

McNeil River State Game Sanctuary Annual Management Report 2014

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Cover Photo: Brown bear (*Ursus arctos*) maternal female with 2 cubs of year at McNeil River State Game Sanctuary, Alaska. ©2014 ADF&G, photo by Thomas M. Griffin.

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Executive Summary

The McNeil River State Game Sanctuary (MRS GS) and McNeil River State Game Refuge (MRS GR) were created by the Alaska State Legislature in 1967 and 1991, respectively. The sanctuary was established primarily to provide permanent protection for brown bears (*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 remained good in 2014 as indicated by all 3 data indices. Bear index count numbers at McNeil River falls, the primary bear gathering and viewing location, averaged 41 bears, lower than the 2013 average (49.9) and 2012 average (53.9) yet above the lower limit average of 40.8 bears. Staff observed 89 individual bears this season at MRS GS; expending approximately 1,070 bear use days within the sanctuary. The long-term (1976–2013) average number of individual bears annually identified is 93.8 and the median number of individual bears annually identified (1976–2014) is 95.

The bear-viewing program at MRS GS attracted 1,075 applicants from 16 different countries, who vied for 185 regular permits and 57 standby permits issued through a lottery. Sixty-four percent of applicants were Alaska residents and 36% were nonresidents. The 189 guided, standby, and special access permits purchased were distributed to 66% Alaska residents and 34% nonresidents. The 171 participants in bear viewing during the 2014 season came from 6 countries, including Canada, Great Britain, Israel, Japan, Poland, and the United States. The MRS GS bear-viewing permit program generated approximately \$67,150.00 in 2014 that was deposited into the state's Fish and Game Fund.

The 2014 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 17,475 fish. The 2014 run timing of McNeil River chum salmon was earlier than in previous years. ADF&G-Division of Commercial Fisheries (CF), continued working on a remote video project designed to estimate bear predation on chum salmon at McNeil River falls. ADF&G-CF staff also continued work collecting baseline genetic samples from wild pink, coho and chum salmon stocks in McNeil River and nearby streams (e.g., Kamishak River, Amakdedori Creek).

A total of 5 ADF&G special area permits and 15 commercial access permits were issued during 2014. These included permits issued to commercial operators for their guide operations in the Kamishak River and Chenik Creek areas and commercial access to McNeil River camp. There were no mineral resource developments or activities permitted or reported to the department within MRS GS or MRS GR during 2014.

During 2014, the Cook Inlet Aquaculture Association (CIAA) conducted some minor maintenance and opened the Paint River fish ladder to allow water flow for evaluation purposes and potential salmon colonization between 13 June and 7 September.

A few coho salmon were observed using the ladder in September 2014.



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.

