

McNeil River State Game Sanctuary Annual Management Report 2017

Thomas M. Griffin

Edward W. Weiss



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2018

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Thomas M. Griffin

Alaska Department of Fish and Game
Division of Wildlife Conservation
333 Raspberry Road
Anchorage, AK 99518-1565

Edward W. Weiss

Alaska Department of Fish and Game
Division of Wildlife Conservation
333 Raspberry Road
Anchorage, AK 99518-1565

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Alaska Department of Fish and Game
Division of Wildlife Conservation
PO Box 115526
Juneau, AK 99811-5526



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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) 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 was extremely good this season. Bear index count numbers at McNeil River falls, the primary bear gathering and viewing location, averaged 47 bears, above the long-term average of 40.8 bears and higher than the last 3 years' averages. Staff observed 107 individual bears this season; which expended approximately 2,749 bear use days within the sanctuary. The long-term (1976–2017) average number of individual bears annually identified is 94.5 and the long-term average of bear use days (1980–2017) is 2,089.

The bear-viewing program at MRSGS attracted 972 applicants from 15 different countries, who vied for 185 regular permits and 57 standby permits issued through a lottery. Fifty-four percent of applicants were Alaska residents and 46% were nonresidents. The 228 guided, standby, and special access permits were distributed to 60% Alaska residents and 40% nonresidents. The 199 participants in bear viewing during the 2017 season came from 6 countries, including Australia, Canada, Germany, Japan, Switzerland, and the United States. The MRSGS bear-viewing permit program generated approximately \$73,400.00 in 2017 that was deposited into the state's Fish and Game Fund.

The 2017 cumulative McNeil River chum salmon (*Onchorynchus keta*) aerial survey escapement index was estimated at 38,679 fish. The 2017 run timing of McNeil River chum salmon was earlier than the historic average. 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.

During 2017 the Cook Inlet Aquaculture Association (CIAA) opened the Paint River fish ladder from 7 June through 5 October for potential salmon colonization. A video fish enumeration system was installed and operational as of 7 June; but had several interruptions due to battery and low power issues. While escapement estimates cannot be made from the sporadic video weir data, an aerial survey and observations at the ladder confirmed that some fish are colonizing the Paint River. An aerial survey on 20 September confirmed escapement of about 150 coho salmon (*O. kisutch*) throughout the Paint River system.

A total of 14 ADF&G special areas permits and 20 ADF&G commercial access permits were issued during 2017. These included the special areas and commercial access permits issued to companies involved in commercial transportation, sport fishing, wildlife viewing and fisheries research in the McNeil River, Kamishak River, and Chenik Creek areas. There were no mineral resource developments or activities permitted or reported to the department within MRSGS or MRSGR during 2017.



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.

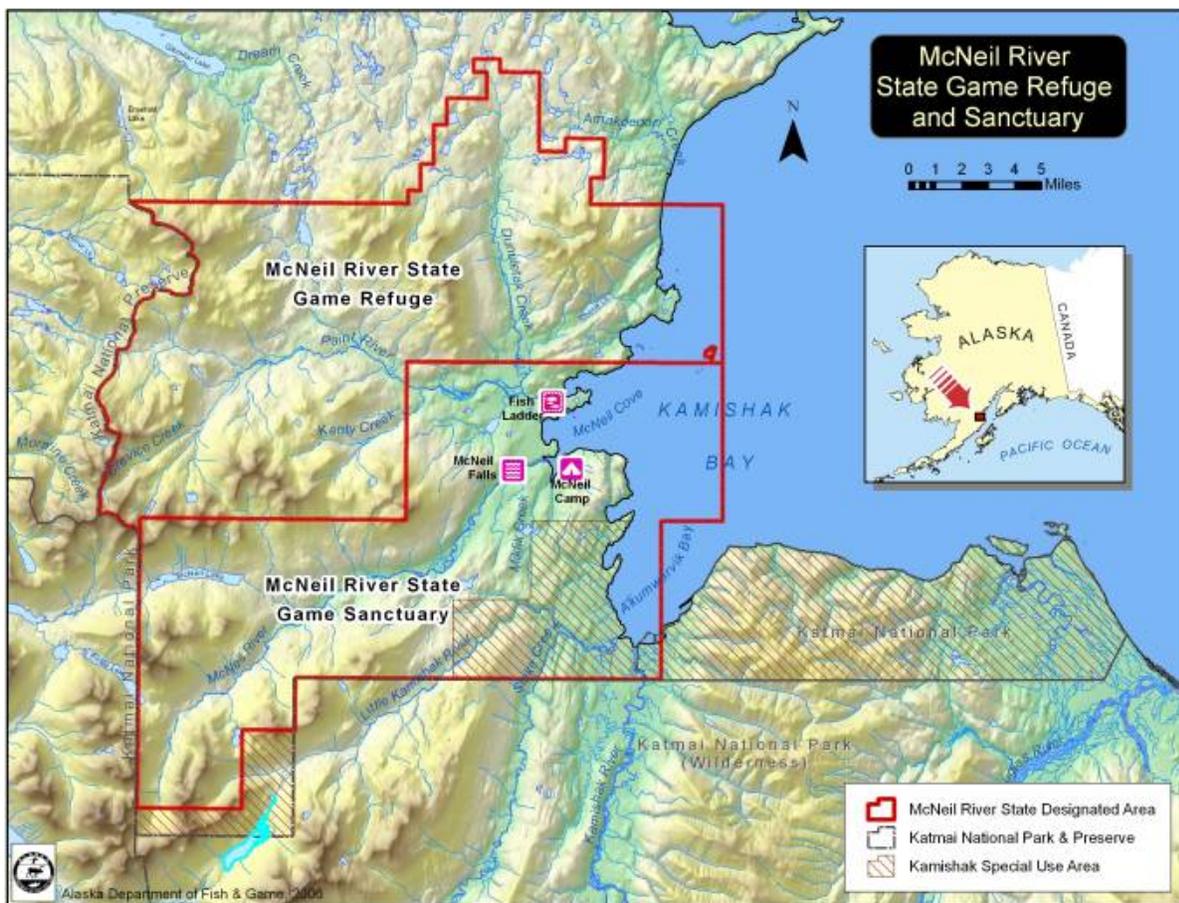


Figure 1. Location of the McNeil River State Game Sanctuary and McNeil River State Game Refuge in Southwest Alaska.

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) 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. 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).

Wildlife

BROWN BEAR MONITORING PROGRAM

MRS GS and MRS GR encompass approximately 388 mi². 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 MRS GS and MRS GR. 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 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 MRS GS: 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).

Hourly 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 from 15 July through 5 August. 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 a.m. and 8:00 p.m. 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. 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.

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 towards 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 during 1993–2004; 1 July during 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 2017 the overall average of the 7 highest hourly counts (47 bears) was above the long-term average of 40.8 bears. As were all 7 of the highest hourly counts used to compute the average. As noted above, historically these highest counts are derived from data collected between 15 July and 5 August; however, during 2017, 4 of the highest counts used in computing the index occurred outside this typical window (9, 10, 11, and 12 July). Bear index count numbers during 2017 were above the levels observed 2014–2016; but still below the high numbers observed in 2010–2013. The 2017 average of 47 bears was higher than the annual averages for the past 5 years (2012–2016) of 42 bears.

Table 1. High hourly index counts of brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 2000–2017. (Underlined bold numbers = 7 highest hourly counts/season used for index.)

Date	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	MEAN
Jun-07												3	5	4	8	5	2	2	4.14
Jun-08												8	5	4	4	3	1	3	4.00
Jun-09												5	7	4	3	2	2	4	3.86
Jun-10												6	8	5	5	2	2	9	5.29
Jun-11												5	10	7	4	10	2	6	6.29
Jun-12												5	10	7	5	7	4	3	5.86
Jun-13												4	14	4	3	6	2	6	5.57
Jun-14												10	8	6	4	3	2	3	5.14
Jun-15												4	7	7	6	4	1	4	4.71
Jun-16												10	12	4	3	4	5	5	6.14
Jun-17												11	8	9	4	7	4	4	6.71
Jun-18												13	9	2	7	4	4	5	6.29
Jun-19												12	13	3	5	7	4	4	6.86
Jun-20												10	22	5	5	5	6	9	8.86
Jun-21												13	22	9	5	6	4	7	9.43
Jun-22												11	18	5	1	3	4	5	6.71
Jun-23												8	16	9	6	5	8	6	8.29
Jun-24												4	16	5	9	6	7	6	7.57
Jun-25												7	11	6	14	11	10	8	9.57
Jun-26												12	11	11	12	12	15	3	10.86
Jun-27												14	7	6	17	14	20	7	12.14
Jun-28												6	8	3	22	5	25	12	11.57
Jun-29												18	6	9	28	12	20	15	15.43
Jun-30						11						21	11	7	18	18	25	19	16.25
Jul-01							1			13	7	18		14	38	19	27	28	18.33
Jul-02						13				14	14	18		17	35	18	27	16	19.11

Date	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	MEAN
Jul-03									3	16	16	17	20	18	30	15	24	23	18.20
Jul-04						16	3			15	26	13	20	30	44	18	26	31	22.00
Jul-05						20	12	4	9	15	27	14	18	28	37	17	18	35	19.54
Jul-06						20	12	4	8	19	19	10		27	28	31	24	32	19.50
Jul-07						22	18		16	21	27	12	13	26	33	24	29	36	23.08
Jul-08						21	14	4	10	25		24	25	35	47	38	29	33	25.42
Jul-09						25	15		14	26		27	41	34	48	33	33	48	31.27
Jul-10						23	21	11	14	33	17	31	45	36	7	47	25	46	27.38
Jul-11					15	28	18	11	17	28	27	30	37	45	7	33	30	54	27.14
Jul-12					10	24	19	17	24	32	33	33	0	49	16	30	24	41	25.14
Jul-13					20	28	26	20	22	25	30	40	36	50	28	28	30	40	30.21
Jul-14					20	21	34	21	18	27	42	42	40	48	32	31	21	35	30.86
Jul-15	34	25	30	36	19	19	31	29	25	41	54	50	48	57	40	31	23	47	34.95
Jul-16	31	39	26	27	24	19	31	35	32	34	64	54	50	39	36	23	20	47	34.36
Jul-17	30	40	28	32	20	21	31	32	28	35	53	42	63	44	29	31	22	37	34.32
Jul-18	29	40	31	31	21	19	30	37	37	34	54	64	66	51	23	30	15	25	34.71
Jul-19	33	35	31	31	25	20	33	29	38	39	70	75	62	50	25	24	14		39.21
Jul-20	20	37	26	29	22	22	37	42	42	40	54	62	43	40	21	36	15	32	35.12
Jul-21	25	39	36	21	19	11	21	40	40	21	70	65	35	42	19	32	12	28	32.20
Jul-22	34	32	21	26	18	16	24	34	42	10	54	60	24	41	12	25	13	38	30.32
Jul-23	33	30	33	23	15	16	31	30	41	14	50	47	32	36	11	17	8	35	30.68
Jul-24	33	42	30	16	18	12	26	21	40	25	32	37	21	45	9	14	5	47	28.32
Jul-25	33	33	28	18	11	2	27	29	51	40	21	39	26	35	7	14	4	41	27.24
Jul-26	32	24	24	16	7	6	25	36	49	21	41	38	31	33	9	7	3	27	27.04
Jul-27	23	29	20	20	6	5	31	33	34	30	62	26	20	24	8	8	4	23	26.40
Jul-28	20	23	26	12	10	6	27	33	35	32	49	43	26	15	9	8	3	18	24.20
Jul-29	21	20	30	14	9	6	25	29	42	33	44	45	25	11	12	7	4	16	23.28
Jul-30	25	15	23	14	8	8	20	17	33	29	35	38	18	10	7	8	3	16	20.64

