Special Areas Management Report ADF&G/DWC/SAMR-2017-2

McNeil River State Game Sanctuary Annual Management Report 2015

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2017

Alaska Department of Fish and Game Division of Wildlife Conservation

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Special areas 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.

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

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Cover Photo: Brown bear (*Ursus arctos*) maternal female with 2 yearling cubs at McNeil River State Game Sanctuary, Alaska. ©2015 ADF&G, photo by Thomas M. Griffin.

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Executive Summary

The McNeil River State Game Sanctuary (MRSGS) and McNeil River State Game Refuge (MRSGR) were created by the Alaska State Legislature in 1967 and 1991, respectively. The sanctuary was established primarily to provide permanent protection for brown bears (*Ursus arctos*) 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 or department) 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.

Bear viewing remained good in 2015 as indicated by all 3 data indices. Bear index count numbers at McNeil River falls, the primary bear gathering and viewing location, averaged 36 bears, lower than the 2014 average (41.4) and 2013 average (50.0), and below the lower limit average of 40.8 bears. Staff observed 95 individual bears this season at MRSGS; expending approximately 1,856 bear use days within the sanctuary. The long-term (1976–2015) average number of individual bears annually identified is 93.9 and the median number of individual bears annually identified (1976–2015) is 95.

The bear-viewing program at MRSGS attracted 983 applicants from 16 different countries, who vied for 185 regular permits and 57 standby permits issued through a lottery. Fifty-seven percent of applicants were Alaska residents and 43% were nonresidents. The 210 guided, standby, and special access permits were distributed to 63% Alaska residents and 37% nonresidents. The 178 participants in bear viewing during the 2015 season came from 6 countries, including Canada, France, Great Britain, Japan, Switzerland, and the United States. The MRSGS bear-viewing permit program generated approximately $68,875.00 in 2015 that was deposited into the state's Fish and Game Fund.

The 2015 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 20,494 fish. The 2015 run timing of McNeil River chum salmon was earlier than in previous years. 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.

A total of 3 ADF&G special area permits and 12 commercial access permits were issued during 2015. These included permits issued to commercial operators for their guide operations in the Kamishak River and Chenik Creek areas and commercial access to McNeil River camp. There were no mineral resource developments or activities permitted or reported to the department within MRSGS and MRSGR during 2015. Cook Inlet Aquaculture Association (CIAA) is coordinating with ADF&G regarding permitting for construction of a cabin at the Paint River facility.

In April 2015, CIAA stocked approximately 1.02 million unfed pink salmon fry in upper Paint River Lake. These fish came from Bruin Bay stocks and were hatched at Tutka Bay hatchery. Adult returns from this stocking are expected to return in July–August 2016. CIAA also did some minor

maintenance and opened the Paint River fish ladder to natural colonization in 2015. A small number of naturally colonizing chum and coho salmon were once again observed in the lower Paint River and Dunuletak Creek.

♦ ♦ ♦

Introduction

McNeil River, located in southwestern Alaska (Fig. 1) supports the world's largest congregation of brown bears (*Ursus arctos*). The Alaska State Legislature established the McNeil River State Game Sanctuary (MRSGS) 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) above and to maintain and enhance the unique bear-viewing opportunities within the sanctuary; and 3) provide opportunities that are compatible with 1) above 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.

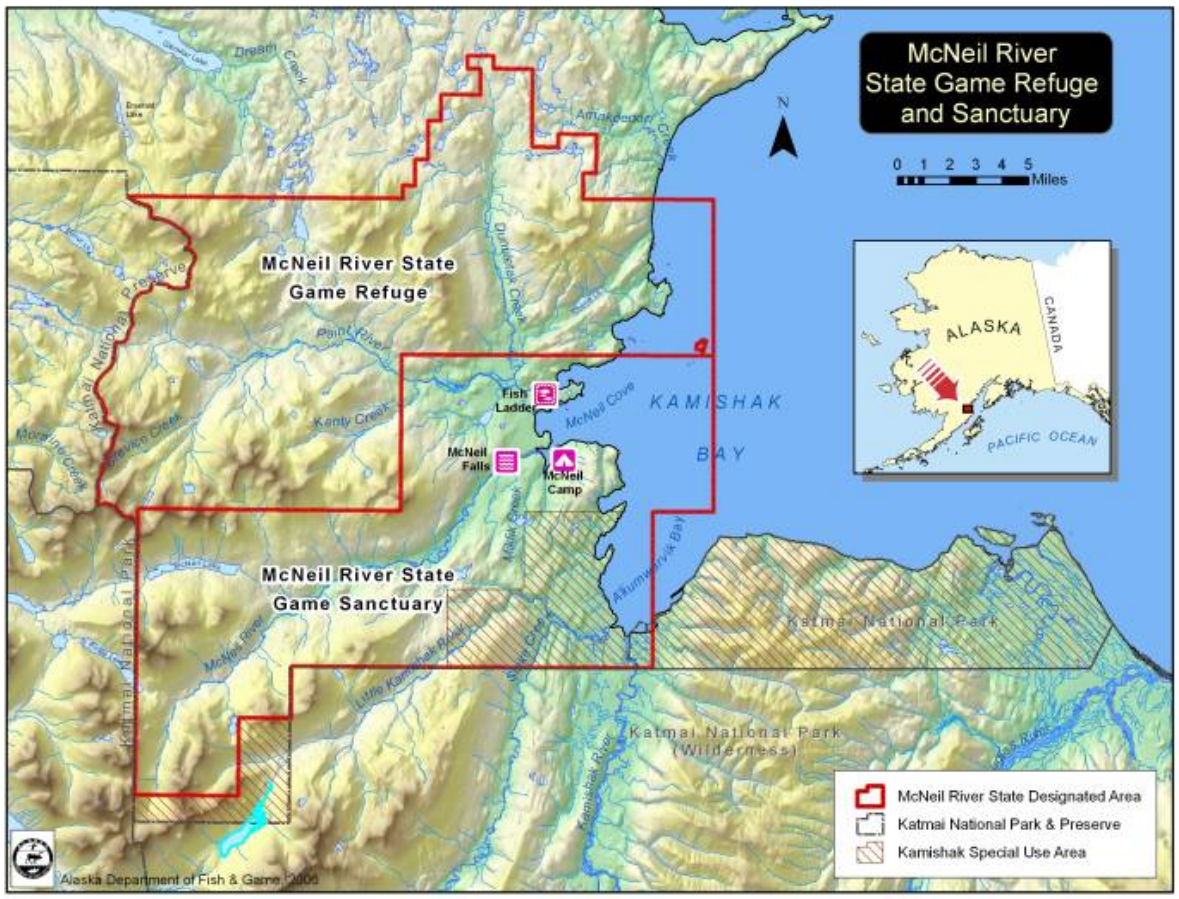

Figure 1. Location of the McNeil River State Game Sanctuary and McNeil River State Game Refuge in Southwest Alaska.

The sanctuary was expanded and the adjoining McNeil River State Game Refuge (MRSGR) was created in 1991; however, implementation of this legislation was delayed until January 1993 when the commissioner of the Alaska Department of Fish and Game (ADF&G or 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 (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 ADF&G as required by the sanctuary and refuge enabling legislation (AS 16.20.041(f) and AS 16.20.162(f), respectively).

Wildlife

BROWN BEAR MONITORING PROGRAM

MRSGS and MRSGR encompass approximately 388 mi^2. 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 sport fish and bear-viewing guide services that operate within MRSGS and MRSGR. Monitoring and reporting statistics and subsequent management decisions are based on the data gathered as part of the McNeil River bear-viewing program at the 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 3 different methods to monitor bear use at MRSGS: *index counts* (the average of the 7 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 once each hour during the viewing day to develop an index of bear-viewing quality. Historically these index counts were only done from the viewing pad at McNeil River falls each hour 15 July–5 August. 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 expanded data have thus far only been analyzed for the period 15 July–

5 August. However, in future years these data can be looked at to gauge the quality of viewing during the June and August periods as well as the July periods at the falls. 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 the index, only counts between 11:00 AM and 8:00 PM are used in the analyses and cubs are excluded from the overall count numbers. (While viewing cubs actually enhances the bear-viewing experience; cubs are more prone to mortality and may not return in future years, therefore they are not included in the index averages until they mature). The average of the 7 highest hourly counts for the season is then calculated for the index.

During 2014–2015 a review of the historic data, along with this newer data, revealed several facts that affect the index counts traditionally gathered at the falls viewing pad. For one, variations in the fish runs, as well as high water events, affect the number of bears present at the falls. Thus the 7 highest hourly counts do not always fall during the 15 July–5 August period; which can skew data toward a lower number in some years, if only considering the 15 July–5 August period. Additionally, the practice of not including cubs in these index counts and the range of viewing hours used was not consistently applied over the years. And finally, the Shewhart–CUSUM control monitoring scheme used to assess if the index number is within normal variation has not accounted for yearly variations in bear numbers.

In order to address these issues, ADF&G staff reviewed the historic data and the Shewhart-CUSUM control monitoring scheme and determined that changes were needed to account for these issues. Consequently data for 1993–2015 were reanalyzed to apply the following rules consistently from year to year and develop a more accurate model assessment of the index.

1. Hourly counts between 11:00 and 20:00 from McNeil River pad during 1 July–5 August (15 July for 1993–2004; 1 July for 2005–2015).
2. Cubs not included in analysis.
3. Seven highest hourly counts averaged for index.
4. The Shewhart-CUSUM analysis incorporates a cumulative mean value of the 7 highest counts and uses an error of 2 standard deviations as the lower limit that would indicate a potential issue with viewing at McNeil River falls.

Data presented in Table 1 and Figure 2 represent data revised after having consistently applied these rules across all years.

In 2015 the average of the 7 highest hourly counts was 36 bears; below the long-term average of 40.8 bears. Only one of the 7 highest hourly counts was above the long-term average. As noted above, historically these highest counts are derived from data collected between 15 July and 5 August; however, during 2015, 4 of the highest counts occurred outside this typical window (8, 9, 10, and 11 July) and were used in the resulting index. Bear index count numbers during 2015 continued a slight downward trend from the higher numbers experienced in 2010 and 2011; but were still above the lower numbers seen in the previous decade. The 2015 average of 36 bears was lower than the annual averages for the past 5 years (2010–2014); however, these prior years

were some of the higher averages recorded since 1998. Daily high index counts between 1993 and 2015 are presented in Table 1.