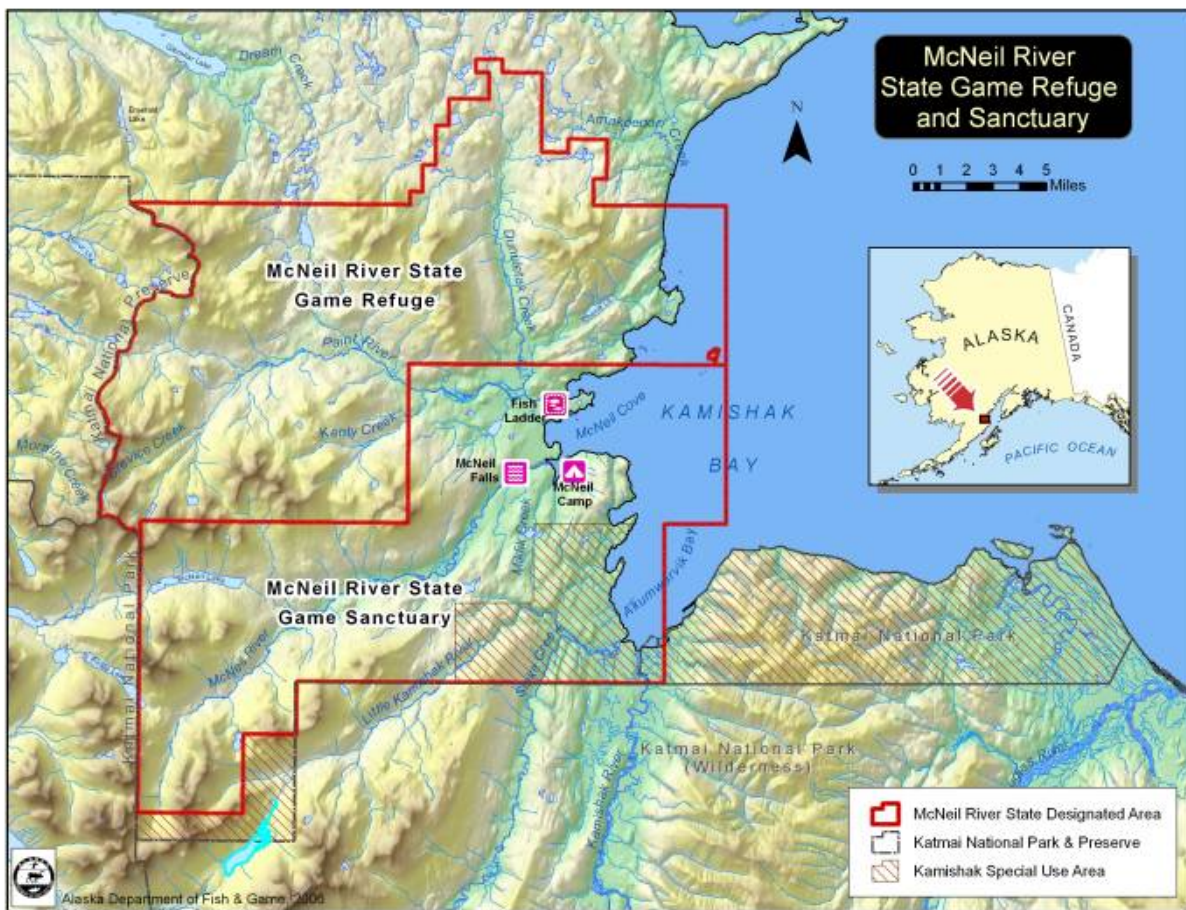


Figure 1. Location of the McNeil River State Game Sanctuary and McNeil River State Game Refuge in Southwest Alaska.

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 and mineral entry in the refuge is permitted.

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

Wildlife

BROWN BEAR MONITORING PROGRAM

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 falls fluctuates daily and annually. Variability in bear use may be influenced by several factors including food availability, the strength and timing of salmon runs in McNeil River and surrounding river systems, changes in the regional bear population, as well as hunting and other human-caused mortalities. A public advisory committee assisted ADF&G 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).

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. This index monitoring program is intended to allow the department to detect large, short-term declines or gradual, long-term declines in the average number of independent bears at McNeil River falls. A decline below a certain level may be indicative of adverse impacts to the purposes for which the sanctuary was established and would initiate an assessment of the possible causes.

Beginning in 1993 these index counts were conducted from the viewing pad at McNeil River falls each hour between 11:00 AM and 7:00 PM; 15 July–5 August. Due to the changing and opportunistic nature of the daily bear-viewing schedule, the number of hourly counts that occur from year to year is variable. In order to obtain the index, the average of the 7 highest daily hourly counts is calculated. At inception, the annual medians of the 7 highest daily counts of bears at the falls from 1983 to 1992 were averaged to establish a standard of 48.6 bears as the benchmark for maintaining bear numbers and the quality viewing opportunities in the sanctuary. And the lower limit of these medians of 40.8 bears, representing a statistically significant lower level in the observed number of bears, was established as the bear threshold criterion.

Since 2011, staff have implemented these hourly index counts throughout the bear viewing day at all locations for the entire season in order to gather additional data on bear use and the quality of the bear viewing at locations in addition to the McNeil River falls viewing pad. For consistency with historical data these expanded data had thus far only been analyzed for the period 15 July–5 August.