Date	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	MEAN
Jul-31	16	11	25	11	10	7	20	22	35	18	31	24	19	7	7	12	3	19	18.48
Aug-01	12	7	21	9	8		12	15	30	14	23	22	14	3	4	8	3	17	15.71
Aug-02	17	5	19	11	9		11	13	18	10	28	11	10	3	5	8	2	12	13.38
Aug-03	22	3	15	5	8		10	16	19	8	19	7	9	5	3	6	3	14	11.95
Aug-04	11	3	9		4		10	14	19	-	12	5	10	3	6	4	2	9	8.74
Aug-05	4	4	8	6	5		6	7	18	9	19	9	11	6	5	4	1	12	8.80
Aug-06												8	13	3	4	5	1	13	6.71
Aug-07												7	15	3	3	4	2	14	6.86
Aug-08												6	10	3	7	2	1	15	6.29
Aug-09												5	7	6	3	5	1	5	4.57
Aug-10												7	5	5	2	4	2	14	5.57
Aug-11												6	2	0	1	7	1	6	3.29
Aug-12												8	4	2	1	3	4	12	4.86
Aug-13												6	3	2	1	4	0	7	3.29
Aug-14												7	4	2	2	5	2	9	4.43
Aug-15												7	5	2	1	2	2	8	3.86
Aug-16												8	3	1	1	5	1	5	3.43
Aug-17												5	3	1	1	1	1	6	2.57
Aug-18												7	3	2	2	3	1	6	3.43
Aug-19												2	4	2	0	2	3	7	2.86
Aug-20												3	2	1	0	2	3	7	2.57
Aug-21												2	3	1	1	3	1	7	2.57
Aug-22												4	2	2	1	1	2	7	2.71
Aug-23												4	2	2	2	1	3	5	2.71
Aug-24												3	4	3	1	1	2	3	2.43
Aug-25												3	2	0	2	2	1	1	1.57
Mean of 7 Daily Highs	33.1	38.8	31.5	30.2	21.7	24.5	32.5	36.7	43.8	37.5	61.1	61.4	53.8	50.0	41.4	35.7	29.2	47.1	39.71

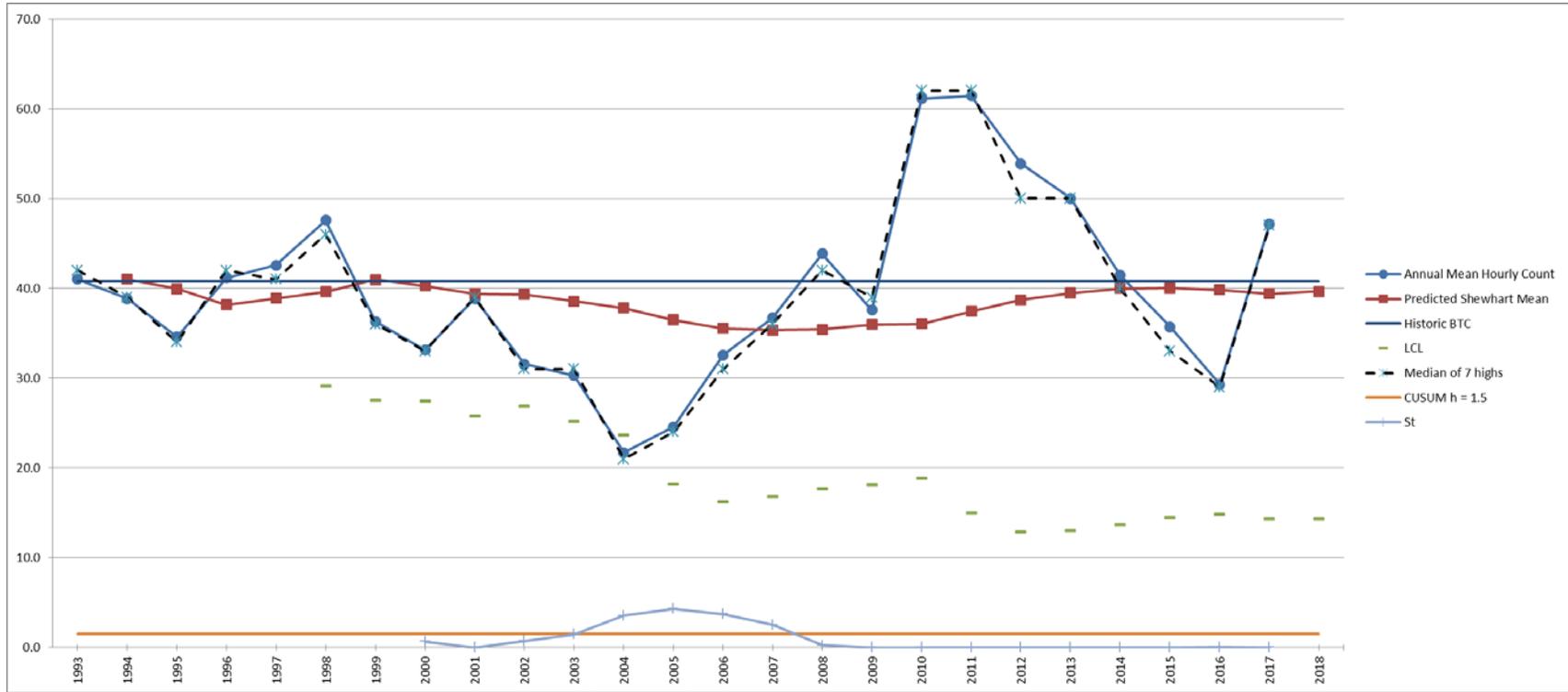


Figure 2. Historic hourly index counts (annual mean of 7 highest daily counts) of brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 1993–2017.

Review of the high hourly index counts for each day of the 2017 season showed that viewing was generally consistent with the 2011–2017 mean for the June period; above the July (1993–2017 mean and above the 2011–2017 mean for August (Fig. 3). High hourly index counts between 2000 and 2017 are presented in Table 1.

Individual Counts

A second method of monitoring bear use and the quality of the bear-viewing program at MRS GS is by tallying the number of individually identifiable bears (adults, subadults, and cubs) observed by sanctuary staff daily and throughout the season (Fig. 4 and Table 2). 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. This monitoring method records the presence of an individual bear within MRS GS, if observed during viewing, on a daily basis. While it does not provide the true count of all bears present at MRS GS, it does provide an additional index in evaluating the overall bear use and the quality of the bear-viewing program. Only individual bears that are known or recorded a minimum of 3 times are included in this count. Hence, this method provides an inherently conservative estimate.

There were 107 individual bears identified at MRS GS during the 2017 season. This is about 13% higher than the long-term (1976–2017) average of 94.5 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 in all viewing areas within MRS GS, only data from McNeil River falls, 15 June–25 August, is used for historical comparison (Fig. 4). 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 1,212 bear use days at McNeil River falls in 2017, which is above both the long-term average (1980–2017) of 1,198 and the recent 10-year average of 1,149. There were a total of 2,875 bear use days (all bears including cubs) within the sanctuary for the full 7 June–25 August season. These days were distributed 17%, 56%, and 27%, across June, July, and August, respectively. The long-term (1980–2017) average of bear use days is 2,089.

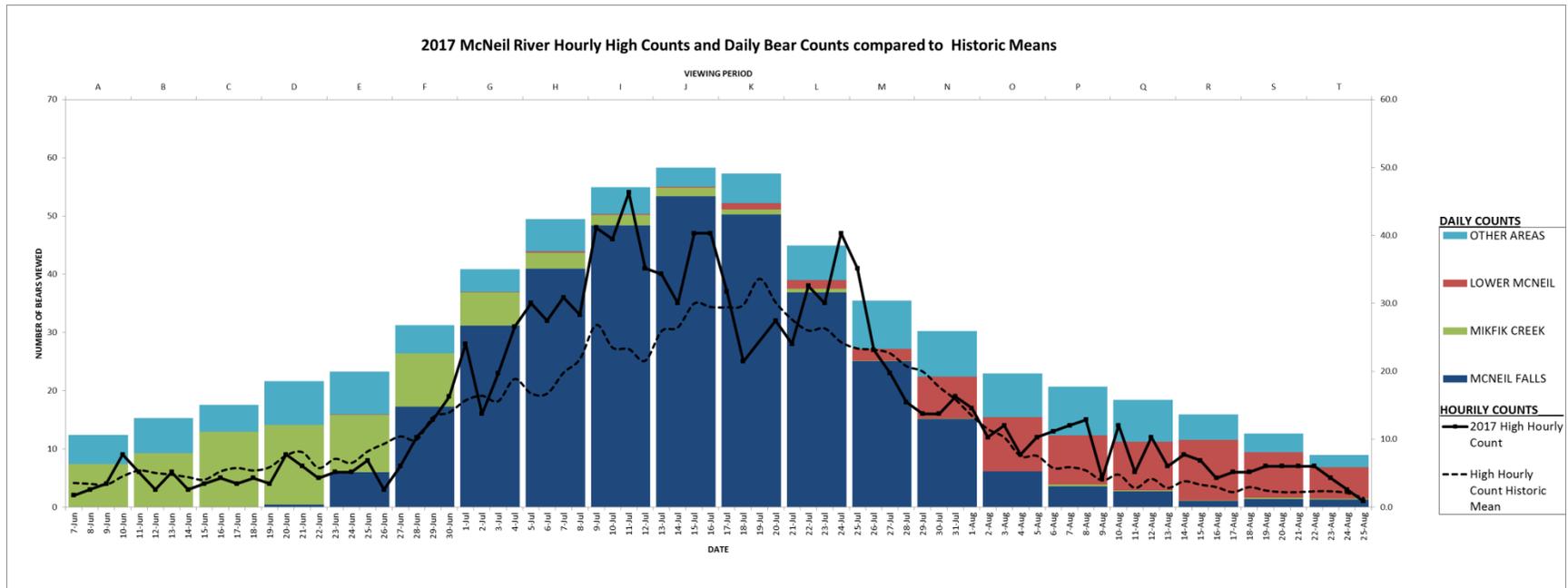


Figure 3. Daily and hourly index counts of brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 2017.