Individual Counts

A second method of monitoring bear use and the quality of the bear-viewing program at MRSGS is by tallying the number of individually identifiable bears (adults, subadults, and cubs) observed by sanctuary staff daily and throughout the season (Fig. 3). Using unique identifying characteristics such as sex, age, size and shape, maternal status, claw color, scars, coat color, and behavior, a record of individually identifiable bears visiting the sanctuary has been documented every year since 1976 (40 years). Only individual bears that are known or recorded a minimum of 3 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 95 individual bears identified at MRSGS during the 2015 season. This is lower than bears recorded during 2010–2012 but is slightly higher than the long-term (1976–2015) average of 94 bears. Since 1976 the lowest count was 58 (1976) and the highest count was 144 (1997).

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 subadult 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 in MRSGS, only data from McNeil River falls, 15 June–25 August, is used for the index and historical comparison (Fig. 3). One bear or family group at McNeil River falls seen during a day is counted as 1 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. These data have been recorded since 1980, but no data were recorded in 1999, 2000, or 2001.

There were 938 bear use days at McNeil River falls in 2015, which is below both the long-term average (1980–2015) of 1,207 and the recent 10-year average of 1,101. The lowest count was 709 bear use days in 1980 (first year these data were collected) and the highest count was 1,863 in 1989. It is important to note that while bear use days at McNeil falls were lower than long-term and 10-year averages, overall bear use days were up when considering all use areas.

Table 1. Daily highs of systematic hourly index counts of brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 1993–2015. (Underlined bold numbers = 7 highest hourly counts for the season.)

Date	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	MEAN
Jul-01														1			13	7	18		14	**38**	19	17.13
Jul-02													13				14	14	18		17	35	18	19.50
Jul-03																3	16	16	17	20	18	30	15	17.67
Jul-04													16	3			15	26	13	20	30	**44**	18	21.10
Jul-05													20	12	4	9	15	27	14	18	28	**37**	17	18.25
Jul-06													20	12	4	8	19	19	10		27	28	31	18.36
Jul-07													**22**	18		16	21	27	12	13	26	33	24	21.91
Jul-08													21	14	4	10	25		24	25	35	**47**	**38**	24.73
Jul-09													**25**	15		14	26		27	41	34	**48**	**33**	29.60
Jul-10													**23**	21	11	14	33	17	31	**45**	36	7	**47**	25.83
Jul-11												15	**28**	18	11	17	28	27	30	37	45	7	**33**	25.08
Jul-12												10	**24**	19	17	24	32	33	33	0	**49**	16	30	23.92
Jul-13												**20**	**28**	26	20	22	25	30	40	36	**50**	28	28	29.46
Jul-14												**20**	21	**34**	21	18	27	42	42	40	**48**	32	31	30.54
Jul-15				34	30	41	25	**34**	25	**30**	**36**	19	19	**31**	29	25	**41**	54	**50**	**48**	**57**	**40**	**31**	34.38
Jul-16				35	26	39	25	31	**39**	26	**27**	**24**	19	**31**	**35**	32	**34**	**64**	**54**	**50**	39	**36**	23	33.76
Jul-17				24	40	41	32	30	**40**	28	**32**	**20**	21	**31**	32	28	**35**	53	42	**63**	44	29	31	34.19
Jul-18	**34**	30	29	**35**	33	**42**	23	29	**40**	**31**	**31**	**21**	19	30	**37**	37	**34**	**54**	**64**	**66**	**51**	23	30	34.92
Jul-19	**49**	**44**	**33**	**49**	**49**	**52**	31	**33**	**35**	**31**	**31**	**25**	20	**33**	29	38	**39**	**70**	**75**	**62**	**50**	25	24	39.21
Jul-20	**46**	**33**	**40**	**37**	**41**	27	**34**	20	**37**	26	**29**	**22**	**22**	**37**	**42**	**42**	**40**	**54**	**62**	**43**	40	21	**36**	35.25
Jul-21	**38**	**39**	28	**44**	**40**	8	32	25	**39**	**36**	21	19	11	21	**40**	40	21	**70**	**65**	35	42	19	**32**	32.38
Jul-22	**45**	24	**37**	**42**	34	17	**35**	**34**	32	21	**26**	18	16	24	**34**	**42**	10	**54**	**60**	24	41	12	25	30.00
Jul-23	**42**	**40**	28	**43**	**46**	28	**38**	**33**	30	**33**	23	15	16	**31**	30	**41**	14	50	47	32	36	11	17	30.50
Jul-24	29	**46**	**30**	28	37	36	29	**33**	**42**	**30**	16	18	12	26	21	**40**	25	32	37	21	**45**	9	14	27.54
Jul-25	18	18	**38**	**38**	**40**	**44**	26	**33**	33	28	18	11	2	27	29	**51**	**40**	21	39	26	35	7	14	26.67
Jul-26	28	30	**30**	29	**41**	**57**	32	**32**	24	24	16	7	6	25	**36**	**49**	21	41	38	31	33	9	7	27.04
Jul-27	**33**	**38**	**34**	32	**41**	**48**	28	23	29	20	20	6	5	31	**33**	34	30	**62**	26	20	24	8	8	26.54
Jul-28	23	**32**	25	30	22	**46**	32	20	23	26	12	10	6	27	33	35	32	49	43	26	15	9	8	24.46
Jul-29	25	31	11	17	25	**44**	**36**	21	20	**30**	14	9	6	25	29	**42**	33	44	45	25	11	12	7	23.58
Jul-30	21	24	24	26	22	35	**37**	25	15	23	14	8	8	20	17	33	29	35	38	18	10	7	8	20.83
Jul-31	18	19	27	22	11	30	**38**	16	11	25	11	10	7	20	22	35	18	31	24	19	7	7	12	18.46
Aug-01	13	15	22	22	17	30	**36**	12	7	21	9	8		12	15	30	14	23	22	14	3	4	8	15.65
Aug-02	7	14	15	18	20	26	29	17	5	19	11	9		11	13	18	10	28	11	10	3	5		13.68
Aug-03				18	16	21	24	22	3	15	5	8		10	16	19	8	19	7	9	5	3	6	11.85
Aug-04				11	11	8	15	11	3	9		4		10	14	19	-	12	5	10	3		4	8.88
Aug-05				10		14	18	4	4	8	6	5		6	7	18	9	19	9	11				9.31
Mean of 7 Daily Highs	41.00	38.86	34.57	41.14	42.57	47.57	36.29	33.14	38.86	31.57	30.29	21.71	24.57	32.57	36.71	43.86	37.57	61.14	61.43	53.86	50.00	41.43	35.71	39.40

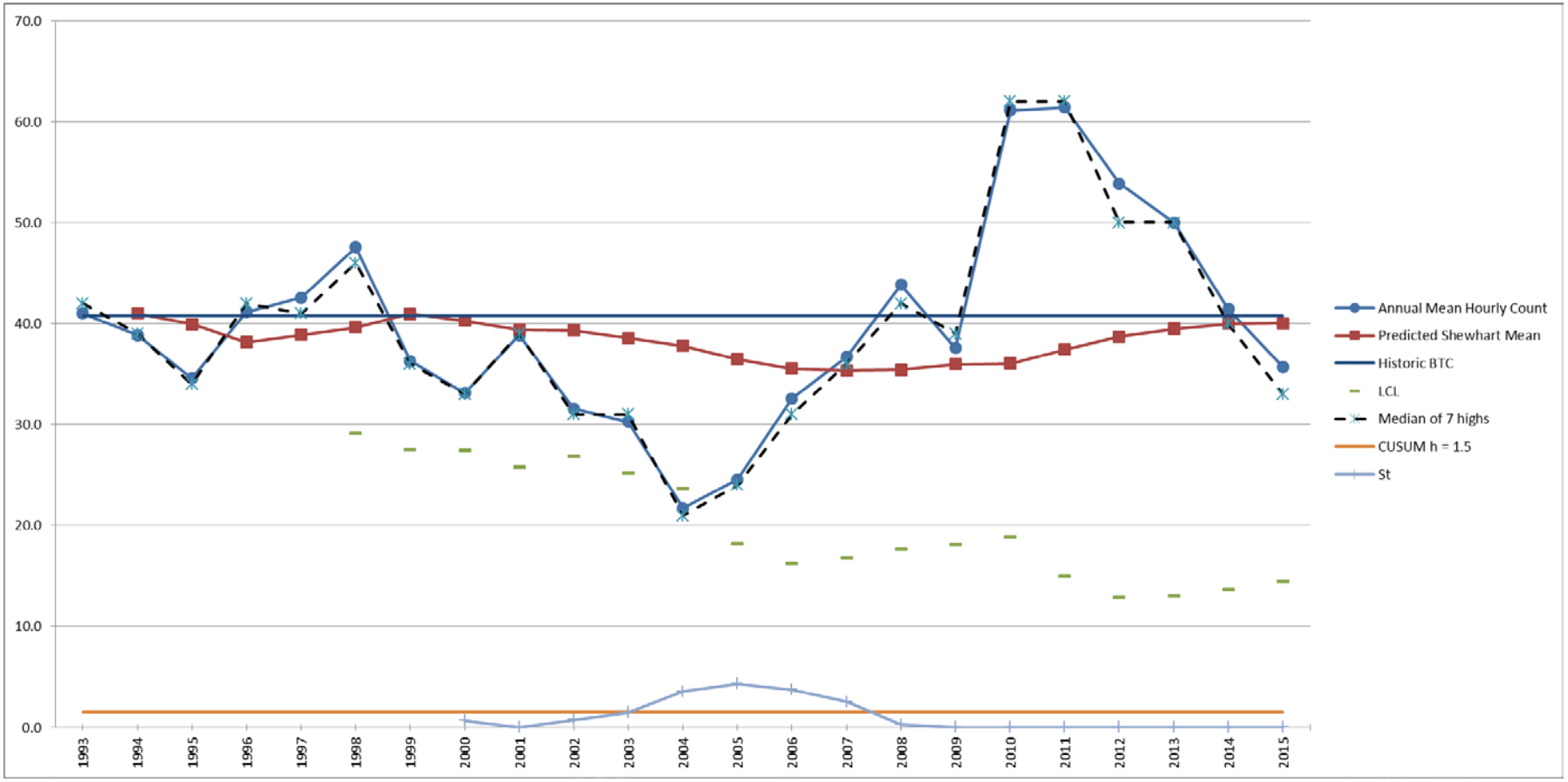

Figure 2. Historic index counts (annual mean of 7 highest systematic daily counts) of brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 1983–2015 (α = 0.01).

