to Mikfik Creek and McNeil River, respectively. Remote video is also used to monitor the escapement of sockeye salmon into Mikfik Lake. In 2012, generally good weather and stream conditions allowed for effective aerial surveys, except during one major storm event in late July. 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 2012 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 10,388 fish (Table 4). Below the low end of the sustainable escapement goal range of 24,000-48,000 chums (Figure 8); this was the 24th consecutive year the chum salmon run failed to produce a significant harvestable surplus. The number of spawning chum salmon documented upstream of McNeil River Falls in 2012 was considered relatively poor and was below the average observed during the past 20 seasons. Chum salmon were consistently seen in low numbers above the falls during aerial observations from July 6th through the last survey on August 25th. A peak daily aerial estimate of 802 chums upstream of McNeil River Falls occurred on July 18. By comparison chum returns to some other Kamishak Bay District systems in 2012 were also relatively weak, resulting in low fishing effort and a district-wide commercial harvest of just 2,425 chums, the lowest total since 2007. The 2012 run timing of McNeil River chum salmon was somewhat later 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 stream-life, document spawning distribution and estimate predation by bears (Peirce 2007, Peirce et al. 2011). The study determined that

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

- The average stream life for fish spawning above McNeil Falls was much higher than the stream life 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 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 stream life 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 stream life (SL) factor to estimate the total annual escapement. Stream life, 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 10,388 chum salmon for McNeil River in 2012.

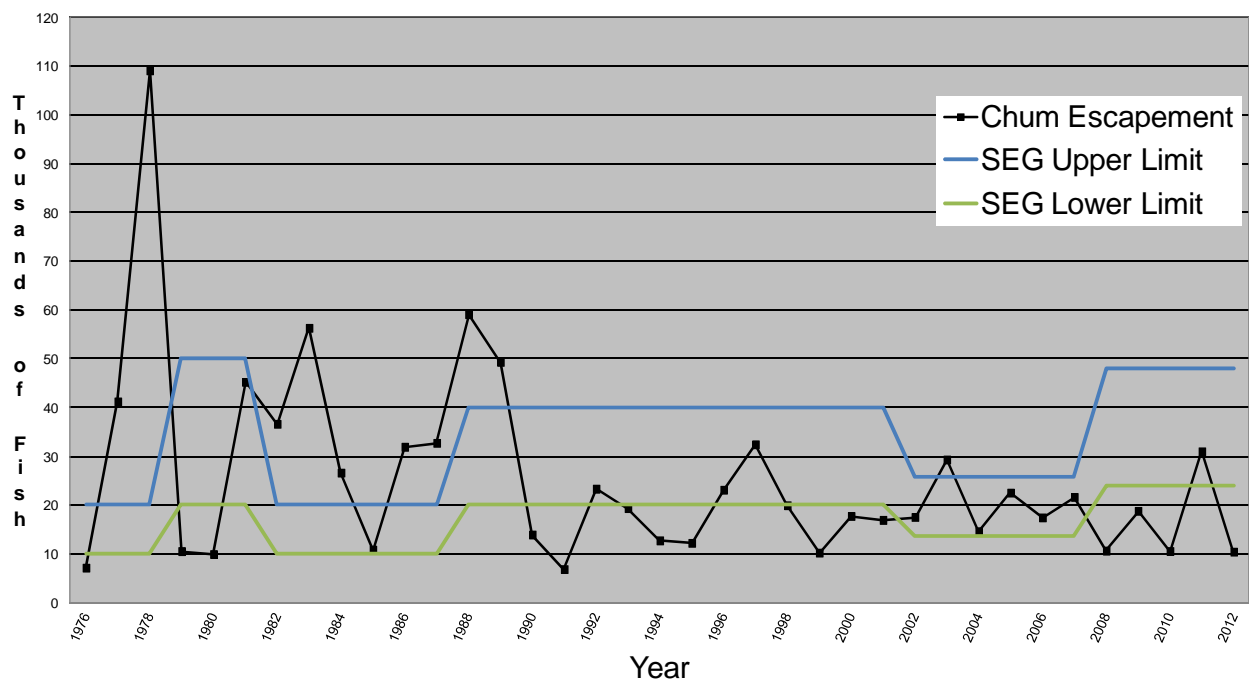


Figure 7. McNeil River chum salmon escapement 1976-2012, McNeil River State Game Sanctuary, Alaska.