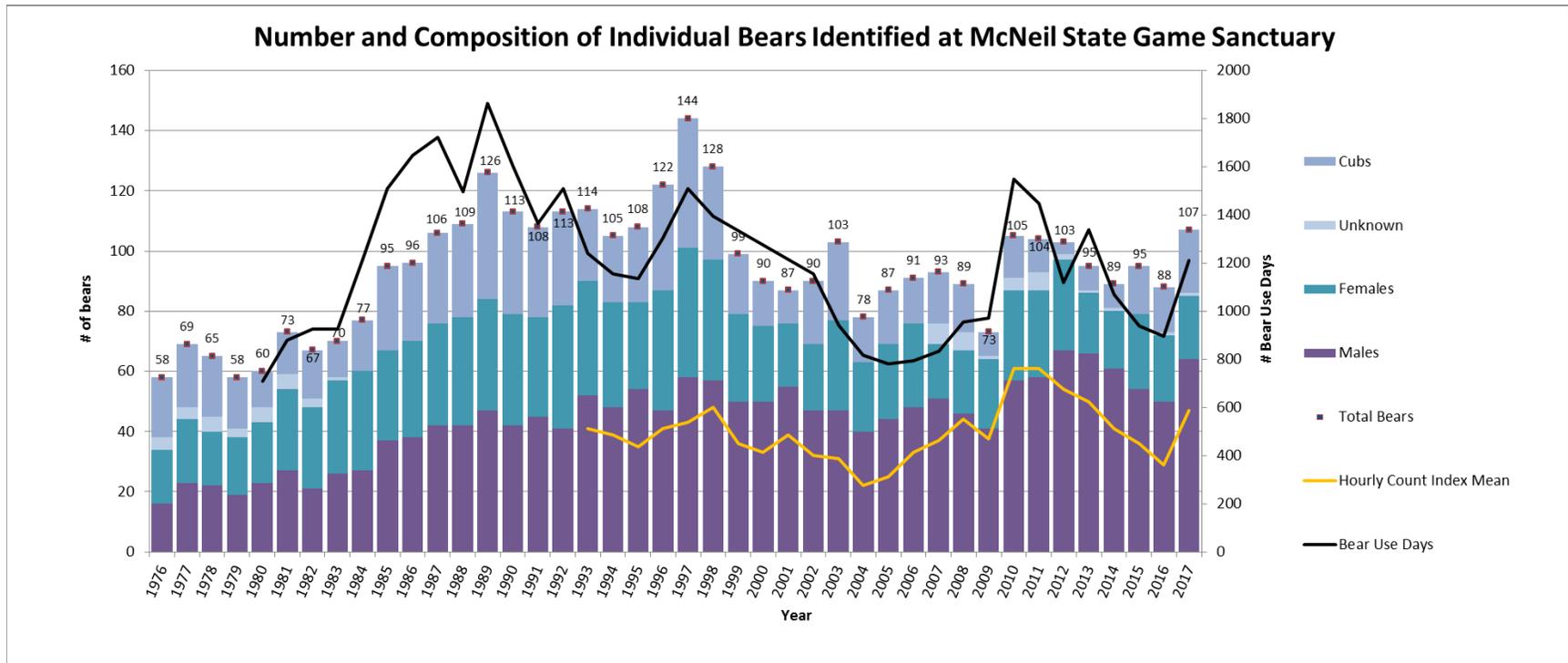


Figure 4. Annual brown bear numbers, bear use days, and index counts compared to bear composition, McNeil River State Game Sanctuary, Alaska, 1976–2017.

Table 2. Composition of brown bears observed at McNeil River State Game Sanctuary, Alaska, 1976–2017.

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	2016	2017
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	7	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	<u>14</u>	<u>14</u>	12	8	16	12	13	14	7	9	16	20	22	24	16	15	14	15	9
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	66	61	53	46	59
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	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	<u>73</u>	<u>69</u>	70	63	73	58	64	62	62	64	61	83	83	91	86	80	77	68	78
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	0	0	1	0	2
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	0	0	1	4	5
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	0	7	6	1	4	6	2	1	1	0	1	1
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	<u>6</u>	<u>6</u>	6	6	4	5	5	14	14	9	4	8	10	8	1	1	2	5	8
Total Adults & Sub-Adults (2)	38	48	45	41	48	59	51	58	60	67	70	76	78	84	79	78	82	90	83	83	87	101	97	<u>79</u>	<u>75</u>	76	69	77	63	69	76	76	73	65	91	93	99	87	81	79	73	86
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	15	21
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	<u>99</u>	<u>90</u>	87	90	103	78	87	91	93	89	73	105	104	103	95	89	95	88	107
<p>Notes: (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>Underlined Bold Numbers</u> represent average of data four years prior and after (No data were recorded in 1999 and 2000).</p>																																										

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 was due in part to an overall decline in maternal females offset by an increase in single adult females. In 2017 the number of maternal females increased, with a total of 10 maternal females and 21 cubs observed. However, there were also fewer nonmaternal females than typically observed, so the overall number of females remained relatively flat. The historic sex and age composition of bears using the McNeil River-Mikfik Creek viewing areas during the viewing season are presented in Fig. 4 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 EOS 7D Mark II SLR camera with a Canon 100–400 mm zoom and an EF24-105 mm 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 among 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 MRS GS or MRS GR. Some information is available through opportunistic surveys, fisheries escapement videos, and commercial guide reporting from the Mikfik Lake, Paint River, Chenik Creek-Lagoon, and from the Kamishak-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 MRS GS. 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 7 of the 7 guide services operating in 2017, there was a mean of 8 bears seen per day in the Kamishak-Little Kamishak-Strike Creek areas from 30 June to 30 September 2017.

Chenik Creek

The department does not conduct bear surveys in the Chenik Creek area; however, a local Homer guide conducted bear-viewing tours in the lower Chenik Creek-Chenik Lagoon area in 2017. He observed up to 15 individual bears during 30 June–10 July 2017 with the following composition (including cubs): 2 maternal females with 3 cubs of the year, 2 subadults, 5 adult females, 1 adult male, and 2 unknowns. In addition, 1 porcupine (*Erethizon dorsatum*) was observed below Chenik Lake and no red foxes (*Vulpes vulpes*) were observed.

OTHER WILDLIFE

General Observations

During the 2017 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 2017 season. Some were species that are regularly seen in MRS GS, including Wilson's snipe, golden-crowned sparrow, savannah sparrow, fox sparrow, bank swallow, Wilson's warbler, yellow warbler, orange-crowned warbler, American widgeon, American robin, hermit thrush, Swainson's thrush, gray-cheeked thrush, tree swallow, common redpoll, glaucous-winged gull, mew gull, brant, green-winged teal, mallard, northern shoveler, common raven, red-breasted merganser, common merganser, greater yellowlegs, northern pintail, greater scaup, black-billed magpie, northern harrier, bald eagle, semi-palmated plover, western sandpiper, least sandpiper, and Caspian tern. Less frequently seen birds were also observed, including, sandhill crane, harlequin duck, northern shrike, unidentified swan, belted kingfisher, double-crested cormorant, pigeon guillemot, spotted sandpiper, rock sandpiper, peregrine falcon, merlin, red-throated loon, whimbrel, black-legged kittiwake, black scoter, black oystercatcher, and black turnstone. A nesting pair of rough-legged hawks, common loon, and a pair of common goldeneye were observed on a pre-season Mikfik Lake hike.

Marine mammal sightings during the 2017 season included the usual 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.

Other terrestrial wildlife observed this season included the following. A single gray wolf (*Canis lupus*) was observed for about 15–20 minutes among several bears at McNeil Falls on 24 July. Wolf tracks were often observed around the edge of the lagoon, along the Mikfik trail (at the base of the east bluff) and along the McNeil River trail. Also, several arctic ground squirrels (*Spermophilus parryii*), masked shrew (*Sorex cinereus*), and red fox with 4 kits were observed in and around camp. As usual, numerous wood frogs (*Rana sylvatica*) were observed throughout the Mikfik and McNeil River viewing areas. Less common sightings of a beaver (*Castor canadensis*), and of a wolverine (*Gulo gulo*) were observed this summer as well.

In collaboration with the Threatened, Endangered, and Diversity Program of ADF&G-Division of Wildlife Conservation (DWC), MRS GS staff set up and monitored a Wildlife Acoustic,

Songmeter Zero-crossing bat detector during the 2017 season. The detector records ultrasound frequencies to detect the presence of bats in the area. The detector was mounted on the west side of the cache facing the open area behind camp and was operational from 26 May through 25 August. The first bat detection was on 29 May and bat activity continued through the entire field season. However, similar to 2016, this activity was significantly lower during May and June, increasing in July and August. The months of May, June, July, and August had 4, 6, 130, and 104 detections, compared to 0, 5, 23, and 86 respectively for 2016. There were 48 evenings that the recorder was running but did not detect any activity, compared to 65 evenings in 2016. Thirty-two evenings had less than 10 bat passes and 9 evenings had 10 or more detections, compared to 27 and 3 respectively in 2016. The highest activity level was 22 detections on 22 August, similar to the high of 39 on 29 August in 2016.

During 2017, staff did not observe any carcasses or sign of large seabird die-offs occurring in lower Cook Inlet and the Gulf of Alaska at McNeil Cove.

ADF&G-Division of Commercial Fisheries (CF) staff recorded 1,530 hours of video connected with the video monitoring of sockeye salmon (*Onchorynchus nerka*) escapement into Mikfik Lake. In addition to the escapement data, reviewers documented wildlife transiting the cameras view including eagles, beavers, 1 wolf, 1 coyote (*Canis latrans*), various waterfowl, and river otters (*Lontra canadensis*). Brown bears transited the field of view of the camera in 157 instances, an average of 2.5 bears per day of video operation ($n = 62$ d). Most sightings were of individual bears, but several sightings were of females with 1, 2, or 3 cubs. On 23 July, 11 bears were captured on video, including a female with 1 cub.