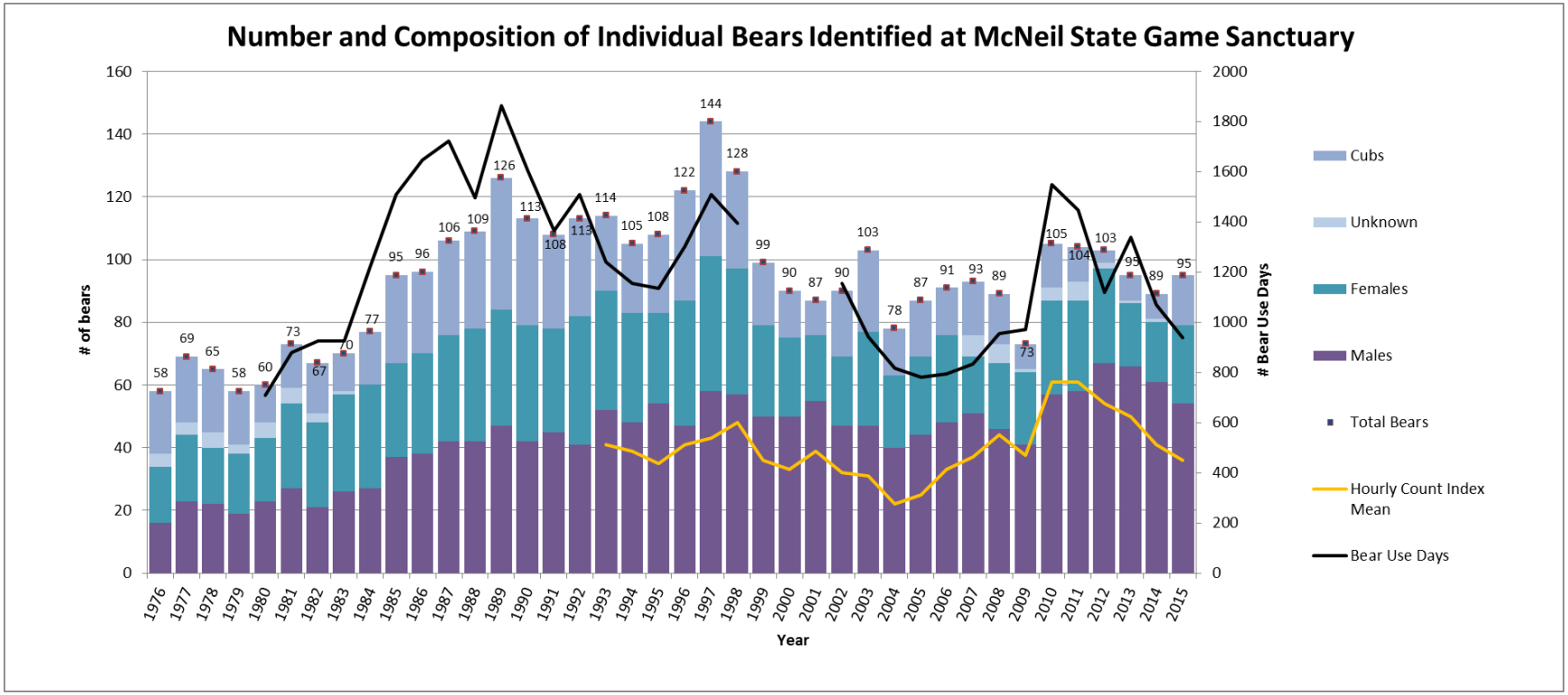

Figure 3. Annual brown bear numbers, bear use days, and index counts compared to bear composition, McNeil River State Game Sanctuary, Alaska, 1976–2015.

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. While males have typically outnumbered females at McNeil River, this difference has become more pronounced over the last 30 years. The percentage of male bears observed throughout the season has steadily increased while the number of females has slightly declined. Following a general increase in both sexes through the late 1990s, there was a general decrease in all bears after 2000. This decrease was more pronounced in the females. And in the years since 2005, while numbers of male bears have increased the overall numbers of females has remained fairly flat. This is due in part to an overall decline in maternal females which is offset by an increase in single adult females. There were 10 maternal females and 16 cubs observed within the viewing areas during 2015 (Fig. 3, Table 2), which is higher than the recent 5-year average. The historic sex and age composition of bears using the McNeil River-Mikfik Creek viewing areas during the viewing season are presented in Figure 3 and Table 2.

Bear Photo Identification Project

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 100–400 mm zoom lens. This photo identification project was initiated in 2007 and 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.

Other Areas

The department currently does not conduct bear surveys or monitoring in other areas of MRSGS and MRSGR. Some information is available through opportunistic surveys, fisheries escapement videos, and commercial guide reporting from the Mikfik Lake, Chenik Creek-Lagoon, Paint River, and the Kamishak River and Little Kamishak-Strike Creek areas. Mikfik Lake observations are detailed below under Other Wildlife-General Observations; and Paint River observations are noted in the Fisheries Enhancement-Paint River Fish Ladder section below.

KAMISHAK RIVER DRAINAGE

The lower stretches of the Kamishak River, Little Kamishak River, and Strike Creek are within MRSGS. 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 sport fishing guide services operate in the area from approximately early July to early October and brown bears are typically observed on a daily basis. Based on reporting by the 5 guide services operating in 2015, the average number of bears seen per day on the Kamishak River from 7 July through 1 October 2015 was 5.

Table 2. Composition of brown bears observed at McNeil River State Game Sanctuary, Alaska, 1976–2015.

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	2013	2014	2015
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	4	4	10
Single Adult Females	5	8	6	8	8	10	9	15	16	12	11	13	13	14	16	12	19	19	15	12	14	19	19	**14**	**14**	12	8	16	12	13	14	7	9	16	20	22	24	16	15	14
Single Adult Males	16	18	18	19	23	26	20	22	22	27	31	34	34	42	37	41	39	48	45	49	46	55	54	**48**	**48**	53	45	45	39	41	40	46	45	40	56	56	65	66	61	53
Adult Sex Unknown	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Adults	31	36	32	36	38	44	36	44	47	55	56	61	61	75	69	68	74	78	71	75	80	93	88	**73**	**69**	70	63	73	58	64	62	62	64	61	83	83	91	86	80	77
Sub-Adult Females	4	3	4	2	6	9	11	9	8	2	7	7	9	4	5	6	6	8	9	3	6	5	6	**4**	**4**	4	4	2	4	2	6	2	2	2	3	2	4	0	0	1
Sub-Adult Males	0	5	4	0	0	1	1	4	5	10	7	8	8	5	5	4	2	4	3	5	1	3	3	**2**	**2**	2	2	2	1	3	8	5	1	1	1	2	2	0	0	1
Sub-Adult Sex Unknown	3	4	5	3	4	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	0	0	0	0	0	0	7	6	1	4	6	2	1	1	0
Total Sub-Adults *(1)*	7	12	13	5	10	15	15	14	13	12	14	15	17	9	10	10	8	12	12	8	7	8	9	**6**	**6**	6	6	4	5	5	14	14	9	4	8	10	8	1	1	2
Total Adults & Sub-Adults *(2)*	38	48	45	41	48	59	51	58	60	67	70	76	78	84	79	78	82	90	83	83	87	101	97	**79**	**75**	76	69	77	63	69	76	76	73	65	91	93	99	87	81	79
Total Cubs	20	21	20	17	12	14	16	12	17	28	26	30	31	42	34	30	31	24	22	25	35	43	31	20	15	11	21	26	15	18	15	17	16	8	14	11	4	8	8	16
Total Bears	58	69	65	58	60	73	67	70	77	95	96	106	109	126	113	108	113	114	105	108	122	144	128	**99**	**90**	87	90	103	78	87	91	93	89	73	105	104	103	95	89	95

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

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

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

CHENIK CREEK

The department does not conduct bear surveys in the Chenik Creek area; however, one local Homer guide did view bears in the lower Chenik Creek-Chenik Lagoon area in 2015. He observed up to 17 individual bears during 6–19 July 2015 with the following composition (including cubs): 1 maternal female with 1 cub of the year, 1 maternal female with 2 yearlings, 1 subadult, 5 adult females, and 6 adult males.

OTHER WILDLIFE

General Observations

During the 2015 season, sanctuary staff recorded general wildlife observations, including birds, terrestrial mammals, and marine mammals opportunistically. Daily observations are summarized in the Appendix.

There were many bird sightings and identifications over the course of the 2015 season. Some were species that are regularly seen in MRSGS, including Wilson's snipe, golden-crowned sparrow, Savannah sparrow, fox sparrow, bank swallow, Wilson's warbler, American robin, hermit thrush, Swainson's thrush, tree swallow, common redpoll, glaucous-winged gull, mew gull, brant, green-winged teal, common raven, red-breasted merganser, greater yellowlegs, northern pintail, black-billed magpie, northern harrier, bald eagle, semipalmated plover, and Caspian tern. Less frequently seen birds were also observed, including black-legged kittiwakes; white-winged scoters; a northern shrike; a Bonaparte's gull; swans (most likely tundra or trumpeter swans, species identification unclear due to distance); belted kingfishers; double-crested cormorants; spotted sandpipers; western sandpipers; peregrine falcons; merlins; song sparrows; and 2 pine grosbeaks (1 male and 1 female). Willow ptarmigan were again observed on the McNeil River trail. Pigeon guillemots, gray-crowned rosy-finches, surf scoters, horned puffins, least sandpipers, and harlequin ducks were observed along the coast to McNeil Head.

Marine mammal sightings during the 2015 season included the usual Pacific harbor seals which 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. An unusual sighting was also made of a single Steller sea lion just outside the spit in McNeil Cove on 2 August.