**Table 4. Aerial escapement estimates of salmon in the Mikfik Lake and McNeil River drainages, McNeil River SGS, Alaska, 2012.**

Survey Date	Mikfik Sockeyes (Daily) <sup>a</sup>	McNeil Chums (Daily) <sup>a</sup>
6/2/12	0	
6/5/12	2	
6/11/12	1,570	
6/20/12	320	0
6/27/12	2,520	460
7/1/12	384	860
7/3/12	360	2,200
7/6/12	2,200	80
7/10/12	521	697
7/18/12	140	1,802
7/27/12		4,484
8/8/12		4,460
<b>Escapement Index</b>	<b>3,131<sup>b</sup></b>	<b>10,388<sup>c</sup></b>

<sup>a</sup> All individual daily estimates are from individual aerial surveys and are considered to be conservative.

<sup>b</sup> The escapement index for Mikfik sockeyes is the accumulative count from the remote video system at Mikfik Lake.

<sup>c</sup> 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 2012 Mikfik Creek/Lake estimated escapement as determined through aerial surveys, at 2,520 sockeye salmon. A video camera attached to a digital video recorder (see below), used to document sockeye salmon escapement into Mikfik Lake again this season, showed a cumulative total of 3,131 fish actually escaping into the lake. Significant predation by bears occurs in Mikfik Creek, so only those fish documented reaching the lake are considered escapement. Because no aerial surveys were flown of Mikfik Lake in 2012, the video estimate of 3,131 fish was used as the final escapement estimate. This value is well below the SEG range of 6,300 – 12,150 (Table 4). Post-season evaluation indicated that run timing of sockeye salmon into Mikfik Lake was late, with less than 50% of the escapement reaching the lake by July 1st.

### ***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 2012, 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 3,500 – 14,000 sockeye salmon has been met

or exceeded each year beginning in 2003, with the 2012 escapement cumulatively estimated by remote video as 16,505 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 and visitors in camp for bear-viewing activities. Fishing effort was low in 2012. Visitors and ADF&G staff harvested approximately 5 sockeye salmon, 1 chum salmon, 0 pink salmon, and 0 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 2012 season, four lodges and transporters reported a total of 373 angler use days during 100 days within the sanctuary for sportfishing. Wildlife viewing, primarily brown bears, was also a significant part of their activities. These anglers reported catching 3,488 fish, of which 45% were Dolly Varden, 35% were coho salmon and 19% were chum salmon. Nearly all Dolly Varden were released as were most pink and chum salmon. Eighty-four percent of all fish caught were released.

**Table 5. Visitor Use and Sportfish harvest reported from Kamishak River Drainages, McNeil River SGS, Alaska, 2012.**

# of Days in Sanctuary	# of Guide Use Days	# of Angler Use Days	# of Non-angler Days	COHO SALMON		CHUM SALMON		PINK SALMON		DOLLY VARDEN		# of bears
				Kept	Released	Kept	Released	Kept	Released	Kept	Released	
100	162	373	0	536	690	12	637	0	57	19	1537	769

## 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 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. The Paint River Salmon Enhancement Project Operational Plan, drafted in 1993 but never approved, was also updated in 2010. 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.

While no specific plans are in place, at this time CIAA hopes to conduct salmon stocking of the Paint River system, this option remains a possibility and CIAA is investigating potential options for pink and chum salmon enhancement.

During 2012, CIAA staff conducted maintenance repairs to the fish ladder July 1 – 8, 2012; doing additional concrete work to fill in eroded areas around the structure. The CIAA opened the Paint River fish ladder to allow water flow between July 1 and September 3; for evaluation purposes and potential salmon colonization. CIAA also conducted an aerial survey on September 3<sup>rd</sup> looking for fish. During CIAA visits no fish or bears were observed in the area of the fish ladder. CIAA further reported that they did not receive any reports from commercial fisherman of fish pooling below the ladder. ADF&G Commercial Fish staff also included periodic checks of the saltwater below the Paint River Fish ladder in their Mikfik Creek and McNeil River escapement aerial surveys, but no fish were observed near or believed to be using the ladder or the Paint River. ADF&G did not fly any surveys of the Paint River above the fish ladder in 2012.