HUNTING AND TRAPPING

MRS GS is closed to hunting and trapping by Alaska state statute (AS 16.20.162(b)), and 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 mi² that comprise MRS GS and MRS GR are part of a much larger area of approximately 5,585 mi² 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 [DNR]) 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 2000–2016 are summarized in Table 3. Data for regulatory year (RY) 2017 (a regulatory year begins 1 July and ends 30 June, e.g., RY17 = 1 July 2017–30 June 2018) 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 MRS GS and MRS GR. 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 MRS GS and MRS GR are

presented in Fig. 5 and Table 3. The area represented includes about 2,100 mi² currently open to hunting.

The long-term average harvest from areas surrounding MRSGS (outside the sanctuary and refuge) from RY80 through RY10 is 78 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 RY14–RY15, the most recent data available, the harvest in areas surrounding MRSGS and MRSGR was 93 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 (*Alces alces*), beaver, lynx (*Lynx canadensis*), marten (*Martes americana*), river otter, wolf, wolverine, coyote, red fox, mink (*Neovison vison*), weasel (*Mustela nivalis*), muskrat (*Ondatra zibethicus*), ground squirrel, and marmot (*Marmota caligata*). 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.

Table 3. Reported harvests of selected big game and furbearer species within and around McNeil River State Game Sanctuary (MRS GS) and McNeil River State Game Refuge (MRS GR), Alaska, regulatory years^a 2000–2016.

RY ^a	Species																			
	Brown bear		Black bear		Caribou		Moose		Beaver		Lynx		Marten		Otter		Wolf		Wolverine	
	MRS GS- MRS GR ^b	AA ^c																		
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	15	0	3	0	2	0	0	0	2	0	0	0	2
2015			0	3	0	1	0	4	0	7	0	0	0	0	0	0	3	2	0	0
2016			0	0	0	8	0	14	0	10	0	3	0	0	0	4	0	1	0	8

^a Regulatory year (RY) begins 1 July and ends 30 June, e.g., RY00 = 1 July 2000–30 June 2001.

^b Harvest numbers for McNeil River State Game Sanctuary (MRS GS) and McNeil River State Game Refuge (MRS GR) are based on data from reporting areas that extend slightly outside of the MRS GS-MRS GR complex. MRS GS is closed to hunting and trapping and MRS GR is closed to the hunting of brown bear.

^c AA = adjacent areas. Harvest numbers for surrounding areas largely from reporting areas outside of the MRS GS-MRS GR complex. Some data may be from within MRS GS and MRS GR where these reporting areas overlap the MRS GS-MRS GR complex boundary. MRS GS is closed to hunting and trapping and MRS GR is closed to the hunting of brown bear.

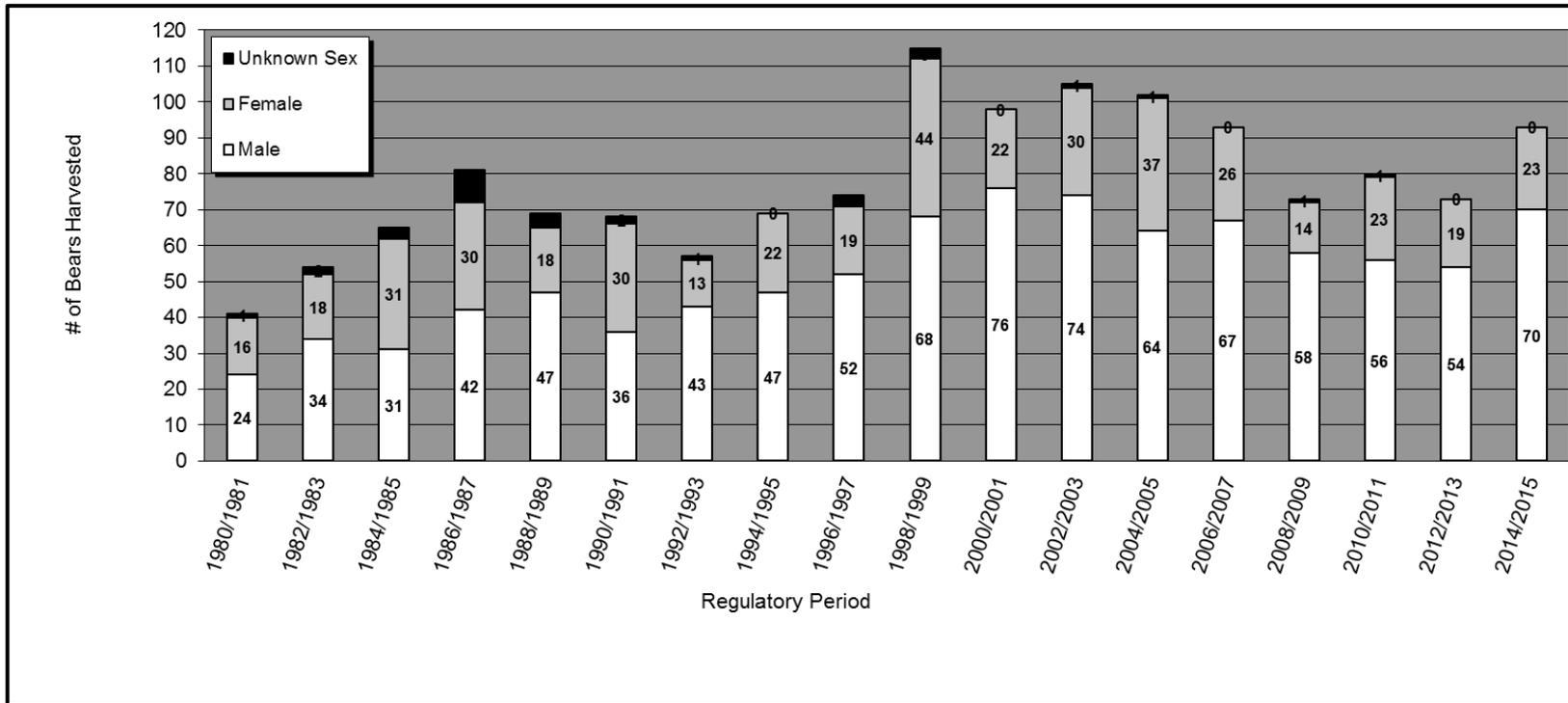


Figure 5. Brown bear harvest from areas surrounding the McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska, 1980–2015 (harvest from Game Management Units/Uniform Coding Units: 9A/201, 301, 401, 501; 9B/301; and 9C/101, 201, 301, 601, 702, and 703). Even and odd regulatory years (regulatory year begins 1 July and ends 30 June, e.g., regulatory year 1980 = 1 July 1980–30 June 1981) are lumped.

Fisheries

MRS GS and MRS GR 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 (*Salvelinus malma*). The McNeil River drainage contains Dolly Varden trout, chum salmon, some coho salmon (*O. kisutch*), pink salmon, and small numbers of Chinook salmon (*O. tshawytscha*). The Mikfik Creek-Lake drainage contains sockeye salmon, 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.

COMMERCIAL FISHERIES

Periodic aerial surveys are flown to index the escapement of chum salmon to McNeil River and remote video is used to monitor the escapement of sockeye salmon into Mikfik Lake. In 2017, generally favorable stream conditions allowed for 4–5 effective aerial surveys of McNeil River and the video system at Mikfik Lake operated successfully through 30 July. 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 2017 McNeil River chum salmon aerial survey escapement index was estimated at 38,679 fish (Table 4, Fig. 6). Chum salmon were consistently seen in moderate numbers above the falls during aerial observations from 20 June through the last survey on 6 August. A peak daily aerial estimate of 13,120 chum salmon occurred on 12 July, of which 2,280 were upstream of McNeil River falls. The McNeil River subdistrict was closed and no commercial fishing for chum salmon occurred there in 2017. Chum runs to other Kamishak Bay district systems in 2017 were also strong. However, strong pink salmon runs in other districts and areas resulted in reduced fishing effort in the Kamishak District and a district-wide commercial harvest of just over 34,000 chum salmon. The 2017 run timing of McNeil River chum salmon was earlier than the historical average. Brown bears were fishing at McNeil River falls by 21 June, and staff were regularly guiding visitors to the falls and viewing 6–8 bears fishing there by 23 June.

McNeil River Chum Salmon Stock Status

In response to guidelines established in the Policy for Management of Sustainable Fisheries (5 AAC 39.222), in November 2016 at the Lower Cook Inlet Board of Fisheries meeting, ADF&G recommended that McNeil River chum salmon be designated as a “stock of management concern.” A “management concern” is defined as “a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for salmon stocks within the bounds of the sustainable escapement goal (SEG)...”. Two natural conditions unique to McNeil River presumed to contribute to the present status of chum salmon are 1) a

physical obstacle (McNeil Falls) located low in the drainage impedes consistent use of upriver spawning habitats; and 2) a high density of brown bears aggregated at McNeil Falls to feed, essentially creating a biological impediment to upstream migration (Otis and Szarzi 2007) and also contributing to high predation rates on pre-spawning chum salmon in McNeil River below the falls (Pierce et al. 2011, 2013). Further details on the status of McNeil River chum salmon, including a review of past and current research and management actions, can be found in Otis et al. (2016b).

Table 4. Escapement estimates of salmon into Mikfik Lake and McNeil River, McNeil River State Game Sanctuary, Alaska, 2017.

Date	Mikfik sockeyes cumulative total	McNeil chums (daily) ^a
6/1/2017	277	
6/8/2017	3,285	
6/15/2017	3,644	
6/20/2017		3,540
6/22/2017	3,662	
6/29/2017	3,663	
7/6/2017	5,715	
7/7/2017		7,120
7/12/2017		13,120
7/13/2017	6,039	
7/20/2017	6,830	
7/25/2017		8,096
7/27/2017	7,416	
8/3/2017	7,495	
8/6/2017		9,863
8/10/2017	7,495	
8/17/2017	7,495	
Escapement index	7,495 ^b	38,679 ^c

^a Daily estimate from individual aerial surveys and considered to be conservative.

^b The escapement index for Mikfik sockeyes is the cumulative total from the remote video system at Mikfik Lake; data above reflects cumulative totals as of dates noted.

^c Escapement index for McNeil chums 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.