As for terrestrial mammals, several gray wolves (*Canis lupus*) were observed during the summer season. Wolf tracks were often observed around the edge of the lagoon and along the Mikfik trail at the base of the east bluff. Also, several arctic ground squirrels (*Spermophilus parryii*) and red fox (*Vulpes vulpes*) were observed in and around camp.

In collaboration with the Threatened, Endangered, and Diversity Program of ADF&G-Division of Wildlife Conservation (DWC), MRSGS staff set up and monitored a Wildlife Acoustic, Songmeter Zero-crossing bat detector during the 2015 season. The detector records ultrasound frequencies to detect the presence of bats in the area. The detector was mounted on the southeast side of the cache facing the open area behind camp and was operational from 29 May through 27 June and 21 July through 28 August. It was inoperable 28 June through 20 July likely due to

dead batteries. There was no bat activity recorded from 29 May through 26 June. Bats were recorded 27 out of 34 nights between 21 July and 28 August. The density of bat passes during this time was low. The nightly average number of bat passes during this time was 2.41. The highest number of passes (range 6–10) occurred on 2, 4, 10, 20, and 25 August. Bats were most likely present after 26 June and before 22 July; but the recorder was not running during this time and the first bats of the season were likely missed.

As detailed below within the Mikfik Creek Video Research section, ADF&G-Commercial Fisheries (CF) staff recorded 1,953 hours 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 moose (*Alces alces*), eagles, beavers (*Castor canadensis*), red fox, river otters (*Lontra canadensis*), and various waterfowl. Brown bears transited the field of view of the camera in 95 instances, an average of just over 1 bear per day of video operation (n = 81 d). Nearly all sightings were of individual bears, but a few sightings were of females with 1, 2, or 3 cubs. Females with 2 and 3 cubs of the year were observed on multiple occasions.

HUNTING AND TRAPPING

MRSGS is closed to hunting and trapping by Alaska state statute (AS 16.20.162(b)), and MRSGR, while open to hunting and trapping of other species, has been closed to brown bear hunting by the Alaska Board of Game since July 1996. The approximately 388 mi^2 that comprise MRSGS and MRSGR are part of a much larger area of approximately 5,585 mi^2 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 state-owned lands by Alaska Board of Game action.

Reported harvest data from units within and surrounding the MRSGS-MRSGR complex for the period 2000–2014 are summarized in Table 3. Data for regulatory year (RY) 2015 (regulatory year begins 1 July and ends 30 June, e.g., RY15 = 1 July 2015–30 June 2016) are still being gathered.

Brown Bear

Brown bear hunting, as well as hunting and trapping for others species are open on lands within harvest units north and west of MRSGS and MRSGR. During alternating 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 4 and Table 3. The area represented includes 2,100 mi^2 currently open to hunting.

The long-term average harvest from areas surrounding MRSGS (outside the sanctuary and refuge) from RY80 through RY13 is 77.5 brown bears every 2 years (about 39 bears annually). Average 2-year harvest by decade was 62 in the 1980s, 77 in the 1990s, and 94 in the 2000s. For RY12–RY13, the most recent data available, the harvest in areas surrounding MRSGS and MRSGR was 73 bears.

Many brown bears have large home ranges, which include MRSGS, MRSGR, Katmai National Park, as well as other lands open to hunting north and west of the sanctuary and refuge. Data from early studies and staff observations show that some bears using MRSGS and MRSGR are subject to harvest outside the sanctuary and refuge. 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. And based on the available information, legal hunting of bears outside the sanctuary is not a significant factor affecting the regional bear population.

Other Species

As noted above, the MRSGR portion of the MRSGS-MRSGR 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 (*Ursus americanus*), caribou (*Rangifer tarandus*), moose, beaver, lynx (*Lynx canadensis*), marten (*Martes americana*), otter, wolf, wolverine (*Gulo gulo*), coyote (*Canis latrans*), red fox, mink (*Neovison vison*), weasel (*Mustela nivalis*), muskrat (*Ondatra zibethicus*), ground squirrel, and marmot (*Marmota broweri*). However, ADF&G only maintains harvest records on the first 9 of these.

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

Fisheries

MRSGS and MRSGR contain several rivers and streams that support both anadromous and resident fish populations. The Kamishak River drainages support all 5 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*), Dolly Varden trout, and Rainbow trout (*O. mykiss*). 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, 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 sport fishing and commercial fishing effort and harvests within the lower Kamishak district.

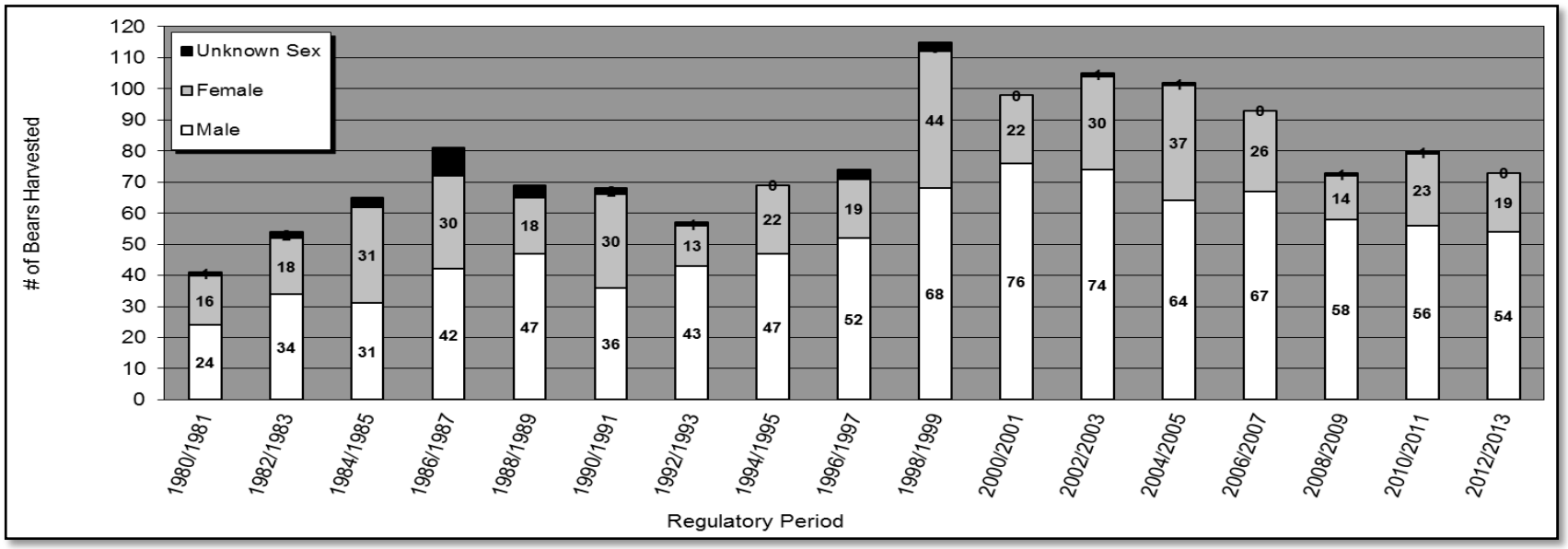

Figure 4. Brown bear harvest from areas surrounding the McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska, 1980–2013 (harvest from Game Management Units/Uniform Coding Units: 9A/201, 301, 401, 501; 9B/301; and 9C/101, 201,301, 601, 702, and 703). Two consecutive regulatory years are lumped (regulatory year begins 1 July and ends 30 June, e.g., regulatory year 1980 = 1 July 1980–30 June 1981). This graph does not include harvest data for regulatory years 2014 and 2015 as the data are still being compiled.

Table 3. Reported harvests of selected big game and furbearer species within and around McNeil River State Game Sanctuary and McNeil River State Game Refuge, 2000–2014.

Regulatory Year	Brown Bear		Black Bear		Caribou		Moose		Beaver		Lynx		Marten		Otter		Wolf		Wolverine	
	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**	MRSGS/R*	Adjacent Areas**
2000	6	98	0	0	0	114	0	16	0	12	0	1	0	0	0	0	**0**	**3**	**0**	**1**
2001			0	3	0	97	1	19	0	0	0	0	0	0	0	0	**0**	**1**	**0**	**2**
2002	6	105	0	1	0	39	3	18	0	0	0	0	0	1	0	0	**0**	**1**	**0**	**4**
2003			0	7	0	53	1	14	0	9	0	3	0	6	0	10	**0**	**10**	**0**	**20**
2004	3	102	0	1	0	33	2	15	0	0	0	0	0	0	0	2	**0**	**1**	**0**	**2**
2005			0	6	0	51	2	17	0	1	0	1	0	0	0	0	**0**	**8**	**0**	**0**
2006	4	93	0	2	0	25	0	10	0	0	0	4	0	2	0	1	**0**	**2**	**0**	**7**
2007			0	2	0	0	2	16	0	0	0	1	0	1	0	3	**0**	**3**	**0**	**4**
2008	4	73	0	1	0	5	0	18	0	4	0	3	0	0	0	0	**0**	**4**	**0**	**2**
2009			0	1	0	6	1	11	0	2	0	13	0	1	0	1	**1**	**2**	**0**	**1**
2010	5	75	0	1	0	0	0	6	0	13	0	27	0	0	0	8	0	2	0	2
2011			0	0	0	1	0	11	0	5	0	38	0	0	0	0	0	4	0	1
2012	7	66	0	0	0	0	1	10	0	0	0	33	0	0	0	0	0	5	0	5
2013			0	3	0	1	0	8	0	2	0	4	0	0	0	0	0	3	0	0
2014	3	90	0	0	0	1	1	13	0	3	0	1	0	0	0	2	0	0	0	1
2015			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** 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 largely from reporting areas outside of the McNeil River SGS/SGR complex. Some data may be from within McNeil River SGS & SGR where these reporting areas overlap the McNeil River SGS/SGR complex boundary. McNeil River SGS is closed to hunting & trapping and McNeil River SGR is closed to the hunting of brown bear.**

COMMERCIAL FISHERIES

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 2015, generally favorable stream conditions allowed for 7 effective aerial surveys. There was no commercial fishing effort targeting the Mikfik return and the McNeil River subdistrict was closed for the duration of the chum salmon run. Consequently, the entire Mikfik sockeye and McNeil chum salmon runs entered their respective freshwater drainages this season.