During 2014 and 2015 a retrospective review of the historic data, along with this newer data, showed several details that affect the index counts traditionally gathered at the falls viewing pad. For one, variations in the fish runs, as well as flood events, affect the number of bears present at the falls, and the timing of that presence. Thus the 7 highest hourly counts at McNeil River falls do not always occur during the 15 July–5 August period, which can skew data towards a lower number in some years, when only considering the period 15 July–5 August. Additionally, the practice of not including cubs in the analysis of these index counts was not consistently applied over the years. The practice of using only counts up to 19:00 was also inconsistently applied over the years. And finally, the Shewhart–CUSUM control monitoring scheme used to assess if the index number is within normal variation does not account for the 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 2014 the average of the 7 highest hourly counts was 41 bears; above the long-term average of 40.8 bears. As noted above, historically these highest counts are derived from data collected during 15 July–5 August; however, during 2014, 5 of the highest counts occurred outside this typical window (1, 4, 5, 8, and 9 July) and were used in the resulting index. Bear index count numbers during 2014 continued a slight downward trend from the higher numbers experienced in 2010 and 2011, but were still above those seen in the previous decade. Four of the highest hourly counts for 2014 are above the long-term average (40.8 bears) and 3 of the 7 hourly counts are below the long-term average. The 2014 average of 41 was lower than the previous 4-year averages of 2010 (59.9), 2011 (60.9), 2012 (53.9), and 2013 (49.9); however these past 4 years were some of the highest averages recorded since 1998. Between 1993 and 2014 the highest and lowest averages of the 7 highest hourly counts were 61 (2011) and 22 (2005), respectively. From 1998 to 2005, there was a relatively steady decline in the average of the 7 highest hourly counts. From 2005 to 2013, there has been an increase in the average of the 7 highest hourly counts. Hourly index counts for 1993–2014 are presented in Table 1. Index numbers for 1993–2014 are presented in Figure 2.

Individual Counts

A second method of monitoring bear use and the quality of the bear-viewing program at MRSGS is by tallying the number of individually identifiable bears (adults, subadults, and cubs) observed by sanctuary staff daily and throughout the season (Table 1). 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 (39 years). Only individual bears that are known or recorded a minimum of 3 times are included in this count. Hence, this method provides an intrinsically conservative estimate. This monitoring method records the presence of an individual bear within MRSGS, if observed during viewing, on a daily basis. While it does not provide the true count of all bears present at MRSGS, it does provide an additional index in evaluating the overall bear use and the quality of the bear-viewing program.

There were 89 individual bears identified at MRSGS during the 2014 season. This is lower than bears recorded during 2010–2013 and lower than the long-term (1976–2014) average of 94 bears but remains higher than the low numbers experienced during 2004–2005. Since 1976 the lowest count was 58 (1976) and the highest count was 144 (1997).

Table 1. Daily highs of systematic hourly index counts of brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 1993–2014. (Underlined bold numbers = 7 highest hourly counts for the season.)