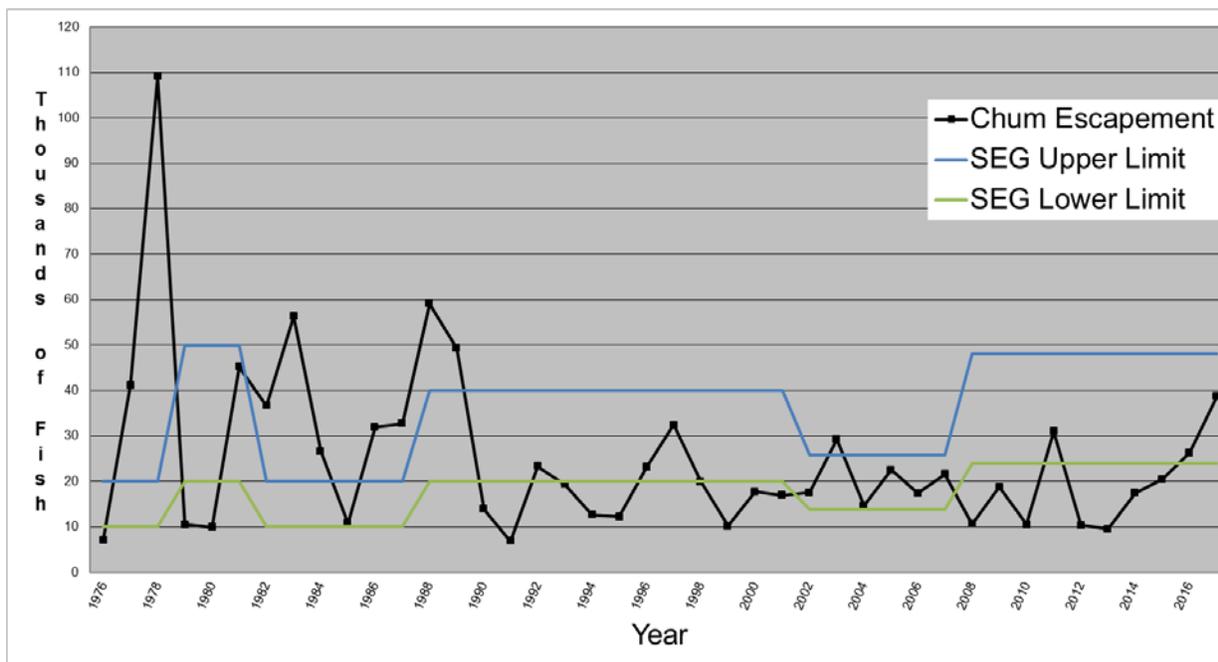


Figure 6. McNeil River chum salmon escapement 1976–2017, McNeil River State Game Sanctuary, Alaska.

Mikfik Creek-Lake System

A video camera attached to a digital video recorder used to document sockeye salmon escapement into Mikfik Lake showed a cumulative total of 7,495 fish 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 7,495 fish was used as the final escapement estimate. This value is within the sustainable escapement goal (SEG) range of 3,400–11,000, the upper end of which decreased slightly following the 2016 Lower Cook Inlet Board of Fisheries meeting (Otis et al. 2016a). Post-season evaluation indicated that run timing of sockeye salmon into Mikfik Lake was atypical, with 3 distinct escapement pulses: a large spike in early June, followed by modest bumps in early and mid- to late July, respectively.

The McNeil River subdistrict was open to commercial fishing for Mikfik Creek sockeye salmon from 1 June to 20 June. However, no fishing effort occurred in the McNeil River subdistrict in 2017.

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 2017, 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 2,900–13,700 sockeye salmon has been met or exceeded each year beginning in 2003, with the 2017 escapement cumulatively estimated by remote video as 21,468 sockeye salmon. A total of 97,537 sockeye salmon were commercially harvested from the Chenik subdistrict in 2017.

SPORT FISHING

A limited amount of sport fishing occurs within MRS GS and MRS GR. This occurs primarily in the Kamishak River area (Table 5). 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 2017. Due to the high bear activity in the lagoon this season, sport fishing effort by staff and visitors was restricted for safety reasons. A total of 4 sockeye and 3 chum salmon were harvested and 3 Dolly Varden were caught and released.

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 2017 season, 7 of the 10 permitted lodges and transporters operating in the Kamishak Special Use Area reported. Two companies reported no activity. Reporting companies spent a total of 377 angler use days and 173 guide use days during 89 days of sport fishing in the Kamishak area of sanctuary. These anglers reported catching 3,080 fish, of which 29% were Dolly Varden, 46% were coho salmon, and 15% were chum salmon. Nearly all Dolly Varden were released as were most pink and chum salmon. Seventy-six 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, 2017.

# 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	
89	173	377	0	701	715	5	470	9	254	9	910	8

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 run 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). At that time, the structure was never opened to allow fish passage upstream through the ladder. CIAA, responsible for building and operating the Paint River fish ladder, has been performing maintenance and repair improvements to the ladder since 2008. And in 2011 began opening the ladder each summer to allow for colonization by salmonids. Additionally, in 2015 CIAA released 1.02 million unfed pink salmon fry into ice free leads of Paint Lake during 4–5 April. The anticipated 1–2% return of these fish to Paint River in 2016 did not materialize. Since 2014 a small number (<200) of salmon or salmon carcasses (presumably coho) have been observed annually within or above the ladder in mid- to late September. A few chum have also been observed passing the ladder in July via video weir recently. While detailed surveys have not been conducted, available information indicates that some colonization from stray salmon is occurring.

In 2017, CIAA opened the Paint River fish ladder to water flow between 7 June and 5 October for potential salmon colonization. Additional visits on 6 July, 8 July, 21 July, 21 August, 6 September, 26 September, and 5 October were made to install the video fish enumeration system, assess water levels, download video data, conduct maintenance, and conduct stop log adjustments. The video fish enumeration system was installed and operational as of 7 June; however it had several interruptions over the season due to battery and low power issues. While escapement estimates cannot be made from the sporadic video weir data, aerial surveys and observations at the ladder confirmed that some fish are colonizing the Paint River. The video system was pulled and the ladder shut down on 5 October.

Three aerial surveys of Paint River were conducted by CIAA or ADF&G in 2017. No fish were noted during visits or surveys through 21 July. Subsequent visits on 14, 19, and 21 August all documented thousands of primarily pink and some coho salmon within Akjemguiga Cove and small numbers (<60) of primarily coho salmon above the ladder within the Paint River system. An aerial survey of the system on 20 September further documented about 150 primarily coho salmon throughout the Paint River system. Data from the video weir system is still pending.

Brown bears and bear sign were observed at the site beginning on 6 July when 5 bears were spotted within the area of Akjemguiga Cove adjacent the mouth of the Paint River – and continued through 6 September. No bears or recent bear sign were observed at the fish ladder itself during the 6 visits. Observations of fish and bears in the vicinity of Paint River are summarized in Table 6.

Public Use and Land Management

To protect the bears, their habitat and the unique visitor experience, access to MRSGRS 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 permits, special access permits, non-viewing permits, transporter permits, and commercial guide permits.

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 to 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 DNR.

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 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, 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 the McNeil River Sanctuary and/or the general efforts to conserve bears.

Table 6. Paint River fish surveys, Alaska, 2017.

Survey date	Fish count	Observer and comments	Bears observed
6/7/17		CIAA ^a . Open fish ladder and set up video weir system. No aerial survey of system or cove noted.	0
7/6/17		CIAA. Check video weir and finish weir installation. No aerial survey of system or cove noted. 2 adult bears far side of Akhemguiga Cove; sow with 2 cubs on bluff at mouth of Paint River.	5
7/21/17		CIAA. Check video weir and battery installation. No aerial survey of system or cove noted. No bears noted.	
8/14/17	~13,000	ADF&G aerial survey Akjemguiga Cove saltwater only, fish primarily pinks with some coho. No bears noted.	
8/19/17	5,461	ADF&G aerial survey of entire Paint River drainage documented 29 chums and 10 pinks in freshwater. 5,422 salmon, primarily pinks with some coho, in saltwater (Akjemguiga Cove).	
8/21/17	Thousands	CIAA. Check video weir and repair battery bank. Thousands of salmon (pink and coho per ADF&G obs) in Akjemguiga Cove and at base of ladder. High water event evident since last visit. Many fish (pink, coho, 1 sockeye) in ladder, some passing through. In 2.5 hr on 8/21, 46 coho and 10 pink passed video weir. Three brown bears catching salmon in cove. Plenty of fresh bear sign on trail.	3
9/6/17		CIAA. Check video weir and perform maintenance, filming. High water. Seals in canyon. One bear on trail above ladder, one at Akjemguiga Cove.	2
9/20/17	0	CIAA. Aerial survey of Paint River system. 45 coho in Selukpuk drainage; 41 coho in upper Paint Lakes fork; 71 coho in Dunutelak drainage. No salmon in ladder or Akjemguiga Cove	
10/5/17		CIAA. Shut down ladder, remove video weir, collect samples, documented leaks and maintenance needs. Marked decline in bears and bear sign since last visit. 175 pink and coho carcasses in ladder. No samples.	0

^a CIAA – Cook Inlet Aquaculture Association.

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 \$150.00 for Alaskan residents and \$350.00 for non-Alaska residents. Camp-standby viewing permit holders are assessed a permit fee of \$75.00 for each Alaskan resident and \$175.00 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 Alaskan resident and \$350.00 for each non-Alaska resident.

In 2017, ADF&G received 972 applications for McNeil River guided and standby bear-viewing permits. Applications were received from 15 different countries and 54% of applicants were Alaska residents. Payments were received for 180 guided viewing access permits, 32 standby viewing access permits, and 8 special access viewing permits. There were 16 special access permits granted by the commissioner. Overall, 228 permits were issued and 199 permit holders (guided viewing, camp standby, and special access) visited the sanctuary (Table 7). The 5-year annual visitation average (2013–2017) is 176. The average number of permits used each day (permittees that bear viewed) at the sanctuary in 2017 was 8.9 (out of a maximum of 10.0). There were 14 guided permit holder no shows, 11 standby permit holder no shows, and 3 special access permit holder no shows. The 199 participants in bear viewing during the 2017 season came from 6 countries, including Australia, Canada, Germany, Japan, Switzerland and the United States. Of the 199 bear-viewing visitors to McNeil River, 59% were Alaska residents and 41% were nonresidents. Of the 228 people who purchased permits, 60% were resident and 40% were nonresident.

There were a total of 1,092 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 1,080 days within the sanctuary, logging 714 actual bear-viewing days. On average there were 13.5 visitors at McNeil River camp on any day, higher than both the 5-year and 10-year averages of 11.6 and 11.7 respectively. There was an average of 8.9 bear viewers per day, higher than the 5- and 10-year average of 7.9. Permitted visitors spent an average of 5.4 days each in the sanctuary and participated in the bear-viewing group an average of 3.6 days each.

The 16 special access permits issued in 2017 included the following recipients: ADF&G Hunter Education, Becharoff National Wildlife Refuge Staff, University of Washington researchers, Alaska Magazine writers, Clem Tillion party, Kenai Peninsula Borough Mayor party, and Katmai National Park bear management staff.

During 2017, 15 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 \$73,400.00 was generated from the 2017 McNeil River sanctuary permit program and deposited in the state's Fish and Game Fund.

Table 7. Visitor use at McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska, 1984–2017.