McNeil River Drainage

The 2015 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 20,494 fish (Table 4, Fig. 5). Chum salmon were consistently seen in significant numbers above the falls during aerial observations from 15 June through 10 July, with lower numbers observed through the last survey on 6 August. A peak daily aerial estimate of 2,383 chum salmon upstream of McNeil River falls occurred on 2 July. By comparison chum returns to some other Kamishak Bay district systems in 2015 were modest, resulting in low fishing effort and a districtwide commercial harvest of fewer than 650 chums, the second lowest total since 2007. The 2015 run timing of McNeil River chum salmon was earlier than previous years.

For McNeil River to realize its full productive capacity, favorable spawning habitats upstream of McNeil River falls need to be consistently seeded by spawners. Approximately 10 km of quality spawning habitat exists upstream of McNeil River falls, compared to less than 1 km below McNeil River falls. At least 3 factors interact to determine how many chum salmon ascend McNeil River falls: 1) the density of fish below McNeil River falls, 2) river discharge, and 3) the number of bears at McNeil River 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 2-year radiotelemetry project to estimate freshwater stream-life, document spawning distribution and estimate predation by bears (Peirce et al. 2011; Peirce et al. 2013). 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 River falls was much higher than the stream life for fish spawning below McNeil River falls.
- Ninety percent of the tagged fish above McNeil River falls lived long enough to spawn, whereas 47% of the tagged fish below McNeil River 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 River falls.

Using this information, ADF&G-CF staff conducted an in-depth retrospective analysis of historical chum salmon escapements above and below McNeil River falls (Otis and Szarzi 2007) as part of the escapement goal review for the 2007 Lower Cook Inlet 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 River falls, which in turn, should provide higher and more consistent streamwide production. The department has also installed a water level monitoring device immediately upstream of McNeil River 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 River 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 lower Cook Inlet. 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 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 20,494 chum salmon for McNeil River in 2015.

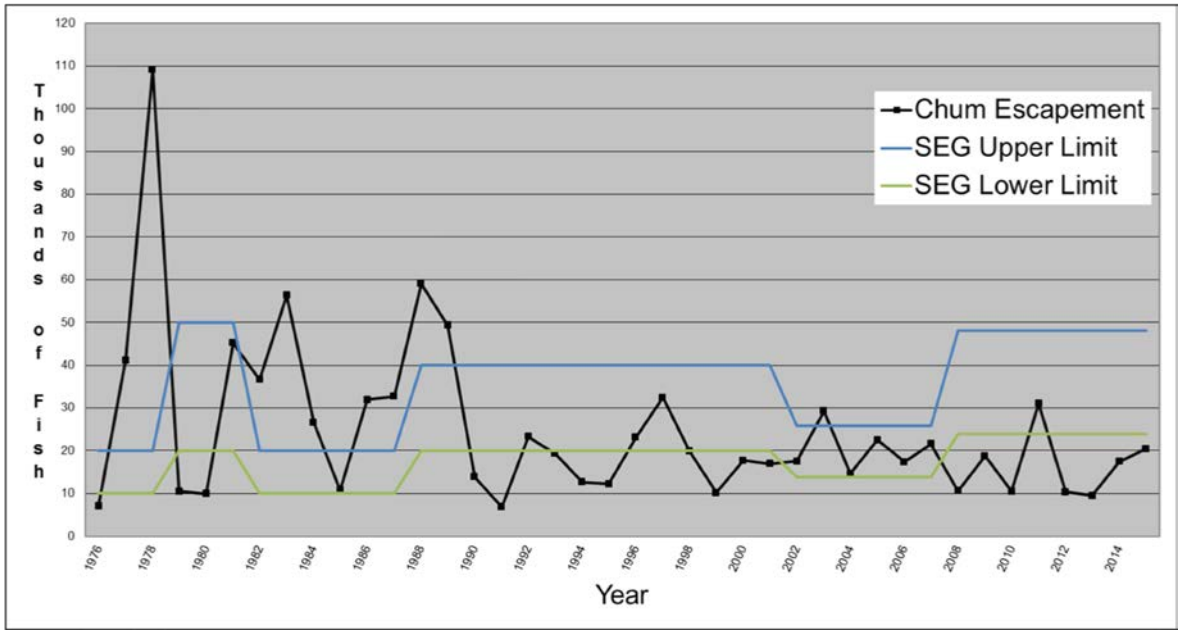

Figure 5. McNeil River chum salmon escapement 1976–2015, McNeil River State Game Sanctuary, Alaska.

Table 4. Aerial escapement estimates of salmon in the Mikfik Lake and McNeil River drainages, McNeil River State Game Sanctuary, Alaska, 2015.

Survey date (mm/dd/yy)	Mikfik sockeyes (daily)[a]	McNeil chums (daily)[a]
6/15/15	3,590	860
6/22/15	1,330	1,802
7/2/15	1,520	6,390
7/10/15	420	5,010
7/24/15	861	1,933
7/30/15	no survey	10,580
8/6/15	200	2,788
9/2/15	202	no survey
Escapement index	3,502[b]	20,494[c]

[a] All individual daily estimates are from individual aerial surveys and are considered to be conservative.
[b] The escapement index for Mikfik sockeyes is the accumulative count from the remote video system at Mikfik Lake; data in the table above reflect aerial survey counts from McNeil-Mikfik Lagoon and Mikfik Creek, not Mikfik Lake.
[c] The escapement index for McNeil chums was derived by dividing the area under the escapement curve by a 13.8-day stream life factor and then applying a run-timing expansion factor to account for fish entering the system after aerial surveys were terminated.

Mikfik Creek-Lake System

The 2015 Mikfik Creek-Lake estimated escapement as determined through aerial surveys was 3,590 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 3,502 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. The video estimate of 3,502 fish was used as the final escapement estimate. This value is within the sustainable escapement goal (SEG) range of 3,400–13,000 (Table 4). Postseason evaluation indicated that run timing of sockeye salmon into Mikfik Lake was early, with 85% of the escapement reaching the lake by 13 June.

The McNeil River subdistrict was open to commercial fishing for Mikfik Creek sockeye salmon from 25 May to 21 June. However, no fishing effort occurred in the McNeil River subdistrict in 2015.

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 1981–1982 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, 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 2015, with resulting annual commercial harvests ranging from no harvest (2015) to over 171,000 fish (2008). Additionally, the established sockeye salmon SEG for Chenik Lake of 3,500–14,000 sockeye salmon has been met or exceeded each year beginning in 2003, with the 2015 escapement cumulatively estimated by remote video as 19,073 sockeye salmon. Despite the Chenik subdistrict being open and a surplus of fish being available, no commercial fishing effort targeted Chenik Lake sockeye in 2015.

SPORT FISHING

A limited amount of sport fishing occurs within MRSGS and MRSGR. 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 (from the end of the spit) associated with staff and visitors in camp for recreational activities. Fishing effort was low in 2015. No fish were harvested by visitors or ADF&G staff during the 2015 summer season.

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 2015 season, 5 lodges and transporters reported a total of 575 angler use days during 147 days within the sanctuary for sport fishing (Table 5). Wildlife viewing, primarily brown bears, was also a significant part of their activities. These anglers reported catching 6,875 fish, of which 46% were Dolly Varden, 44% were coho salmon and 8% were chum salmon. Nearly all Dolly Varden were released as were all pink and most chum salmon. Eighty-three percent of all fish caught were released.

Table 5. Visitor use and sport fish harvest reported from Kamishak River drainages, McNeil River State Game Sanctuary, Alaska, 2015.

# of Days in sanctuary	# of Guide use days	# of Angler use days	# of Non-angler days	COHO SALMON		CHUM SALMON		PINK SALMON		DOLLY VARDEN		Avg bears/ day
				Kept	Released	Kept	Released	Kept	Released	Kept	Released	
147	256	575	0	1,128	1,883	8	559	0	150	24	3,123	5

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 2 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, CIAA, responsible for building and operating the Paint River fish ladder, informed ADF&G-DWC 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 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 Cook Inlet Regional Planning Team voted to accept the document as an appropriate planning document for the time being.

CIAA obtained approximately 1.2 million pink salmon eggs from brood stock in the Bruin Bay fishery during 2014. After being reared and hatched over winter at Tutka Bay Lagoon Hatchery, CIAA released 1.02 million unfed pink salmon fry into ice free leads of Paint Lake on 4–5 April 2015.

CIAA opened the Paint River fish ladder to water flow between 4 June and 13 September for potential salmon colonization. During their 3 visits on 4 June, 17 July, and 13 September they also assessed water levels, conducted minor maintenance, and conducted stop log adjustments. During the 13 September visit 10 salmon carcasses and 2 rainbow trout were observed inside the ladder. At the time water levels within the ladder were too low to easily pass fish. However, aerial surveys by both CIAA and ADF&G did identify small numbers of fish upstream of the fish ladder July through September; so some fish are naturally passing through the ladder. ADF&G aerial surveys identified up to 39 chum salmon in the lower portions of Paint River and Dunuletak Creek during the peak of the July chum run. And a CIAA aerial survey identified 2 small groups of fish, possibly coho salmon, in the lower portions of Paint River around Dunuletak Creek on 13 September. No bears were observed in the area of the fish ladder during the visits. Observations of fish in the Paint River are summarized in Table 6.

Table 6. Paint River fish surveys, Alaska.

Survey date (mm/dd/yy)	Paint River fish count	Observer/Comments
4/4–5/15	1,025,255	CIAA[a]. Pink fry released in Paint Lake.
7/10/15	6	ADF&G[b]. Chum in lower Paint River. Also 341 chum in Akjemguiga Cove.
7/24/15	38	ADF&G. Chum in lower Paint River. Also 900 chum in Akjemguiga Cove.
7/30/15	39	ADF&G. Chum in lower Paint River and Dunuletak Creek. Also 3,001 chum in Akjemguiga Cove.
8/6/15	4	ADF&G. Chum in lower Paint River. Zero chum in Akjemguiga Cove.
8/14/15	1	ADF&G. Chum in lower Paint River.
9/2/15	0	ADF&G. Chum in lower Paint River.
9/13/15	22	CIAA. Lower Paint River near Dunuletak Creek.

[a] CIAA = Cook Inlet Aquaculture Association.
[b] ADF&G = Alaska Department of Fish and Game.