Date	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Jul-01														1			13	7	18		14	38
Jul-02													13				14	14	18		17	35
Jul-03																3	16	16	17	20	18	30
Jul-04													16	3			15	26	13	20	30	44
Jul-05													20	12	4	9	15	27	14	18	28	37
Jul-06													20	12	4	8	19	19	10		27	28
Jul-07													<u>22</u>	18		16	21	27	12	13	26	33
Jul-08													21	14	4	10	25		24	25	35	47
Jul-09													<u>25</u>	15		14	26		27	41	34	48
Jul-10													<u>23</u>	21	11	14	33	17	31	<u>45</u>	36	7
Jul-11												15	<u>28</u>	18	11	17	28	27	30	37	45	7
Jul-12												10	<u>24</u>	19	17	24	32	33	33	0	<u>49</u>	16
Jul-13												<u>20</u>	<u>28</u>	26	20	22	25	30	40	36	<u>50</u>	28
Jul-14												<u>20</u>	<u>21</u>	<u>34</u>	21	18	27	42	42	40	<u>48</u>	32
Jul-15				34	30	41	25	<u>34</u>	25	<u>30</u>	<u>36</u>	19	19	<u>31</u>	29	25	<u>41</u>	54	<u>50</u>	<u>48</u>	<u>57</u>	<u>40</u>
Jul-16				35	26	39	25	31	<u>39</u>	26	<u>27</u>	<u>24</u>	19	<u>31</u>	<u>35</u>	32	<u>34</u>	<u>64</u>	<u>54</u>	<u>50</u>	39	<u>36</u>
Jul-17				24	40	41	32	30	<u>40</u>	28	<u>32</u>	<u>20</u>	21	<u>31</u>	32	28	<u>35</u>	53	42	<u>63</u>	44	29
Jul-18	<u>34</u>	30	29	<u>35</u>	33	<u>42</u>	23	29	<u>40</u>	<u>31</u>	<u>31</u>	<u>21</u>	19	30	<u>37</u>	37	<u>34</u>	<u>54</u>	<u>64</u>	<u>66</u>	<u>51</u>	23
Jul-19	<u>49</u>	<u>44</u>	<u>33</u>	<u>49</u>	<u>49</u>	<u>52</u>	31	<u>33</u>	<u>35</u>	<u>31</u>	<u>31</u>	<u>25</u>	20	<u>33</u>	29	38	<u>39</u>	<u>70</u>	<u>75</u>	<u>62</u>	<u>50</u>	25
Jul-20	<u>46</u>	<u>33</u>	<u>40</u>	<u>37</u>	<u>41</u>	27	<u>34</u>	20	<u>37</u>	26	<u>29</u>	<u>22</u>	<u>22</u>	<u>37</u>	<u>42</u>	<u>42</u>	<u>40</u>	<u>54</u>	<u>62</u>	<u>43</u>	40	21
Jul-21	<u>38</u>	<u>39</u>	28	<u>44</u>	<u>40</u>	8	32	25	<u>39</u>	<u>36</u>	21	19	11	21	<u>40</u>	40	21	<u>70</u>	<u>65</u>	35	42	19
Jul-22	<u>45</u>	24	<u>37</u>	<u>42</u>	34	17	<u>35</u>	<u>34</u>	32	21	<u>26</u>	18	16	24	<u>34</u>	<u>42</u>	10	<u>54</u>	<u>60</u>	24	41	12
Jul-23	<u>42</u>	<u>40</u>	28	<u>43</u>	<u>46</u>	28	<u>38</u>	<u>33</u>	30	<u>33</u>	23	15	16	<u>31</u>	30	<u>41</u>	14	50	47	32	36	11
Jul-24	29	<u>46</u>	<u>30</u>	28	37	36	29	<u>33</u>	<u>42</u>	<u>30</u>	16	18	12	26	21	<u>40</u>	25	32	37	21	<u>45</u>	9
Jul-25	18	18	<u>38</u>	<u>38</u>	<u>40</u>	<u>44</u>	26	<u>33</u>	33	28	18	11	2	27	29	<u>51</u>	<u>40</u>	21	39	26	35	7
Jul-26	28	30	<u>30</u>	29	<u>41</u>	<u>57</u>	32	<u>32</u>	24	24	16	7	6	25	<u>36</u>	<u>49</u>	21	41	38	31	33	9
Jul-27	<u>33</u>	<u>38</u>	<u>34</u>	32	<u>41</u>	<u>48</u>	28	23	29	20	20	6	5	31	<u>33</u>	34	30	<u>62</u>	26	20	24	8
Jul-28	23	<u>32</u>	25	30	22	<u>46</u>	32	20	23	26	12	10	6	27	33	35	32	49	43	26	15	9
Jul-29	25	31	11	17	25	<u>44</u>	<u>36</u>	21	20	<u>30</u>	14	9	6	25	29	<u>42</u>	33	44	45	25	11	12
Jul-30	21	24	24	26	22	35	<u>37</u>	25	15	23	14	8	8	20	17	33	29	35	38	18	10	7
Jul-31	18	19	27	22	11	30	<u>38</u>	16	11	25	11	10	7	20	22	35	18	31	24	19	7	7
Aug-01	13	15	22	22	17	30	<u>36</u>	12	7	21	9	8		12	15	30	14	23	22	14	3	4
Aug-02	7	14	15	18	20	26	29	17	5	19	11	9		11	13	18	10	28	11	10	3	5
Aug-03				18	16	21	24	22	3	15	5	8		10	16	19	8	19	7	9	5	3
Aug-04				11	11	8	15	11	3	9		4		10	14	19	-	12	5	10	3	
Aug-05				10		14	18	4	4	8	6	5		6	7	18	9	19	9	11		
Mean of 7 Daily Highs	41.00	38.86	34.57	41.14	42.57	47.57	36.29	33.14	38.86	31.57	30.29	21.71	24.57	32.57	36.71	43.86	37.57	61.14	61.43	53.86	50.00	41.43