## **IV. Public Use & Land Management**

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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 (5AAC 93.030) and those adopted by the Alaska Board of Game (5AAC 92.065) the ADF&G Division of Wildlife Conservation uses the following types of permits to manage visitation to the sanctuary: Viewing Permits, Special Access Permits, Non-viewing 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**

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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 2012, the ADF&G received 719 applications for McNeil River Guided and Standby bear viewing permits. Applications were received from 17 different countries and 53% of applicants were Alaska residents. After winners were announced, payments were received for 163 Guided Viewing Access permits and 23 Standby Viewing Access permits. There were 12 Special Access (Science-Education/Commissioner) permits granted by the Commissioner. Overall, 198 permits were issued and 180 permit holders (Guided Viewing, Camp Standby, and Special Access) visited the sanctuary (Table 6) in 2012. The 5-year annual

visitation average (2008-2012) is 180. The average number of permits used each day (permittees that bear viewed) at the sanctuary in 2012 was 8.0 (out of a maximum of 10.0). There were 13 guided permit holder no shows/cancellations, 2 standby permit holder no shows/cancellations, 3 special access permit holder no shows/cancellations and 34 standby permits that were not filled. Of the 180 visitors to McNeil River in 2012, 64% were Alaska residents and 36% were non-residents. Of the 198 people who purchased permits, the ratio was 66% resident to 34% non-resident.

There were a total of 1,041 visitor use days connected with the McNeil River bear viewing program, which included all permitted bear viewing visitors and administrative visitors. Permitted bear viewing visitors spent 969 days within the Sanctuary, logging 641 actual bear viewing days. On average there were 12 visitors at McNeil River camp on any day, slightly higher than the 5 and 10 year averages of 11.8. And an average of 8 bear viewers per day, slightly higher than the 5 and 10 year averages of 7.9 and 7.8, respectively. Permitted visitors spent an average of 5.4 days each in the Sanctuary and participated in the bear viewing group an average of 3.5 days each.

The 12 Special Access permits issued in 2012 included the following recipients: ADF&G Hunter Education and Wildlife Education volunteers, Katmai National Park staff, ADF&G staff from Stan Price State Game Sanctuary, a University of Washington (Pullman) student, Kodiak Brown Bear Center staff, and a USFWS staff representative for the Russian River Task Force.

During 2012, eleven Commercial Transporter Permits were issued to commercial operators for the purposes of transporting clients to the ADF&G McNeil River camp for bear viewing.

A total of \$59,150.00 was generated from the 2012 McNeil River sanctuary permit program and deposited in the state's General Fund.

## **Kamishak River**

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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 and an ADF&G Commercial Access 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 operating in this area holding ADF&G Special Area and Commercial Access Permits are required to 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 2012 and spent 535 visitor use days in the sanctuary, which included 373 angler use days and 162 guide use days. 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**

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One commercial bear viewing guide service from Homer brought clients to the Chenik area in 2012. This service obtained a special area permit for a temporary tent camp at Chenik Lake in 2012 and reported a total of 37 visitor use days, including 14 guide use days and 23 bear viewing (non-angler) use days. Private groups were also known to have visited the Chenik area in 2012.

## **Bear-Human Conflicts**

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As detailed above there were 1,041 user days associated with the ADF&G's bear viewing program at the McNeil River camp. An additional 572 user days were reported by area guides utilizing the Kamishak River and Chenik Creek areas of the MRSGS / MRSGR. All 1,613 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 2012 season, there were no reported adverse interactions between bears and people in the MRSGS or MRSGR.