Year	No. of applicants	No. of bear-viewing visitors 6/7–8/25 ^a	Bear-viewing use days 6/7–8/25 ^b	Total bear-viewing visitor use days 6/7–8/25 ^c	Total sanctuary visitor days 6/7–8/25 ^d	Visitor days viewing @ McNeil falls 7/1–8/25 (560 possible) ^e	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	1,156	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	1,266	452	6/7–8/25
2010	714	176	593	932	1,100	433	6/7–8/25
2011	751	195	674	1,017	1,089	447	6/7–8/25
2012	719	180	641	969	1,041	458	6/7–8/25
2013	934	156	574	842	890	388	6/7–8/25
2014	1,075	171	603	882	923	424	6/7–8/25
2015	983	178	678	916	946	471	6/7–8/25
2016	819	175	596	895	929	397	6/7–8/25
2017	972	199	714	1,080	1,092	488	6/7–8/25

^a Sum of all guided, standby, and special access permittees who visited McNeil River State Game Sanctuary.

^b Sum of all guided, standby, and special access permittees who bear viewed each day of season (only those who viewed bear/day).

^c Sum of all guided, standby, and special access permittees in sanctuary each day of season (includes all permittees in sanctuary if viewed or not).

^d Sum of all guided, standby, and special access permittees and nonviewing permittees (staff subs not included) each day of viewing season.

^e Sum of all guided, standby, and special access permittees each day during approximate McNeil falls season.

KAMISHAK RIVER

Lodges and air charter services conduct sport fishing and wildlife viewing trips in 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 DNR. 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, DNR land use permit, and an ADF&G McNeil River SGS 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 bears observed on a data sheet titled “Annual Report for Guides, Transporters, and Lodges.”

During 2017, 10 commercial transporter permits were issued to commercial operators for the purposes of transporting clients to the Kamishak River area for sport fishing. Seven of these companies made trips into the Kamishak area. As reported, these guide services spent 550 visitor use days in the sanctuary, which included 377 angler use days and 173 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. Commercial guides reported seeing an average of 8 bears per day (range 0–16) during operations between 30 June and 30 September.

CHENIK LAKE-CREEK AREA

The mouth of Chenik Creek is another area within MRSGS where low levels of bear viewing have occurred historically. Two commercial groups were permitted in the Chenik area in 2017. One commercial bear-viewing guide service from Homer obtained a special area permit for a temporary tent camp at Chenik Lake and brought clients to the Chenik Creek mouth area for bear-viewing activities. He reported 16 guide use days and 36 visitor bear-viewing (non-angler) use days. The second commercial permit issued was not utilized. Private groups were also known to have visited the Chenik area in 2017. From the incidental observations available, there were at least another 15 visitor use days from these private parties and 4 visitor use days from a commercial film crew. In total there were 71 reported visitor use days at Chenik Creek.

BEAR-HUMAN CONFLICTS

As detailed above there were 1,092 user days associated with ADF&G’s bear-viewing program at the McNeil River camp. An additional 513 user days were reported by area guides or the public using the Kamishak River and Chenik Creek areas of MRSGS and MRSGR. All 1,605 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 ADF&G’s bear-viewing program. Commercial sport fishing and bear-viewing entities perform

self-reporting to ADF&G on any adverse interactions. During the 2017 season, there were no reported adverse interactions between bears and people in MRSGS or MRSGR.

LAND USE PERMITTING

ADF&G-DWC is working on renewals of its ADF&G special area permit and DNR-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 14 ADF&G special areas permits and 20 ADF&G commercial access permits were issued during 2017. These included the special areas and commercial access permits issued to companies involved in commercial transportation, sport fishing, and wildlife viewing in the McNeil River, Kamishak River, and Chenik Creek areas. As well as, permits for fisheries research equipment at Mikfik Lake, Chenik Lake, and Paint River.

There were no mineral resource or development activities applied for, permitted, or reported to the department within MRSGS or MRSGR during 2017.

Fish and Wildlife Research

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

MIKFIK CREEK VIDEO RESEARCH

A remote video escapement recorder was installed at the outlet of Mikfik Lake for the twentieth consecutive season. This project has proven invaluable to both in-season 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 logging 1 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 1 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 when funding allows, ultimately incorporating it into the Mikfik remote video recording system and potentially applying it to similar projects throughout the management area.

In 2017, the video system at Mikfik Creek-Lake was installed on 30 May and shut down on 30 July. The system operated continuously (~24 hr/d) and successfully recorded images approximately 100% of the time that it was programmed to operate between 30 May and 30 July (1,530 hr). The 2017 sockeye salmon run into Mikfik Lake was characterized by 3 distinct pulses of escapement. Over 3,500 sockeye salmon entered the lake over a 5-day period in early June, followed by 2 other spikes of 2,300 and 1,400 fish in early and mid- to late July, respectively. Unlike recent years, in 2017 ADF&G-CF staff did not have to breach any active beaver dams on Mikfik Creek to allow migrating sockeye salmon to reach the lake.

A single camera mounted on the original (west bank) light pole was used to collect all video images of fish passage in 2017. Recordings were made using a time-lapse rate of 5 frames per second, which has proven to provide sufficient 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, 7,495 sockeye salmon were counted into 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 is based on remote video, the method currently used to monitor escapement (Otis et al. 2013). As a result, the remote video based estimate of 7,495 fish was used as the final escapement index in 2017. The video-based escapement goal for Mikfik Creek sockeye salmon is 3,400–11,000 fish (Otis et al. 2016a).

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 1,530 hours of recorded video between 30 May and 30 July, reviewers documented 157 instances where brown bears transited the field of view of the camera, an average of 2.5 bears per day of video operation ($n = 62$ d). Most sightings were of individual bears, but several were of females with 1, 2, or 3 cubs. Other wildlife species observed included wolf, coyote, eagle, beaver, 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 (Gill and Helfield 2012). 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 Ian to use the methodology and data in developing a model to estimate bear-salmon predation on prespawning chum salmon in McNeil River. Since 2011, ADF&G-CF staff has continued the video project to estimate the number of pre-spawning chum salmon killed by bears at McNeil River falls each year. The current project is being conducted in collaboration with Dr. Brad Harris, a professor at Alaska Pacific University (APU), where one of his students is reviewing the video. For the 2017 field season, APU purchased a new high-definition camera system to enhance the project's ability to collect accurate predation data and to evaluate the potential for identifying individual bears using enhanced video techniques.

Sanctuary Administration and Management

STAFFING

Sanctuary Manager Tom Griffin completed his 18th season at McNeil River, his 8th as manager. Beth Rosenberg completed her 2nd season as Assistant Manager and Ray Pohl (Wildlife Technician III) completed his 3rd season. Staff arrived at the McNeil River camp on 25 May 2017 and pulled camp on 26 August 2017. We were very fortunate to have Ed Weiss (Lands and Refuge Manager) and Dave Saalfeld (Wildlife Biologist) fill-in this year as group leaders when regular staff was on leave. In addition to their normal duties at the sanctuary, the McNeil staff completed the annual ADF&G firearms safety training in spring 2017.

Volunteers

Volunteers Blaine Smith, Deb Ajango, Pete Robinson, Sarah Woolley, John Tuckey, Lindsay Tisdale, and Robert Hixon completed extensive work on the trail system and additional camp maintenance from 30 May through 6 June. Many thanks to this fantastic group of volunteers.

FACILITIES

Several trail maintenance projects were completed with the volunteer trail crew during a week of pre-season trail work. These included 1) setting and anchoring a portion of the geoblock[®] trail that runs parallel with the Mikfik Creek riffles; 2) relocating and reworking several sections of the trail along the base of the east bluff of Mikfik to allow for better drainage and walking conditions; 3) installing a switch back trail on the steep hill leading to lower/upper Mikfik Creek falls - steep and rain-gouged gully trail (Heart Attack Hill) replaced with lower grade switchback; 4) gravel viewing pad at McNeil falls was cleared of encroaching grasses, re-graveled, and several large rocks were reset to improve footing from the upper and lower viewing pads; and 5) one section of wooden boardwalk near the viewing pad was rebuilt for

more stable footing. Additional maintenance items around camp included alders trimmed around camp for better visibility, 7 bags of invasive dandelions were removed, damaged cedar 1"×3" batons on cabins were replaced, rotten 2" decking/picnic table were replaced, re-setting and caulking roofing screws and caulking fiberglass seams on cabin rooves and successional vegetation was thinned in the sauna pond, stone work and replacement of wood stove in the front cabin, 3 wheelbarrows were repaired, ventilation pipes installed in the 2 public outhouses, sauna door handle was repaired, and staff outhouse door was repaired.

Acknowledgments

Thanks to Lands and Refuge Manager Ed Weiss and ADF&G Wildlife Biologist Dave Saalfeld 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) and Andy Wizik (CIAA) provided information on activities at the Paint River fish ladder. Mike Bouwkamp (ADF&G-DWC) provided bear-viewing applicant information. Megan Marie (ADF&G-DOH) provided special area permit information. Laura McCarthy (ADF&G-DWC) provided formatting and editing changes and prepared this document for publishing.

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Appendix. Daily wildlife observations during 2017, McNeil River State Game Sanctuary, Alaska.

Date	Location zone ^a	Comments
5/25/2017	CMP	Observed 2 golden-crown sparrows first of season
5/25/2017	CMP	Observed 1 bald eagle behind camp
5/25/2017	SPT	Observed glaucous-wing gull, spit
5/25/2017	TDF	Observed 1 loon Single bird on water in front of camp
5/25/2017	MSE	Observed 1 northern harrier, p.m. east side flats
5/26/2017	TDF	Observed 18 Canada geese or brant on water and 15–20 in flight in front of camp.
5/26/2017		Observed 1 redpoll - hoary or common
5/26/2017		Observed 1 harbor seal
5/26/2017		Observed thrush (Swainson's, hermit or grey cheeked)
5/26/2017	CMP	Observed 1 red fox carrying kits, comfortable with folks in camp.
5/26/2017	LAG	Observed 25–30 brant, in the lagoon side of dunes.
5/26/2017	SPT	Observed 12 glaucous-winged gulls flying end of spit.
5/26/2017	SPT	Observed Unknown shorebirds (peeps) could be heard on spit.
5/27/2017	CMP	Observed 1 redpoll in camp alders, feeding on alders.
5/27/2017	CMP	Observed 1 Wilson's snipe early morning, heard from camp.
5/27/2017	CMP	Observed 1 unknown thrush (gray cheeked) camp
5/27/2017	TDF	Observed 1 red-breasted merganser, male swimming on the outside of spit, in McNeil cove in front of camp.
5/27/2017	SPT	Observed 100 brant end of spit.
5/27/2017	MSE	Observed 1 bald eagle on dune.
5/27/2017	MSE	Observed unidentified ducks in water at high tide by dune.
5/27/2017	MSE	Observed 8 scaup, (5–10) in water by dune.
5/29/2017	ODP	Observed 2 common merganser swimming, male and female. (also observed at Mikfik Lake).
5/29/2017		Observed 1 common loon, swimming and fishing in Mikfik Lake.
5/29/2017		Observed 2 rough-legged hawks, nesting pair, above Mikfik Creek upper falls, alarming call as humans approached.
5/29/2017		Observed 6 savannah sparrows, many observed 3–6+ on walk to Mikfik Lake.
5/29/2017		Observed 6 golden-crowned sparrows, many observed 3–6+ on walk to Mikfik Lake.
5/29/2017		Observed 1 beaver, in Mikfik Lake.
5/29/2017		Observed 3 green-wing teal, 1 male 2 females on walk to Mikfik Lake.
5/29/2017		Observed 2 common goldeneye, pair, on Mikfik walk.
5/29/2017	MCR	Observed 6 mew gulls.
5/29/2017	SPT	Observed 12 glaucous-winged gulls on spit.
5/29/2017	LAG	Observed 30 brant in lagoon.
5/29/2017		Observed 3 bald eagles spotted along walk to Mikfik Lake.
5/30/2017	CMP	Observed 1 arctic ground squirrel on camp trails.
5/30/2017	CMP	Observed 1 fox sparrow in camp.