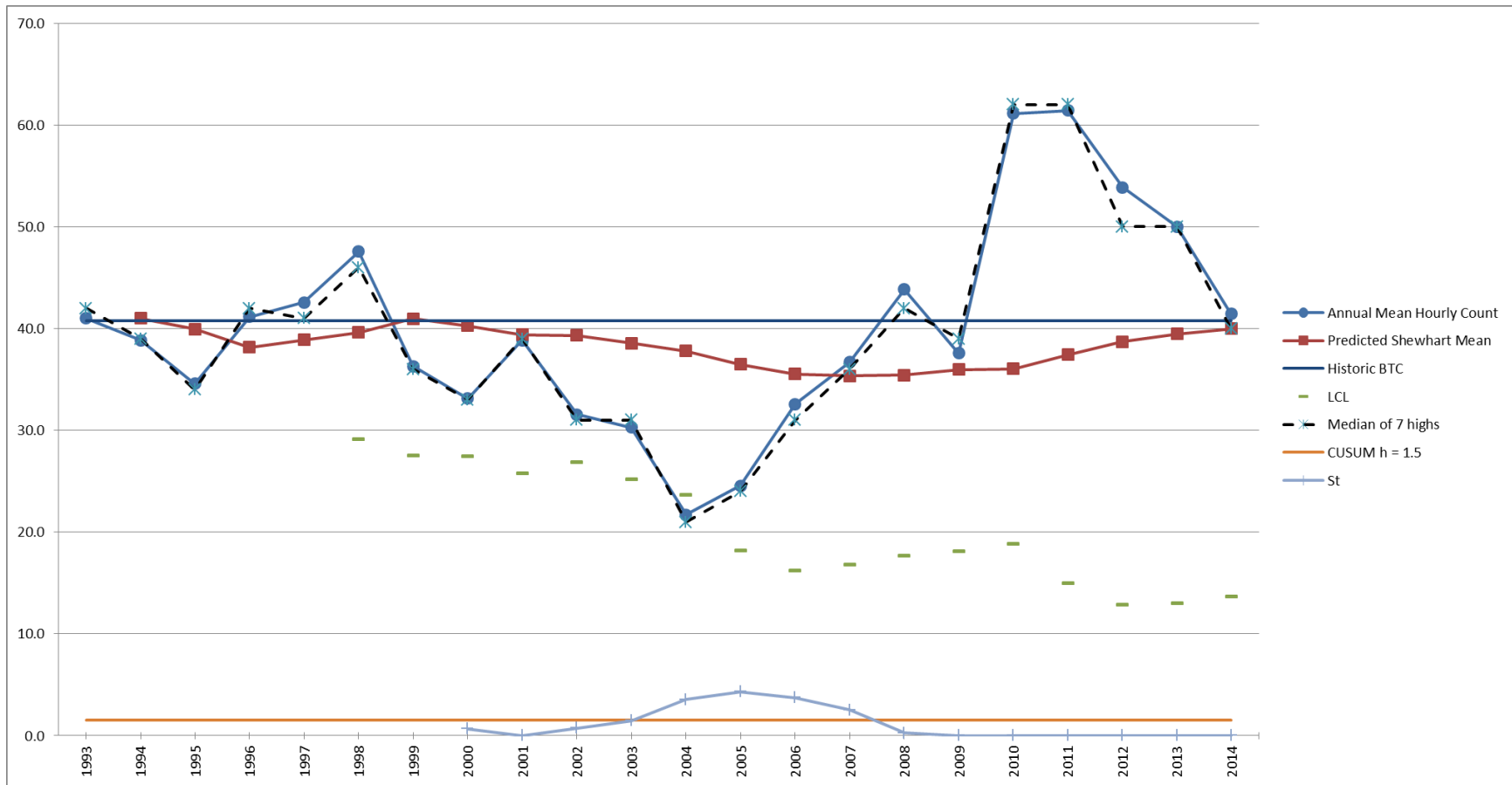


Figure 2. Historic index counts (annual mean of 7 highest systematic daily counts) brown bears at McNeil River falls, McNeil River State Game Sanctuary, Alaska, 1993–2014 ($\alpha = 0.01$).

Bear Use Days

The quality of the bear-viewing experience is not just a matter of the number of bears that visit the area in a season, but also the number viewed on a daily basis and how many days the bears stay in the sanctuary. By summing the individual adult and subadult bears observed daily throughout the season an index of the number of bear use days is calculated. While these counts include bears within all viewing areas within MRS GS, only data from McNeil River falls, 15 June–25 August, is used for the index and historical comparison (Fig. 3). One bear or family group at McNeil River falls seen during a day is counted as 1 bear use day. This monitoring method may be less reliable than the index counts discussed above due to variability of bear identification among sanctuary staff and the variable timing of the counts. However, it can be used to further the interpretation of these other monitoring methods and it generally follows the same trends as the other methods. Bear use days are useful because they track how many days per season individual bears use the sanctuary. These data have been recorded since 1980, but no data were recorded in 1999, 2000, or 2001.

There were 1,070 bear use days at McNeil River falls in 2014, which is below both the long-term average (1980–2014) of 1,215 and the recent 10-year average of 1,086. The lowest count was 709 bear use days in 1980 (first year these data collected) and the highest count was 1,863 in 1989.

Sex and Age Composition

Changes in the sex and age composition of a wildlife population can be indicative of other changes in the species' habitat and environment. The sex and age ratios of adult bears using McNeil River and Mikfik Creek have changed in the last several years (Fig. 3; Table 2). While males have typically outnumbered females, this difference has steadily increased since 1985. The percentage of male bears observed throughout the season increased from the 1984–1988 (5-year) average of 53% to the 2010–2014 (5-year) average of 72%.

There were 4 maternal females and 8 cubs observed within the viewing areas during 2014 (Table 2). It is noteworthy that the 5-year averages, starting from 1995–1999 and going through 2010–2014, exhibit an overall decline in maternal females in the past several decades. The number of subadult bears observed in 2014 was 1. In looking at the data, it can be observed that the average number of subadults declined steadily from the 1984–1988 (5-year) average of 13 to the 2000–2004 (5-year) average of 5, and then increased slightly for the 2004–2008 (5-year) average of 9 and declined to the 2010–2014 (5-year) average to 6 bears.