## **Land Use Permitting**

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The ADF&G Division of Wildlife Conservation 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 2012. These included the Special Areas and Commercial Access Permits issued to the commercial operators in the McNeil River, Kamishak River and Chenik Creek areas; as well the Special Area Permit issued to CIAA for maintenance and repairs to the Paint River Fish ladder.

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) completed installation a Snotell Site within MRSGS that was authorized in 2011. Snotell (SNOWpack TELemetry) is an extensive automated system of sites installed and maintained by NRCS throughout the United States that collects snowpack and related climatic data. The program is part of the NRCS Snow Survey and Water Supply Forecasting program. Snotel site 1191 was established June 26, 2012 at Mikfik Lake (latitude 59.0835, longitude 154.2777) within the MRSGS. Hourly data on temperature, precipitation, winds, snow depth, and soil moisture for the site can be accessed through the NRCS website at: <http://www.wcc.nrcs.usda.gov/nwcc/site?sitenum=1191&state=ak>.

There were no other mineral resource or development activities applied for, permitted or reported to the Department within the McNeil River SGS or SGR during 2012.

**Figure 8. NRCS Snotel site at Mikfik Lake. McNeil River SGS, Alaska**



**Table 6. Visitor Use at McNeil River SGS / SGR, Alaska, 1984-2012.**

Year	Footnotes	# of Applicants	# of Bear Viewing Visitors 6/7-8/25*	Bear Viewing User 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****	Visitor Days Viewing @ McNeil Falls 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
2011	D, K, L, M, O, P	751	195	674	1017	1089	447	6/7 - 8/25
2012	D, K, L, M, O, P	719	180	641	969	1041	458	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 joining 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 Sanctuary 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

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

### Mikfik Creek Video Research

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A remote video escapement recorder (RVER) was installed at the outlet of Mikfik Lake for the 15th 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 in 1998, 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 2012, the video system at Mikfik Creek/Lake was installed on June 11 and shut down on August 9. The system operated continuously during daylight hours (~20 hrs/d) and successfully recorded images approximately 99% of the time that it was programmed to operate between June 11 and August 9 (1,671 hrs). The peak of the run into Mikfik Lake was later and more protracted than usual, occurring from June 26 to July 18. The remote video experienced very few mechanical difficulties in 2012, resulting in just 30 hrs of “down time” spread out over several days in late June.

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 2012. 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 DVR facilitated efficient and convenient video review to estimate escapement. Upon review of the images collected at Mikfik Creek, 3,131 sockeye salmon were counted into the lake, representing 611 more fish than were estimated by the peak aerial survey of Mikfik Creek and McNeil Lagoon. 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 is normally used to generate the spawning escapement index. However, no surveys of Mikfik Lake were flown in 2012, so the remote video based estimate of 3,131 fish was used as the final escapement index. LCI staffs 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 1,671 hrs of recorded video between June 11 and August 9, reviewers documented 64 instances where brown bears transited the field of view of the camera, an average of just over 1 bear per day of video operation (n=60 d). Bear sightings were fairly evenly distributed across the season, with just slightly more bears observed in late July and early August. Nearly all sightings were of individual bears, but a few sightings were of females with one or two cubs. Other wildlife species observed included moose, eagle, beaver, wolverine, various waterfowl, and river otter.

## **McNeil River Brown Bear & Chum Salmon Research**

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During 2009 and 2010, Western Washington University graduate student Ian Gill researched the fishing behavior of brown bears and bear-salmon predation at McNeil Falls. This research provided data and streamlined video sampling methodologies that allowed estimating the total chum salmon taken by bears at the falls. Information that is also beneficial to the management of area fisheries.

ADF&G Division of Commercial Fisheries Research Biologist Ted Otis, worked with Ian to use the methodology and data in developing a model to address bear-salmon predation on fish escapement in the McNeil system. Preliminary results and analysis determined that the data and modeling was a useful tool for estimating the removals of pre-spawning chums at McNeil River. In 2012 the ADF&G Division of Commercial Fish continued the project, with minor changes to the equipment, to gather data to use in refining estimates of chum salmon spawning escapement into McNeil River. The current project is being conducted in collaboration with Dr. Brad Harris, a professor at Alaska Pacific University, where one of his students is reviewing the video.