Public Use and Land Management

To protect the bears, their habitat and the unique visitor experience, access to MRSGS is restricted requiring an access permit issued by ADF&G for entry into the sanctuary. Under regulations developed by ADF&G (5AAC 93.030) and those adopted by the Alaska Board of Game (5AAC 92.065), ADF&G-DWC uses the following types of permits to manage visitation to the sanctuary: viewing, special access, nonviewing, transporter, and commercial guide.

MRSGR 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, snowmachining, and camping; except that MRSGR is closed brown bear hunting. Other activities and land uses are managed through ADF&G special area permits issued by the Division of Habitat. Land use permits are also issued by the Alaska Department of Natural Resources.

McNeil River Falls-Mikfik Creek

Public use and access to the sanctuary, with the exception of the McNeil Cove spit and beach, requires an access permit from the department (5 AAC 92.065). Since 1973, bear viewing at established sites on McNeil River and nearby Mikfik Creek has been limited to 10 people daily between 7 June and 25 August, and viewing access permits for this period are issued by lottery. Ten regular and 3 standby permits are issued for each of the established 4-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 who 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, filmmakers, 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 MRSGS 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 Alaska residents and $350 for non-Alaska residents. Camp-standby viewing permit holders are assessed a permit fee of $75 for each Alaska resident and $175 for each non-Alaska resident. The special access permit application fee is $50.00 per person. If selected by the commissioner of ADF&G to receive a special access permit, there is a use fee of $150.00 for each Alaska resident and $350.00 for each non-Alaska resident.

In 2015, ADF&G received 983 applications for McNeil River guided and standby bear-viewing permits. Applications were received from 16 different countries and 56% of applicants were Alaska residents. Payments were received for 167 guided viewing access permits, 28 standby viewing access permits, and 7 special access viewing permits. There were 15 special access (science-education/commissioner) permits granted by the commissioner. Overall, 210 permits were issued and 178 permit holders (guided viewing, camp standby, and special access) visited the sanctuary (Table 7) in 2015. The 5-year annual visitation average (2011–2015) is 176. The average number of permits used each day (permittees that bear viewed) at the sanctuary in 2015 was 8.5 (out of a maximum of 10.0). There were 21 guided permit holder no shows, 6 standby permit holder no shows, and 5 special access permit holder no shows. The 178 participants in bear viewing during the 2015 season came from 6 countries, including Canada, France, Great Britain, Japan, Switzerland, and the United States. Of the 178 bear viewing visitors to McNeil River in 2015, 58% were Alaska residents and 42% were nonresidents. Of the 202 people who purchased permits, the ratio was 62% resident to 38% nonresident.

Table 7. Visitor use at McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska, 1984–2015.

Year	# of Applicants	# of Bear Viewing Visitors 6/7-8/25*	Bear Viewing Use Days 6/7-8/25**	Total Bear Viewing Visitor Use 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	992	159			574	377	6/5 - 8/27
1985	832	216			816	449	6/10 - 8/25
1986	806	255			967	430	6/9 -8/25
1987	1,757	252			1,054	473	6/9 - 8/23
1988	1,094	304			1,328	498	6/1 - 8/29
1989	1,306	264			1,183	488	5/22 - 8/26
1990	1,481	299			1,435	524	6/8 - 8/25
1991	1,818	249			1,415	526	6/1 - 8/27
1992	1,672	245			1,210	478	6/1 - 8/25
1993	2,150	225			1,128	516	6/7 - 8/25
1994	1,766	228			1,086	484	6/7 - 8/25
1995	1,486	212			1,074	475	6/7 - 8/25
1996	1,502	219			1,158	494	6/7 - 8/25
1997	1,474	228			1,197	489	6/7 - 8/25
1998	1,159	219			1,096	504	6/7 - 8/25
1999	1,223	208			1,122	398	6/7 - 8/25
2000	1,322	198			1,051	424	6/7 - 8/25
2001	1,329	186			1,012	437	6/7 - 8/25
2002	1,434	175			930	351	6/7 - 8/25
2003	1,314	188			995	451	6/7 - 8/25
2004	860	201			1,034	462	6/7 - 8/25
2005	960	195			983	431	6/7 - 8/25
2006	783	183			970	420	6/7 - 8/25
2007	1156	157	540	781	832	356	6/7 - 8/26
2008	932	167	617	863	913	413	6/7 - 8/26
2009	725	181	639	948	1266	452	6/7 - 8/25
2010	714	176	593	932	1100	433	6/7 - 8/25
2011	751	195	674	1017	1089	447	6/7 - 8/25
2012	719	180	641	969	1041	458	6/7 - 8/25
2013	934	156	574	842	890	388	6/7 - 8/25
2014	1075	171	603	882	923	424	6/7 - 8/25
2015	983	178	678	916	946	471	6/7 - 8/25

*=	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. (only those that viewed bears
***=	Sum of all Guided, Standby, & Special Access Permittees in Santuary each day of season. (includes all permittees in sanctua
****=	Sum of all Guided, Standby, & Special Access Permittees & Non-Viewing permittees (staff subs not included) each day of view
*****=	Sum of all Guided, Standby, & Special Access Permittees each day during approximate McNeil Falls season.

There were a total of 946 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 916 days within the sanctuary, logging 678 actual bear-viewing days. On average there were 11.5 visitors at McNeil River camp on any day, slightly lower than the 5-year averages of 11.6 and higher than the 10-year average of 11.4. There was an average of 8.5 bear viewers per day, higher than the 5- and 10-year average of 7.9 and 7.8, respectively. Permitted visitors spent an average of 5.1 days each in the sanctuary and participated in the bear-viewing group an average of 3.8 days each.

The 15 special access permits issued in 2015 included the following recipients: ADF&G Hunter Education, Wildlife Education and Special Areas volunteers, U.S. Forest Service (Chugach National Forest staff), National Park Service (Yellowstone National Park staff), West Yellowstone Grizzly Wolf Center staff, ADF&G Commissioner, Alaska Zoo education staff, and a National Park Service staff member (Alaska).

During 2015, 10 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 $68,875.00 was generated from the 2015 McNeil River sanctuary permit program and deposited in the state's Fish and Game Fund.

KAMISHAK RIVER

Lodges and air charter services conduct sport fishing and wildlife viewing trips within the Kamishak River drainages within MRSGS and adjacent Katmai National Park. This area is also part of the Kamishak Special Use Area, which is managed by the Alaska 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."

Five commercial sport fishing guide services operated in the Kamishak River area of MRSGS in 2015 and spent 831 visitor use days in the sanctuary, which included 575 angler use days and 256 guide use days. These operators also held special area permits for the storage of boats and operations in the Kamishak River area. Their primary activity is sport fishing; however, they also engage in wildlife viewing activities, primarily viewing of brown bears.

CHENIK AREA

One commercial bear-viewing guide service from Homer brought clients to the Chenik area in 2015. This service obtained a special area permit for a temporary tent camp at Chenik Lake in 2015 and reported a total of 31 visitor use days, including 12 guide use days and 19 bear viewing (non-angler) use days. Private groups were also known to have visited the Chenik area in 2015.

BEAR-HUMAN CONFLICTS

As detailed above there were 946 user days associated with ADF&G's bear-viewing program at the McNeil River camp. An additional 862 user days were reported by area guides utilizing the Kamishak River and Chenik Creek areas of MRSGS-MRSGR. All 1,808 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 sport fishing and bear viewing entities perform self-reporting to ADF&G on any adverse interactions. During the 2015 season, there were no reported adverse interactions between bears and people in MRSGS or MRSGR.

LAND USE PERMITTING

ADF&G-DWC has a special area permit and an Alaska Department of Natural Resources Interagency Land Management Assignment for operation and maintenance of the McNeil River camp, trails, and bear-viewing operation. ADF&G-CF holds a special area permit 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 3 special area permits and 12 commercial access permits were issued during 2015. These included the special area and commercial access permits issued to the commercial operators in the McNeil River, Kamishak River, and Chenik Creek areas. In addition, ADF&G is currently reviewing ADF&G and Alaska Department of Natural Resources permits for maintenance of a seismic monitoring station on a mountain north of the Paint River within MRSGR.

The U.S. Department of Agriculture-Natural Resources Conservation Service (NRCS) continues to operate a snowpack telemetry (SNOTEL) site at Mikfik Lake. The site is part of the NRCS Snow Survey and Water Supply Forecasting program that collects snowpack and related climatic data throughout the United States. SNOTEL site 1191 was established 26 June 2012 at Mikfik Lake (latitude 59.0835, longitude 154.2777) within 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 MRSGS or MRSGR during 2015.

Fish and Wildlife Research

This section summarizes new or ongoing fish and wildlife research projects within MRSGS-MRSGR.

MIKFIK CREEK VIDEO RESEARCH

A remote video escapement recorder was installed at the outlet of Mikfik Lake for the 18th consecutive season. This project has already proven invaluable to both inseason and postseason 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 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 5 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 2015, the video system at Mikfik Creek-Lake was installed on 22 May and shut down on 11 August. The system operated continuously (~24 hr/d) and successfully recorded images approximately 100% of the time that it was programmed to operate between 22 May and 11 August (1,953 hr). The peak of the run into Mikfik Lake was slightly earlier than past years (early to mid-June). Fifty percent of the run was in Mikfik Lake by 11 June and 85% by 13 June. Low water, bear predation, and a beaver dam located 1 km downstream of Mikfik Lake

contributed to poor late-season escapement. Only 539 of the 3,590 sockeye observed in the lagoon-lower river on a 15 June aerial survey made it past the video camera into Mikfik Lake by 11 August.

A single camera mounted on the original (west bank) light pole was used to collect all video images of fish passage in 2015. Recordings were made using a compression rate of 5 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, 3,502 sockeye salmon were counted into the lake, very similar to the 3,590 fish that were estimated by the peak aerial survey of Mikfik Creek and McNeil Lagoon on 15 June. However, as noted above, 85% of the escapement into Mikfik Lake occurred prior to 15 June and most of the fish observed in lagoon on or after that date never made it up to the lake. In the past, to remain consistent with the historical Mikfik Creek database and with the methods used to derive the Mikfik sockeye salmon SEG, aerial survey data were normally used to generate the spawning escapement index. However, at the 2013 Lower Cook Inlet Board of Fisheries meeting, lower Cook Inlet staff recommended revising the Mikfik Lake sockeye salmon SEG so it's based on remote video, the method currently used to monitor escapement (Otis et al. 2013). As a result, the remote video based estimate of 3,502 fish was used as the final escapement index in 2015. The new video-based escapement goal for Mikfik Creek sockeye salmon is 3,400–13,000 fish and it went into effect in 2014.