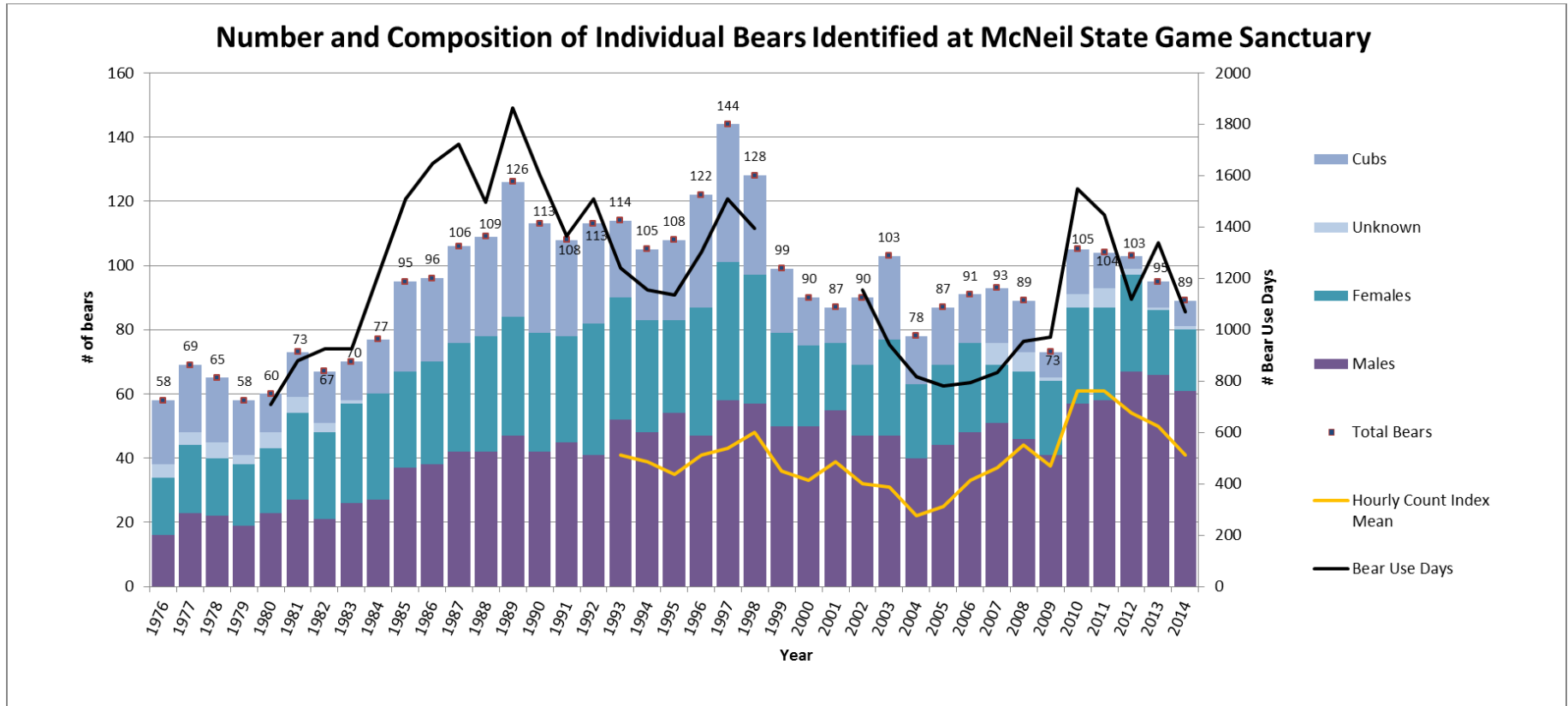


Figure 3. Annual brown bear numbers, bear use days, and index counts compared to bear composition, McNeil River State Game Sanctuary, Alaska, 1976–2014.

Table 2. Composition of brown bears observed at McNeil River State Game Sanctuary, Alaska, 1976–2014.

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
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
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
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
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
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
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
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
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
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
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
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
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
<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>																																							

Bear Photo Identification Project

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

Other Areas

The department currently does not conduct bear surveys or monitoring in other areas of MRS GS or MRS GR. Some information is available through opportunistic surveys and commercial guide reporting from the Chenik Lagoon area and from the Kamishak River and Little Kamishak-Strike Creek areas.

KAMISHAK RIVER DRAINAGE

The lower stretches of the Kamishak River, Little Kamishak River, and Strike Creek are within 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 mid-September and brown bears are typically observed on a daily basis. Based on reporting by the 6 guide services operating in 2014, the average number of bears seen per day on the Kamishak River from 10 July 2014 through 21 September 2014 was 3.

CHENIK CREEK

ADF&G does not conduct bear surveys in the Chenik Creek area; however, one local Homer guide did view bears in the lower Chenik Creek-Chenik Lagoon area in 2014. He observed up to 15 individual bears 10–18 July 2014 with the following composition (including cubs): 1 maternal female with 3 cubs of the year, 1 maternal female with 2 yearlings, 2 subadults, 4 adult female and 2 adult males.