ADF&G Division of Commercial Fisheries began collecting baseline genetic samples from wild pink, chum, and sockeye salmon throughout Kamishak Bay in 2012. Ted Otis and his crew worked out of the MRS GS Camp while collecting samples from McNeil River and nearby streams (e.g., Kamishak River, Amakdedori Creek). They also collected samples from sockeye salmon in Chenik Lake and plan to collect samples from Mikfik Lake sockeye salmon in 2013 if adequate escapement is achieved.



## **VI. Sanctuary Administration & Management**

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### **Staffing**

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Sanctuary Manager Tom Griffin completed his thirteenth season at McNeil River, his third as manager. Drew Hamilton completed his first season as Assistant Manager and his third season at McNeil River. Samantha McNearney (Wildlife Technician III) rejoined sanctuary staff in a temporary capacity completing her fourth season (2000-02 & 2012) at McNeil River. Staff arrived at the McNeil River camp on May 27 and 28, 2012 and pulled camp on August 28, 2012. We were very fortunate to have John Hechtel (retired ADF&G bear researcher) and Tony Carnahan (previous McNeil River Sanctuary Assistant Manager) fill-in this year as guides when regular staffs were on leave. In addition to their normal duties at the sanctuary, the McNeil staff completed the annual ADF&G Fire Arms Safety training.

### ***Volunteers***

A crew of 4 volunteers worked at MRS GS from June 1 to June 6, 2012. The volunteer crew along with staff performed a variety of tasks prepping camp and sanctuary trails for the 2012 season. Volunteers assisted with a number of tasks around camp including stacking firewood, mending chairs, organizing books and games, helping with inventory, trail maintenance, Geoblock installation, picking up marine debris and trash, preparing the buildings and cleaning.

### **Facilities**

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In addition to performing general maintenance tasks throughout the season, staff conducted general maintenance around camp and on sections of the Mikfik Creek Trail and the McNeil Falls Trail, dug/moved two outhouses, applied a coat of Timberflex preservative on all structures in camp, worked on an equipment inventory, installed a new pipe stand for the data logger (thermograph/ pressure sensor) in McNeil River and graveled the viewing pad at McNeil River Falls. ADF&G staff Tony Carnahan re-roofed the storage cache in camp.

In June of 2012, staff installed Geoblock™ panels along about 130 feet of trail within the sedge meadow on the east side of Mikfik Creek where the trail runs from the east bluff wall in the direction of Mikfik Creek riffles. The trail improvements were made to stabilize muddy trail sections and protect the sedge meadow vegetation. The Geoblock™ application also improves visitor footing along the trail. Thirty-one (2' x 4') panels of Geoblock™ 5150 were attached end to end into transportable sections using 2.5" inch screws and 2" x 4" lumber for support at the joints. Seven (16' foot) sections and one (12' foot) section were laid out with a small gap between each section for a total of over a 130 feet of trail completed. Each individual section was anchored down with one duckbill earth anchor at each end. Additional sections of the trail will be treated in a similar manner during future seasons if this year's treatment holds up to storm tides, wave action, shifting ice and break-up.



Figure 9. 2012 Geoblock trail stabilization, Mikfik Creek east side sedge meadows. Insets of treated (A) and untreated (B) trail sections.

## **VII. Acknowledgements**

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Sanctuary Manager Tom Griffin, Assistant Sanctuary Manager Drew Hamilton, and ADF&G Wildlife Technician Samantha McNearney 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. Chris Peterson (ADF&G-DWC) provided big game and furbearer harvest data. Glenn Hollowell and Ted Otis (ADF&G-CF) prepared the narrative on fish escapement, commercial fisheries and fish research. Caroline Cherry (CIAA), Paul Blanche (ADF&G) and Bert Lewis (ADF&G) provided information about Paint River fish ladder activities. Mike Bouwkamp (ADF&G-DWC) provided bear viewing applicant information. Paul Blanche (ADF&G-DOH) provided Special Area Permit information. Earl Becker (ADF&G-DWC) provided the Shewhart Control Chart.