Date	Location zone ^a	Comments
5/30/2017	SPT	Observed 1 wolverine on the beach in front of camp.
6/3/2017	MCR	Observed 1 belted kingfisher, upper Mikfik creek.
6/7/2017	MCU	Observed 20 bald eagles at upper Mikfik creek.
6/7/2017	MCU	Observed golden-crowned sparrows.
6/7/2017	MCU	Observed savannah sparrows.
6/7/2017	MCU	Observed 1 belted kingfisher.
6/7/2017	MCU	Observed glaucous-wing gull.
6/7/2017	MCU	Observed mew gull.
6/7/2017	LAG	Observed beach pea, many, blooming.
6/7/2017	MSE	Observed mallards.
6/8/2017	MCL	Observed bald eagles.
6/9/2017	MCR	Observed 15 bald eagle.
6/9/2017	MCR	Observed 5 glaucous-winged gull.
6/9/2017	MCR	Observed 1 Wilson's snipe.
6/10/2017	MCR	Observed 1 greater yellowlegs.
6/10/2017	MCR	Observed Sockeye (Red) Salmon in pools, but no fish running all day.
6/11/2017	MCR	Observed 1 greater yellowlegs.
6/11/2017	CMP	Observed 1 red fox on back cabin deck & fuel shed. Chest pink & swollen - nursing. No kits viewed yet.
6/11/2017	MCL	Observed many bald eagles, one has white plumage, Tom photographed. Not true albino.
6/12/2017	MCT	Observed 8 American widgeon.
6/12/2017	LAG	Observed 10 mergansers in flight over lagoon.
6/12/2017	CMP	Observed 1 red fox on beach in front of camp.
6/13/2017	MCR	Observed 2 greater yellowlegs.
6/13/2017	LAG	Observed 3 unspecified mergansers at dunes in lagoon.
6/13/2017	SPT	Observed 2 Caspian terns, orange beak, black cape, photos by Beth.
6/13/2017	LAG	Observed Caspian terns flying, vocalizing in lagoon area.
6/14/2017	LAG	Observed 2 unknown swans, straight necks, possibly tundra swans in lagoon.
6/14/2017		Observed Alaskan paint brush, first bloom.
6/14/2017	MCR	Observed 1 grey-cheeked thrush, vocalizing.
6/14/2017	MCR	Observed 1 greater yellowlegs, alarm calls.
6/14/2017	MCR	Observed 1 belted kingfisher, flying, vocalizing.
6/16/2017	MCT	Observed 25 green-winged teal, Mikfik creek tidal.
6/16/2017	TDF	Observed 2 common loons, in water, in front of camp.
6/16/2017	CMP	Observed 2 dead masked shrews, fox kill most likely, one in trail in camp, one on water trail. Most likely cinereous (see 7/29/17 observations).
6/16/2017	CMP	Observed wild iris, blooming all over now.
6/17/2017	CMP	Observed 12 tree swallows in camp.
6/17/2017	LAG	Observed 28 brant in lagoon (25-30).
6/17/2017	CMP	Observed 2 red foxes, one hunting, one sitting by den.
6/18/2017	LAG	Observed 1 Caspian tern (1) flying vocalizing in lagoon.

Date	Location zone ^a	Comments
6/19/2017	LAG	Observed 2 Caspian tern (2) flying vocalizing in lagoon.
6/19/2017	MCR	Observed 12 green-winged teal.
6/19/2017	MCR	Observed 1 hermit thrush.
6/20/2017	CMP	Observed 2 fox sparrows in camp.
6/20/2017	CMP	Observed 6 golden-crowned sparrows in camp.
6/20/2017	CMP	Observed 8 tree swallows in camp.
6/20/2017	CMP	Observed 2 American robin in camp.
6/20/2017	MCT	Observed 28 green-winged teal in Mikfik tidal.
6/20/2017	MCT	Observed 1 greater yellowlegs in Mikfik Creek riffles.
6/20/2017	MCR	Observed 1 yellowlegs, likely greater.
6/21/2017	MCL	Observed 1 peregrin falcon at Mikfik Creek lower falls.
6/21/2017	MCL	Observed 1 orange-crowned warbler at Mikfik Creek lower.
6/22/2017	MCU	Observed 2 peregrine falcons spotted by birders in group above Mikfik Upper falls.
6/22/2017	CMP	Observed 3 masked shrews, marts in trails around campand on way to water trail.
6/23/2017	MCL	Observed 1 black-billed magpie.
6/23/2017	MCL	Observed 2 common raven.
6/23/2017	MCR	Observed many bald eagles, white eagle viewed.
6/24/2017	MCR	Observed 1 white eagle at Mikfik Creek Riffle.
6/25/2017		Observed 1 bumblebee in the Mikfik area.
6/25/2017	TDF	Observed 2000 black scoters (large raft of 2000+) out toward Polly Cove in middle of bay.
6/25/2017	LAG	Observed 2 Caspian terns in lagoon.
6/25/2017	MCU	Observed 2 peregrines in dog fight with eagles.
6/25/2017	MCR	Observed 1 belted kingfisher.
6/26/2017	TDF	Observed black scoters, raft at high tide.
6/26/2017	LAG	Observed 2 Caspian terns in lagoon.
6/26/2017	CMP	Observed 1 red fox kit observed by fox den.
6/27/2017	SPT	Observed 2 black oystercatchers on spit.
6/27/2017	TDF	Observed raft black scoters, D. Saalfeld ID'd.
6/27/2017	SPT	Observed 11 brant on the spit.
6/28/2017	TDF	Observed 1000 black scoters (large raft).
6/28/2017	MCR	Observed 2 belted kingfishers at Mikfik Creek riffles.
6/28/2017	MCR	Observed 2 red-breasted merganser.
6/28/2017	SPT	Observed 4 black oystercatchers.
6/28/2017	MCR	Observed 1 yellow warbler, Mikfik Creek riffles.
6/28/2017	MCR	Observed 1 greater yellowlegs at Mikfik Creek riffles.
6/28/2017	MSE	Observed 1 Wilsons snipe at Mikfik Sedge East.
6/28/2017	MSE	Observed 1 hermit thrush at Mikfik Sedge East.
6/28/2017		Observed 2 red-throated loons.
6/29/2017	SPT	Observed 1 peregrine falcon on the Spit.
6/29/2017	MSE	Observed 2 swans at Mikfik Sedge East.
6/29/2017	MCR	Observed 3 common mergansers at Mikfik Creek Riffle.

Date	Location zone ^a	Comments
6/30/2017	MRF	Observed 1 wolf at McNeil River falls for approximately 20 minutes scavenging scraps.
6/30/2017	CMP	Observed many fledgling birds on trails to falls and around camp (sparrows, robins, thrush).
7/1/2017	MSE	Observed 1 gray wolf, crossing spit, over lagoon flats, and over dune toward Mikfik at approx. 0730.
7/1/2017	CMP	Observed 3 red fox kits active right around den entrance, small, gray, blue eyes.
7/1/2017	LAG	Observed 3 northern pintail ducks flying in a mixed flock over lagoon.
7/1/2017	MCT	Observed 1 greater yellowlegs at Mikfik Creek Tidal.
7/3/2017	TDF	Observed 2 black oystercatchers at p.m. low tide.
7/4/2017	SPT	Observed 1 beaver on the edge of the outside beach.
7/6/2017	MRF	Observed 9 common mergansers and red breasted mergansers, mixed flock.
7/6/2017	MRF	Observed 9 common mergansers and red breasted mergansers, mixed flock.
7/8/2017	MRF	Observed 1 common raven.
7/9/2017	LAG	Observed 3 Caspian terns in the lagoon.
7/9/2017	MRF	Observed 10 mew gulls mixed with glaucous-winged gulls at falls.
7/9/2017	MRF	Observed 18 bald eagles at falls.
7/9/2017	CMP	Observed 6 Red fox, 2 adults and 4 kits active around den adjacent to staff outhouse. Adults seen with ground squirrels and fledgling birds for kits.
7/10/2017	SPT	Observed 18 semipalmated plovers on spit then flying over lagoon, (15–20).
7/11/2017	CMP	Observed 6 fox kits + 2 adults near den on outskirts of camp, near staff outhouse. Kits moving further from den opening, up to outhouse.
7/11/2017	CMP	Observed many fledgers all around camp (sparrows, thrushes, robins).
7/11/2017	MRF	Observed 15 red-breasted mergansers below lower falls, floating/fishing for the 4th day in a row.
7/11/2017	LAG	Observed 1 least sandpiper, identified by biologist Declan Troy.
7/11/2017	LAG	Observed 15 Caspian terns identified by biologist Declan Troy.
7/12/2017	CMP	Observed fox sparrows, fledglings (Declan Troy).
7/12/2017	CMP	Observed golden-crown sparrows, fledglings (Declan Troy).
7/12/2017	CMP	Observed savannah sparrows, fledglings. (Declan Troy).
7/12/2017	CMP	Observed redpolls, fledglings. (Declan Troy).
7/12/2017	CMP	Observed orange-crowned warblers, fledglings. (Declan Troy).
7/12/2017	CMP	Observed Wilson's warblers, adults. (Declan Troy).
7/12/2017	CMP	Observed yellow warblers, adults. (Declan Troy).
7/12/2017	LAG	Observed 15 Caspian terns, 15 individuals. (Declan Troy).
7/12/2017	SPT	Observed bank swallows. Fledglings and mature. (Declan Troy).
7/12/2017	SPT	Observed tree swallows. Fledglings and mature. (Declan Troy).