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 1,953 hours of recorded video between 22 May and 11 August, reviewers documented 95 instances where brown bears transited the field of view of the camera, an average of 1.2 bears per day of video operation (n = 81 d). Nearly all sightings were of individual bears, but several sightings were of females with 1–3 cubs. Other wildlife species observed included moose, eagle, beaver, red fox, various waterfowl, and river otter.

McNeil River Brown Bear and Chum Salmon Research

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

ADF&G-CF Research Biologist Ted Otis, worked with graduate student Ian Gill to use the methodology and data in developing a model to estimate bear-salmon predation on prespawning chum salmon in McNeil River. In 2015 ADF&G-CF continued the project 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.

Sanctuary Administration and Management

STAFFING

Sanctuary Manager Tom Griffin completed his 16th season at McNeil River, his 6th as manager. Drew Hamilton completed his 4th season as Assistant Manager and his 6th season at McNeil River. Ray Pohl (Wildlife Technician III) joined the sanctuary staff mid-season on 8 July 2015. Tony Carnahan (previous McNeil River Sanctuary Assistant Manager) worked the month of August 2015 to fill in as a staff member. Staff arrived at the McNeil River camp on 31 May 2015 and pulled camp on 28 August 2015. We were very fortunate to have Polly Hessing (retired ADF&G biologist) and Samantha McNearney (previous MRSGS staff) fill-in this year as group leaders when regular staff were on leave. In addition to their normal duties at the sanctuary, the McNeil staff completed the annual ADF&G firearms safety training in spring 2015.

Volunteers

Volunteers John Tuckey and Pete Robinson completed several carpentry upgrades to camp structures, such as repairing the floor in the cook cabin, replacing the deck and the entire fascia on the sauna, and repairing the staff outhouse. John and Pete also assisted with a number of tasks around camp including installation of wood stoves, painting, basic carpentry, stacking firewood, picking up marine debris and trash, preparing the buildings and cleaning.

FACILITIES

As noted above, upgrades to camp structures included repairing the floor in the cook cabin, replacing the deck and the fascia on the sauna, repairing the staff outhouse, as well as, new holes were dug for the 2 public outhouses in 2015.

Acknowledgments

Thanks to retired Wildlife Biologist Polly Hessing and Samantha McNearney who filled in during staff breaks. 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. Lisa Ka'aihue (CIAA), Glenn Hollowell, and Ted Otis (ADF&G-CF) provided information on activities at the Paint River fish ladder. Mike Bouwkamp (ADF&G-DWC) provided bear-viewing applicant information. Megan Marie (ADF&G-Division of Habitat) provided special area permit information. Earl Becker (ADF&G-DWC) provided the provided the revised bear index methodology. Laura McCarthy (ADF&G-DWC) provided formatting and editing changes and processed this document for publishing.

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Appendix. Daily wildlife observations in 2015, McNeil River State Game Sanctuary, Alaska.

Date	Comments
5/31/2015	Observed American robin (*Turdus migratorius*) at camp.
5/31/2015	Observed many bald eagle (*Haliaeetus leucocephalus*) at multiple locations.
5/31/2015	Observed 1 black-billed magpie (*Pica hudsonia*) at beach.
5/31/2015	Observed many brant (*Branta bernicula*) at lagoon.
5/31/2015	Observed 3 common ravens (*Corvus corax*) at Mikfik Creek Lower Falls.
5/31/2015	Observed common redpoll (*Acanthis flammea*) at camp.
5/31/2015	Observed fox sparrow (*Passerella iliaca*) at camp.
5/31/2015	Observed glaucous-winged gull (*Larus glaucescens*) at camp.
5/31/2015	Observed golden-crowned sparrow (*Zonotrichia atricapilla*) at camp.
5/31/2015	Observed 1 Nagoonberry (*Rubus arcticus*) at camp. First observation of blooming upon arrival.
5/31/2015	Observed 1 nootka lupine (*Lupinus nootkatensis*) at camp. First observation of blooming lupine upon arrival.
5/31/2015	Observed 2 red fox (*Vulpes vulpes*) at camp. One has no tail.
5/31/2015	Observed savannah sparrow (*Passerculus sandwichensis*) at camp.
5/31/2015	Observed 1 star flower (*Trientalis europea*, ssp arctica) at camp. First observation of blooming upon arrival
5/31/2015	Observed tree swallow (*Tachycineta bicolor*) at camp.
5/31/2015	Observed dandelion (*Taraxacum officinale*).
6/1/2015	Observed 5 semipalmated plover (*Charadrius semipalmatus*) at spit.
6/2/2015	Observed 50 brant (*Branta bernicula*) at lagoon.
6/2/2015	Observed 2 yellow warblers (*Dendroica petechia*) at camp.
6/3/2015	Observed 2 mew gulls (*Larus canus*) at Mikfik Creek Lower Falls.
6/3/2015	Observed 1 northern harrier (*Circus cyaneus*) at camp.
6/4/2015	Observed 1 arctic ground squirrel (*Spermophilus parryii*) at camp.
6/6/2015	Observed large-leaf Avens (*Geum macropyllum*, ssp macropyllum).
6/6/2015	Observed yellow marsh marigold (*Caltha palustris* L.).
6/6/2015	Observed Alaska violet (*Viola langsdorfii*).
6/6/2015	Observed chocolate lily (*Fritillaria camschatcensis*).
6/6/2015	Observed tall Jacob's ladder (*Polemonium acutiflorum*).
6/7/2015	Observed 1 arctic ground squirrel (*Spermophilus parryii*) at camp.
6/7/2015	Observed 1 black-billed magpie (*Pica hudsonia*) at Mikfik Sedge Flat - East Side.
6/7/2015	Observed 2 golden-crowned sparrow (*Zonotrichia atricapilla*).
6/7/2015	Observed 1 gray wolf (*Canis lupus*) at Mikfik Creek Riffles. Fishing behind 4 bears.
6/7/2015	Observed 2 green-winged teal (*Anas crecca*) at Mikfik Sedge Flat - East Side.
6/7/2015	Observed 3 savannah sparrow (*Passerculus sandwichensis*).

Date	Comments
6/8/2015	Observed 3 Bonaparte's gull (*Chroicocephalus philadelphia*) at Mikfik Creek Riffles.
6/8/2015	Observed 1 belted kingfisher (*Megaceryle alcyon*) at Mikfik Creek Riffles.
6/8/2015	Observed 3 Wilson's warbler (*Wilsonia pusilla*) at Mikfik Creek Riffles.
6/8/2015	Observed 225 brant (*Branta bernicle*) at lagoon.
6/9/2015	Observed 50 brant (*Branta bernicula*) at lagoon. Feeding on the mud flats in the lagoon.
6/10/2015	Observed 1 arctic ground squirrel (*Spermophilus parryii*) at camp. Very gray and white in color, in camp.
6/10/2015	Observed 4 bank swallow (*Riparia riparia*) at lagoon.
6/10/2015	Observed 50 brant (*Branta bernicula*) at lagoon.
6/11/2015	Observed 50 brant (*Branta bernicula*) at lagoon. Feeding on the mud flats in the lagoon
6/11/2015	Observed 12 coastal paintbrush (*Castilleja unalaschensis*) at camp. First bloom, along the water trail
6/12/2015	Observed 1 wood frog (*Rana sylvatica*) at Mikfik Sedge Flat - East Side.
6/13/2015	Observed 6 bald eagles (*Haliaeetus leucocephalus*) at Mikfik Creek Riffles.
6/13/2015	Observed 50 brant (*Branta bernicula*) at lagoon.
6/13/2015	Observed 3 Caspian tern (*Sterna caspia*) at lagoon.
6/14/2015	Observed 2 Caspian tern (*Sterna caspia*) at Tidal Flats. Flying over the Tidal Flats.
6/14/2015	Observed 4 yellow pondlily (*Nuphar polysepalum*) at camp. First bloom, in the sauna pond.
6/15/2015	Observed many Alaska cotton (*Erioporum scheuchzeri*) at Mikfik Sedge Flat - East Side.
6/15/2015	Observed many Alaska spirea (*Spirea beauverdiana*) at Upper Mikfik Creek.
6/15/2015	Observed many alpine heuchera (*Heuchera glabra*) at Mikfik Sedge Flat - East Side.
6/15/2015	Observed many arctic daisies (*Chrysanthemum arcticum*, ssp arcticum) at Mikfik Sedge Flat - East Side. First bloom.
6/15/2015	Observed many beach cinquefoils (*Potentilla egedii*, ssp grandis) at lagoon. Many blooming.
6/15/2015	Observed 1 black-billed magpie (*Pica hudsonia*) at West Bluff.
6/15/2015	Observed many chocolate lilies (*Fritillaria camschatcensis*) at Mikfik Creek Riffles. Many blooming.
6/15/2015	Observed many large leaf Avens (*Geum macropyllum*, ssp macropyllum) at Mikfik Creek Riffles. Many blooming.
6/15/2015	Observed many marsh five-fingers (*Potentilla palustris*) at Mikfik Sedge Flat - East Side.
6/15/2015	Observed many Nagoonberry (*Rubus arcticus*) at Mikfik Creek Riffles. Many blooming.
6/15/2015	Observed many star flowers (*Trientalis europea*, ssp arctica) at Upper Mikfik Creek. Many blooming.