**Appendix A. 2012 Daily Wildlife Observations, McNeil River State Game Sanctuary.**

Date	Comments
5/27/2012	First observation, seen from camp: 1 Brown Bear ( <i>Ursus arctos</i> ) grazing in Mikfik Sedge East, 1 Common Redpoll ( <i>Carduelis flammea</i> ), 2 American Robins ( <i>Turdus migratorius</i> ), 2 Golden-crowned Sparrows ( <i>Zonotrichia atricapilla</i> ), 7 Tree Swallows ( <i>Tachycineta bicolor</i> ), 2 Bald Eagles ( <i>Haliaeetus leucocephalus</i> ) in lagoon, 30 Brant ( <i>Branta bernicla</i> ) in lagoon, 1 Wood Frog ( <i>Rana sylvatica</i> ) in sauna pond, 1 Pacific Harbor Seal ( <i>Phoca vitulina</i> ) in lagoon, Cow Parsnip ( <i>Heracleum lanatum</i> ), Fireweed ( <i>Epilobium augustifolium</i> ), Wild Geranium ( <i>Geranium erianthum</i> ), Chocolate Lily ( <i>Fritillaria camschatcensis</i> ), Horsetail ( <i>Equisetum arvense</i> ).
5/28/2012	First observation: 2 Savannah Sparrows ( <i>Passerculus sandwichensis</i> ) in camp.
5/29/2012	First observation, seen from camp: 1 Northern Harrier ( <i>Circus cyaneus</i> ), 1 Semipalmated Plover ( <i>Charadrius semipalmatus</i> ), 2 Green-winged Teal ( <i>Anas crecca</i> ) in the sauna pond. Lyngbei Sedge ( <i>Carex lyngbei</i> ) in Mikfik Sedge east.
5/30/2012	First observation, seen from camp: 1 Common Merganser ( <i>Mergus merganser</i> ), 1 Wilson's Warbler ( <i>Wilsonia pusilla</i> ), 1 Common Raven ( <i>Corvus corax</i> ), 2 Northern Harriers. Also seen, 30 Brant in the lagoon/tidal flats.
5/31/2012	Seen in Mikfik Sedge east: 2 Northern Harriers, 7 Northern Shovelers ( <i>Anas clypeata</i> ), 1 Black-billed Magpie ( <i>Pica hudsonia</i> ) seen near the east bluff of Mikfik. 200 Brant observed in the lagoon.
6/1/2012	First observation, seen from Mikfik sedge east: Large Leaf Avens ( <i>Geum macropylum</i> ) and Arctic Dock ( <i>Rumex arcticus</i> ).
6/5/2012	1 Gray Jay ( <i>Perisoreus canadensis</i> ) first observation, seen in camp.
6/6/2012	1 Arctic Ground Squirrel ( <i>Spermophilus parryi</i> ) first observation, seen in camp.
6/7/2012	1 Arctic Ground Squirrel seen in camp. 1 Greater Yellow Legs ( <i>Tringa melanoleuca</i> ) observed from opposite driftwood point on the east side of Mikfik Creek. 1 Red Fox ( <i>Vulpes vulpes</i> ) first observation, seen from Drift Wood Point on the west side of Mikfik Creek. Seen from Mikfik Sedge east: 1 Bald Eagle, 5 American Robins, 3 Golden-crowned Sparrows, 4 Savannah Sparrows. 1 Glaucous-winged Gull ( <i>Larus glaucescens</i> ) first observation, seen in the lagoon. 1 Pacific Harbor Seal observed in the Mikfik Creek tidal area at high-tide.
6/8/2012	First observation, seen in the Mikfik Creek tidal area: 8 Northern Pintails ( <i>Anas acuta</i> ), 2 Lesser Yellowlegs ( <i>Tringa flavipes</i> ).
6/9/2012	First observation: 1 Wilson's Snipe ( <i>Gallinago delicata</i> ), "winnowing," observed from opposite driftwood point on the east side of Mikfik Creek.
6/12/2012	First Bloom: Lupine ( <i>Lupinus nootkensis</i> ) in camp.
6/13/2012	First observation: Red-breasted Merganser ( <i>Mergus serrator</i> ) seen on the east side of the Mikfik sedge flats, Sockeye (Red) Salmon ( <i>Oncorhynchus nerka</i> ) seen in the Mikfik Creek tidal area.
6/15/2012	First observation: 1 Gray Wolf ( <i>Canis lupus</i> ) seen on top of the west bluff. First bloom: Nagoonberry ( <i>Rubus arcticus</i> ) and Chocolate Lily observed from the Mikfik Creek riffles.
6/17/2012	First bloom: Tall Jacob's Ladder ( <i>Polemonium acutiflorum</i> ) seen from Mikfik Creek riffles and Cinquefoil ( <i>Potentilla villosa</i> ) seen on conglomerate wall in Mikfik Sedge west.
6/21/2012	First bloom: Wild Geranium in camp, Large Leaf Avens, Alaska Cotton ( <i>Eriophorum scheuchzeri</i> ) seen the Mikfik sedge east. Grey Wolf seen walking along the Mikfik Creek tidal area.
6/24/2012	First Bloom: Wild Iris ( <i>Iris setosa</i> ) seen from the Mikfik Creek riffles.
6/25/2012	First Observation: 1 Chum (Dog) Salmon ( <i>Oncorhynchus keta</i> ) caught by a visitor on the spit, 1 Caspian Tern ( <i>Sterna caspia</i> ) seen near riffles.
6/27/2012	First bloom: Arctic Daisy ( <i>Chrysanthemum arcticum</i> ) seen in Mikfik sedge east.