Date	Location zone ^a	Comments
7/12/2017	LAG	Observed 20 black-legged kittiwake over lagoon and spit, 16:45 (Declan Troy).
7/14/2017	CMP	Observed 1 orange-crowned warbler in camp.
7/16/2017	CMP	Observed fireweed, first bloom at camp and McNeil river Trail.
7/17/2017	CMP	Observed 1 northern shrike.
7/17/2017	CMP	Observed ~40 swallows pushing off a northern shrike above beach and alders in front of camp.
7/21/2017	LAG	Observed masked shrew on lagoon wall eating fish scraps, unidentified shrew, spotted by Dirk Derksen.
7/23/2017	SPT	Observed 1 peregrin falcon on spit - spotted by D. Derksen & M. Petersen.
7/23/2017	LAG	Observed shrew, 2nd sighting in cave on lagoon wall feeding on fish scraps.
7/23/2017	MRT	Observed wood frog on the McNeil River Falls trail by bog.
7/24/2017	MRF	Observed 1 gray wolf at McNeil falls, far side, came from lower river. In view 15–20 minutes. It walked upriver on the far side bank. Long viewing opportunity.
7/24/2017	LAG	Observed 1 Caspian tern in lagoon.
7/25/2017	LAG	Observed 1 northern harrier in lagoon.
7/25/2017	TDF	Observed 6 harbor seals in McNeil cove.
7/25/2017	LAG	Observed 1 black-billed magpie in the lagoon.
7/26/2017		Observed 1 northern harrier.
7/26/2017	TDF	Observed 5 harbor seals in McNeil cove.
7/26/2017	CMP	Observed 1 northern harrier in camp.
7/28/2017	TDF	Observed 1 black scoter cove just off beach.
7/28/2017	MRF	Observed 15 mergansers (15+).
7/28/2017	MRF	Observed 3 common raven gang at falls.
7/29/2017	CMP	Discussed with George Matz that swallows had moved off plus or minus a week ago. He said mosquito population begins to decline mid-July and swallows leave. Also discussed that young swallows seemed to be grouping up around camp perhaps getting ready to head out.
7/29/2017	MRL	Observed 6 western sandpipers at Mikfik Creek Riffles.
7/30/2017	MRF	Observed 15 common or red-breasted mergansers below lower falls, grouping up, more every day.
7/30/2017	MRL	Observed 7 greater yellowlegs, some mature, some juvenile, in back channel to Ender's Island. Id. By G. Matz.
7/30/2017	MRL	Observed several chum salmon jumping at Ender's Island, no silver salmon in view yet.
7/30/2017	CMP	Observed 1 northern shrike on driftwood in front of camp, early morning.
7/30/2017	CMP	Observed 5 masked shrew (cinereous) found dead on trails in camp, keyed out by dental (Ed Weiss).
7/30/2017	MRL	Observed 5 greater yellowlegs in side slough below Enders Island.

Date	Location zone ^a	Comments
7/30/2017	MRF	Observed 20 common mergansers below lower McNeil falls.
7/30/2017	MRF	Observed 1 Wilson's snipe spotted behind McNeil pad as leaving by George Matz.
7/31/2017	CMP	Observed 1 female Wilson's warbler by front cabin.
7/31/2017	SPT	Observed group greater yellowlegs overfly spit (G. Matz).
7/31/2017	MRL	Observed 2 western sandpiper in slough below Enders Island.
7/31/2017	MRL	Observed 4 greater yellowlegs in slough below Enders Island.
8/1/2017	CMP	Observed 1 northern harrier (grey) behind camp.
8/2/2017	CMP	Observed 3 bank swallows in beach bank east of camp.
8/2/2017	CMP	Observed 1 yellow warbler (camp).
8/2/2017	TDF	Observed 3 rock sandpiper beach east of camp (G. Matz).
8/2/2017	LAG	Observed 200 western sandpipers in mudflats of tidal flats and lagoon (G. Matz).
8/2/2017	TDF	Observed 6 black turnstones seen on beach walk to east of camp (G. Matz).
8/3/2017	MRF	Observed 32 red-breasted mergansers grouping up below the lower falls. Id. by G. Matz.
8/3/2017	MRF	Observed 2 juvenile harlequin ducks below the lower falls on far side. Id. by G. Matz.
8/3/2017	MRL	Observed pink salmon caught by bears in lower river.
8/3/2017	MRF	Observed 2 least sandpipers on conglomerate in front of the lower pad. Observed my G. Matz.
8/3/2017	MRL	Observed Siberian aster, general observation not 1st bloom.
8/4/2017	MRL	Observed 2 pink salmon observed from lower island of McNeil River.
8/4/2017	CMP	Observed 1 northern shrike perched in dead alder along beach by back cabin.
8/4/2017		Observed 1 pigeon guillemot with fish in its mouth flew up to the cliff near waterfall.
8/4/2017		Observed 1 cormorant observed flying over water.
8/5/2017	SPT	Observed common goose barnicle, many attached to a piece of driftwood that floated up on the spit.
8/5/2017	LAG	Observed 3 greater yellowlegs.
8/5/2017	CMP	Observed 1 merlin flying above beach in front of camp.
8/5/2017	CMP	Observed 1 northern harrier flying above beach in front of camp.
8/5/2017	CMP	Observed 1 northern shrike flying low near alders in front of camp near beach.
8/6/2017	LAG	Observed 70 green-winged teal flocking up in the lagoon.
8/6/2017	SPT	Observed 20 black-billed magpies on eagle carcass at the end of the spit.
8/6/2017	LAG	Observed 1 pink salmon caught by one of the yearling cubs.
8/6/2017	LAG	Observed 2 greater yellowlegs.
8/6/2017	LAG	Observed 2 black-billed magpies.
8/6/2017	LAG	Observed 4 common ravens.
8/7/2017	LAG	Observed 70 green-winged teal flocking up in the lagoon.

Date	Location zone ^a	Comments
8/7/2017	MRL	Observed 2 pink salmon caught at lower McNeil River.
8/7/2017	LAG	Observed 6 common ravens riding the wind above the bluffs.
8/7/2017	MRL	Observed 10 green-winged teal, over flight.
8/7/2017	LAG	Observed 10 bald eagles, scattered around the lagoon.
8/8/2017	LAG	Observed 70 green-winged teal flocking up in the lagoon.
8/9/2017	SPT	Observed 1 black turnstone on spit.
8/10/2017	CMP	Observed 1 northern shrike in front of camp and on SSB pole.
8/10/2017	SPT	Observed gray wolf tracks (fresh) in wet sand on spit this a.m., wolf not observed.
8/10/2017	END	Observed 1 harlequin duck .
8/10/2017	MCT	Observed 30 green-winged teal.
8/10/2017	MCT	Observed 6 American wigeon.
8/10/2017	LAG	Observed 4 greater yellowlegs.
8/10/2017	MRL	Observed 16 red-breasted mergansers.
8/11/2017	MRL	Observed 1 dolly varden/arctic char (<i>Salvelinus malma</i>) caught.
8/12/2017	LAG	Observed 70 green-winged teal.
8/12/2017	MCT	Observed 40 green-winged teal.
8/12/2017	LAG	Observed 8 greater yellowlegs.
8/13/2017	CMP	Observed 1 merlin soaring above camp.
8/13/2017	MRL	Observed 1 harlequin duck .
8/14/2017	MRL	Observed 5 whimbrels standing on sand bar near the edge of the river.
8/14/2017	MRL	Observed 9 sandhill cranes flying high above.
8/14/2017	MCT	Observed 7 greater yellowlegs also observed in lower McNeil River.
8/14/2017	LAG	Observed 3 common ravens.
8/14/2017	MRL	Observed 2 black-billed magpies.
8/15/2017	SPT	Observed sea rocket (<i>cakik edentula</i>) 1st observation this season on spit.
8/16/2017	CMP	Observed 1 fox sparrow (chubby fledgling) eating seeds.
8/16/2017	TDF	Observed rockweed (<i>fucus distichus</i>) on rocks at the in McNeil Cove.
8/16/2017	LAG	Observed eelgrass (<i>zostera marina</i>), small patches in the lagoon.
8/16/2017	LAG	Observed 1 merlin.
8/16/2017	LAG	Observed 2 greater yellowlegs.
8/16/2017	MCT	Observed 30 green-winged teal.
8/16/2017	MRL	Observed pink salmon, many.
8/17/2017	CMP	Observed northern harrier flying.
8/18/2017	MRL	Observed 1 greater yellowlegs.
8/19/2017	CMP	Observed 1 merlin flying over camp.
8/19/2017	LAG	Observed 1 northern harrier flying low over grasses at edge of lagoon as we left camp.
8/19/2017	MRL	Observed 3 greater yellowlegs, repeated sightings.
8/19/2017	MRL	Observed pink salmon spawning at lower McNeil River and Ender's Island.
8/20/2017	CMP	Observed 2 northern harriers behind camp.
8/20/2017	CMP	Observed red fox kits and one adult out in the rain in p.m.

Date	Location zone ^a	Comments
8/21/2017	LAG	Observed 5 harbor seals in the lagoon at high tide.
8/21/2017	MRL	Observed 15–20 mergansers in lower river grouping up.
8/22/2017	MRF	Observed 50 mergansers in lower river grouping up.
8/22/2017	MRL	Observed 2 greater yellowlegs.
8/23/2017	MRL	Observed 2 barrow's goldeneye females.
8/23/2017	LAG	Observed 8 harbor seals in lagoon at high tide.
8/23/2017	LAG	Observed 1 parasitic jaeger flying over lagoon with flock of glaucous-winged gulls. Vocalizing. Id. by Catherine Bursch with Kachemak Bay Research Reserve.
8/25/2017	LAG	Observed 1 coho salmon (bright) in the mud in lagoon.
8/25/2017	LAG	Observed 1 rock sandpiper.
8/25/2017	LAG	Observed western sandpipers (black legs).
8/25/2017	MRL	Observed mergansers.
8/25/2017	LAG	Observed green-winged teal.
8/25/2017	LAG	Observed greater yellowlegs.

^a Location zones: CMP = Camp; END = Enders Island; LAG = Lagoon; MCL = Mikfik Creek Lower Falls; MCR = Mikfik Creek Riffles; MCT = Mikfik Creek Lower Tidal Sect.; MCU = Mikfik Creek Upper Falls; MRF = McNeil Falls; MRL = Lower McNeil River (below lower McNeil Falls to Lagoon); MRT = McNeil/Mikfik Bench; MSE = Mikfik Sedge East; ODP = Opposite Driftwood Pt.; SPT = Spit; TDF = Tidal Flats.