Date	Comments
6/15/2015	Observed many tall Jacob's ladder (*Polemonium acutiflorum*) at Mikfik Sedge Flat - East Side. Many blooming.
6/15/2015	Observed 6 wild iris (*Iris setosa*) at Mikfik Creek Riffles. First bloom.
6/16/2015	Observed 3 Caspian tern (*Sterna caspia*) flying over the Tidal Flats and the Lagoon.
6/16/2015	Observed 1 northern harrier (*Circus cyaneus*) at Mikfik Sedge Flat - West Side. Female.
6/17/2015	Observed 5 Caspian tern (*Sterna caspia*) flying over the Tidal Flats and the Lagoon.
6/19/2015	Observed 1 Greater Yellowlegs (*Tringa melanoleuca*) at Mikfik Sedge Flat - East Side. Alarming in flight.
6/20/2015	Observed 2 swans at Mikfik Creek Tidal Area. Unidentified swan, possibly trumpeters.
6/21/2015	Observed lots alpine heuchera (*Heuchera glabra*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots arctic daisy (*Chrysanthemum arcticum*, ssp arcticum) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots beach cinquefoil (*Potentilla egedii*, ssp grandis) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots beach pea (*Lathyrus maritimus*, ssp maritimus) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots chocolate lily (*Fritillaria camschatcensis*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots cow parsnip (*Heracleum lanatum*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots Nagoonberry (*Rubus arcticus*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots nootka lupine (*Lupinus nootkatensis*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots star flower (*Trientalis europea*, ssp arctica) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots tall Jacob's ladder (*Polemonium acutiflorum*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots wild geranium (*Geranium erianthum*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots wild iris (*Iris setosa*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed lots marsh cinquefoil (*Potentilla palustris*) at Mikfik Sedge Flat - East Side.
6/21/2015	Observed many arctic daisies (*Chrysanthemum arcticum*, ssp arcticum) at Mikfik Sedge Flat - East Side.
6/22/2015	Observed 2 bank swallow (*Riperia riperia*) at lagoon.
6/22/2015	Observed 40 brant (*Branta bernicula*) at lagoon.
6/22/2015	Observed Caspian tern (*Sterna caspia*) at Tidal Flats. Heard vocalization.

Date	Comments
6/22/2015	Observed 2 common raven (*Corvis corax*) at lagoon.
6/22/2015	Observed 4 tree swallow (*Tachycineta bicolor*) at lagoon.
6/23/2015	Observed 2 Caspian tern (*Sterna caspia*) at lagoon. Heard vocalization.
6/23/2015	Observed 150 black-legged kittiwakes (*Rissa tridactyla*) at Tidal Flats. Observation made by Declan troy
6/23/2015	Observed 35 white-winged scoter (*Melanitta fusca*) at Tidal Flats. Observation made by declan Troy.
6/24/2015	Observed 3 Caspian tern (*Sterna caspia*) at lagoon.
6/24/2015	Observed 5 green-winged teal (*Anas crecca*) at Mikfik Creek Tidal Area. declan troy ID
6/24/2015	Observed 1 song sparrow (*Melospiza melodia*) at West Bluff. Declan Troy ID
6/24/2015	Observed 1 spotted sandpiper (*Actitis macularius*) at McNeil River Falls. Declan Troy ID
6/25/2015	Observed 4 swans at lagoon. Unidentfied swan.
6/25/2015	Observed 4 widgeon at lagoon. Unidentfied wigeon.
6/25/2015	Observed 3 northern pintail (*Anas acuta*) at lagoon.
6/25/2015	Observed 4 least sandpipers (*Calidris minutilla*) at lagoon.
6/26/2015	Observed 1 fox sparrow (*Passerella iliaca*) at McNeil River Falls.
6/26/2015	Observed 4 northern pintail (*Anas acuta*) at Mikfik Creek Tidal Area.
6/28/2015	Observed 5 Caspian terns (*Sterna caspia*) at Mikfik Sedge Flat - East Side.
6/28/2015	Observed 1 Wilson's snipe (*Gallinago delicata*) at Mikfik Sedge Flat - East Side.
7/2/2015	Observed 3 Caspian terns (*Sterna caspia*) at Mikfik Sedge Flat - East Side.
7/2/2015	Observed 2 peregrine falcon (*Falco peregrinus*) at camp. Flying after a smaller bird
7/3/2015	Observed 1 Wilson's snipe (*Gallinago delicata*) at Mikfik Sedge Flat - East Side. Flying over Mikfik Sedge Flat - East Side
7/4/2015	Observed 17 brant (*Branta bernicula*) at spit. Resting on the spit at high tide/35 mph east wind
7/4/2015	Observed 1 Wilson's snipe (*Gallinago delicata*) at Mikfik Sedge Flat - East Side.
7/6/2015	Observed 2 Caspian tern (*Sterna caspia*) at lagoon.
7/7/2015	Observed 2 Caspian tern (*Sterna caspia*) at lagoon.
7/12/2015	Observed 1 gray wolf (*Canis lupus*) at lagoon.
7/12/2015	Observed 1 black-legged kittiwake (*Rissa tridactyla*) at McNeil River Falls.
7/13/2015	Observed 1 American robin (*Turdus migratorius*) at McNeil River Trail.
7/13/2015	Observed 1 American robin (*Turdus migratorius*) at McNeil River Trail.
7/14/2015	Observed 4 black-legged kittiwake (*Rissa tridactyla*) at McNeil River Falls.
7/14/2015	Observed 2 common raven (*Corvus corax*) at McNeil River Falls.
7/14/2015	Observed 1 spotted sandpiper (*Actitus macularius*) at McNeil River Falls.

Date	Comments
7/14/2015	Observed 1 red-breasted merganser (*Mergus serrator*) at McNeil River Falls.
7/15/2015	Observed 9 black-legged kittiwake (*Rissa tridactyla*) at McNeil River Falls.
7/16/2015	Observed 2 pine grosbeak (*Pinicola enucleator*) at camp. Male and female, feeding on seeds in camp.
7/16/2015	Observed 6 black-legged kittiwakes (*Rissa tridactyla*) at McNeil River Falls.
7/17/2015	Observed 1 gray wolf (*Canis lupus*) at Lower McNeil River.
7/19/2015	Observed 2 Caspian tern (*Sterna caspia*) at lagoon. Flying/vocalizing over the lagoon at low-tide.
7/19/2015	Observed 10 least sandpipers (*Calidrius minutilla*) at Mikfik Creek Riffle.
7/19/2015	Observed 4 black-legged kittiwakes (*Rissa tridactyla*) at McNeil River Falls.
7/21/2015	Observed 1 merlin (*Falco columbarius*) at lagoon. Flying low over the lagoon at low-tide.
7/21/2015	Observed gray-crowned rosy-finch (*Leucosticte tephrocotis*) at McNeil Head.
7/21/2015	Observed peregrine falcon (*Falco peregrinus*) at McNeil Head.
7/21/2015	Observed double-crested cormorant (*Phalacrocorax auritus*) at McNeil Head.
7/21/2015	Observed glaucous-winged gull (*Larus glaucescens*) at McNeil Head.
7/21/2015	Observed pigeon guillemot (*Cepphus columba*) at McNeil Head.
7/21/2015	Observed surf scoter (*Melanitta perspicillata*) at McNeil Head.
7/21/2015	Observed white-winged scoter (*Melanitta fusca*) at McNeil Head.
7/21/2015	Observed horned puffin (*Fratercula corniculata*) at McNeil Head.
7/21/2015	Observed bald eagle (*Haliaeetus leucocephalus*) at McNeil Head.
7/21/2015	Observed pine grosbeak (*Pinicola enucleator*) at McNeil Head.
7/21/2015	Observed savannah sparrow (*Passerculus sandwichensis*) at McNeil Head.
7/21/2015	Observed fox sparrow (*Passerella iliaca* ("sooty")) at McNeil Head.
7/21/2015	Observed Wilson's warbler (*Cardellina pusilla*) at McNeil Head.
7/21/2015	Observed harlequin duck (*Histrionicus histrionicus*) at McNeil Head.
7/21/2015	Observed hermit thrush (*Catharus guttatus*) at McNeil Head.
7/21/2015	Observed Swainson's thrush (*Catharus ustulatus*) at McNeil Head.
7/21/2015	Observed bank swallow (*Riparia riparia*) at McNeil Head.
7/21/2015	Observed spotted sandpiper (*Actitis macularius*) at McNeil Head.
7/21/2015	Observed least sandpiper (*Calidris minutilla*) at McNeil Head.
7/25/2015	Observed 2 Caspian tern (*Sterna caspia*) at lagoon. Vocalizing.
7/25/2015	Observed black-legged kittiwake (*Rissa tridactyla*).
7/26/2015	Observed 1 gray wolf (*Canis lupus*) at spit. Observed at 8:36 AM.
8/2/2015	Observed merganser at Lower McNeil River. Unidentified merganser.
8/2/2015	Observed Greater yellowlegs (*Tringa melanoleuca*) at Lower McNeil River.
8/2/2015	Observed 1 Steller sea lion (*Eumetopias jubatus*) at Tidal Flats. Bobbing off spit at high tide.
8/3/2015	Observed 1 mew gull (*Larus canus*) at Lower McNeil River. Juvenile mixed

Date	Comments
	in with glaucous winged gulls.
8/4/2015	Observed 3 semipalmated plover (*Charadrius semipalmatus*) at spit. Mixed with other shorebirds.
8/4/2015	Observed 6 western sandpipers (*Calidrius mauri*) at spit. Mixed with other shorebirds.
8/4/2015	Observed 3 rock sandpipers (*Calidris ptilocnemis*) at Spit.
8/5/2015	Observed 1 northern shrike (*Lanius excubitor*) at spit. Juvenile, on willow drift atop spit.
8/5/2015	Observed 1 peregrine falcon (*Falco peregrinus*) at lagoon. Sped past, after mixed flock of peeps.
8/5/2015	Observed 1 northern harrier (*Circus cyaneus*) at McNeil River Trail. quartering valley below Eagle Rock.
8/5/2015	Observed 1 merlin (*Falco columbarius*) at McNeil River Trail. Fast, from S to N, near Eagle Rock.
8/7/2015	Observed 4 pink (humpback) salmon (*Oncorhynchus gorbuscha*) at Lower McNeil River. Several dead, desiccated, spawned out morts.
8/13/2015	Observed 1 swan at camp. Flying in the lagoon to mikfik, unidentified swan.
8/16/2015	Observed 1 double-crested cormorant (*Phalacrocorax auritus*) at Enders Island at the mouth of McNeil River.
8/17/2015	Observed 1 black-billed magpie (*Pica hudsonia*) at Enders Island.
8/24/2015	Observed 1 gray wolf (*Canis lupus*) at mouth of river.


ALASKA
DEPARTMENT OF FISH AND GAME