6/29/2012	First observation: 1 Tundra Swan ( <i>Cygnus columbianus</i> ) seen in the Mikfik Creek tidal area.
7/3/2012	First observation: 1 Common Redpoll ( <i>Carduelis flammea</i> ) seen from camp.
7/4/2012	First observation: 1 Bank Swallow ( <i>Riparia riparia</i> ) seen from camp.
7/9/2012	First bloom: Beach Fleabane ( <i>Senecio pseudo-arnica</i> ) seen on spit.
7/12/2012	First observation: 2 Red Fox kits ( <i>Vulpes vulpes</i> ) seen near McNeil River trail.
7/18/2012	First bloom: Yellow Monkeyflower ( <i>Mimulus guttatus</i> ) seen along the McNeil River trail. 1 Cormorant (too far for specific identification) seen in McNeil Cove.
7/19/2012	First observation: 1 Wandering Tattler ( <i>Heteroscelus incanus</i> ) seen from McNeil Falls.
7/20/2012	First bloom: Fireweed ( <i>Epilobium augustifolium</i> ) seen from the McNeil River trail.
7/22/2012	First bloom: Monkshood ( <i>Aconitum delphinifolium</i> ) seen from the McNeil River trail just above the viewing pad. 18 Mew Gulls ( <i>Larus canus</i> ) and Glaucous-winged Gulls (many) observed from McNeil River Falls.
7/25/2012	First observation: 1 Pigeon Guillemot ( <i>Cepphus columba</i> ) and 15 White-winged Scoters ( <i>Melanitta fusca</i> ) seen in McNeil Cove.
8/1/2012	First observation: 1 Pine Grosbeak ( <i>Pinicola enucleator</i> ) seen in camp.
8/2/2012	First observation: 1 Bonaparte's Gull ( <i>Larus philadelphia</i> ) seen from McNeil River Falls.
8/3/2012	First observation: Peregrine Falcon ( <i>Falco peregrinus</i> ) seen on the spit.
8/10/2012	First observation: 1 Spotted Sandpiper ( <i>Actitis macularia</i> ), juvenile seen from McNeil River Falls.
8/13/2012	First observation: 1 Merlin ( <i>Falco columbarius</i> ) seen near the west bluff.
8/17/2012	First observation: 1 Sabine's Gull ( <i>Xema sabini</i> ), juvenile seen near the lower McNeil River.
8/19/2012	First observation: 4 Harlequin Ducks ( <i>Histrionicus histrionicus</i> ), one hen and three chicks seen from McNeil River Falls.