OTHER WILDLIFE

General Observations

During the 2014 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 2014 season. Some were species that are regularly seen in MRS GS, including Wilson's snipe, golden-crowned

sparrows, savannah sparrows, Wilson's warblers, American robins, hermit thrush, tree swallows, common redpoll, glaucous-winged gulls, mew gulls, brant, green-winged teal, common ravens, red-breasted mergansers, greater yellowlegs, northern pintails, black-billed magpies, northern harriers, and bald eagles. Less frequently seen birds were also observed, including several Caspian terns, whimbrels, a black oystercatcher, black turnstones, surf scoter, sandhill cranes, a northern shrike, tundra swans, bank swallows, belted kingfishers, double-crested cormorants, spotted sandpipers, alder flycatcher, peregrine falcons, black-capped chickadees, red-throated loons, merlins, and a pine grosbeak. Willow ptarmigan were again observed on the McNeil River trail, and pigeon guillemots and a wandering tattler were observed from McNeil Head.

Marine mammal sightings during the 2014 season included the usual Pacific harbor seals which are generally seen at high tide throughout the season in McNeil River lagoon, McNeil Cove, and the lower tidal areas of McNeil River and Mikfik Creek. An unusual sighting was also made of a single sea otter (*Enhydra lutris*) just outside the lagoon in McNeil Cove.

As for terrestrial mammals, a gray wolf (*Canis lupus*) was observed in June chasing fish in Mikfik Creek near the lower falls. A pair were also remotely observed at the outlet of Mikfik Lake at the end of May. Also, several arctic ground squirrels (*Spermophilus parryii*), a brown lemming (*Lemmus trimucronatus*), and red fox (*Vulpes vulpes*) were observed in and around camp. A moose (*Alces alces*) was observed late in the season from the McNeil trail. A brown bear was observed taking a beaver (*Castor canadensis*) in the Mikfik riffles in June.

As detailed below within the Mikfik Creek Video Research section, ADF&G-Division of Commercial Fisheries (CF) staff recorded 1,798 hours of video connected with the video monitoring of sockeye salmon escapement into Mikfik Lake. In addition to the escapement data, reviewers documented wildlife transiting the cameras view including moose, eagles, beavers, red fox, various waterfowl, wolves, porcupine (*Erethizon dorsatum*), river otters (*Lontra canadensis*), and the first recorded black bear (*Ursus americanus*) within the sanctuary. Brown bears transited the field of view of the camera in 141 instances. Nearly 2 bears per day of video operation ($n = 76$ d). Nearly all sightings were of individual bears, but a few sightings were of females with 1 or 2 cubs.

For the past 3 seasons, it has been noted by staff that some of the vegetation surrounding camp and on the adjacent hillsides was not greening up and instead appeared partially to wholly defoliated. This became more noticeable over time. After some investigation this was attributed to limited foliage on the Sitka alders and willows.

Staff contacted forest pathologist Robin Mulvey and entomologist Dr. James Kruse of the U.S. Forest Service (USFS) in 2012 and 2013 to discuss the potential causes of the defoliation. There are a multitude of hardwood defoliators in Alaska, including a variety of geometrid, tortricid and sawfly larvae with diverse hardwood hosts; as well as other agents such as Alder canker, caused by the native fungus *Valsa melandiscus*. Over the last 3–4 years USFS Forest Health Protection and cooperators have documented a regional outbreak of undulated autumnal moth (*Epirrita undulata*) and bruce spanworm (*Operophtera bruceata*) larvae in Southcentral and Southeast Alaska, including the general area of McNeil River, through aerial and ground surveys. These feed on alder, dwarf birch, some willow species, and other shrub species. According to USFS this outbreak is nearing its end.

In 2013, McNeil staff collected caterpillar samples from several alders and forwarded them to Dr. Kruse for identification. These specimens were reared to determine species and all specimens taken were determined to be Birch Leaf Roller (*Epinotia solandriana*). According to Dr. Kruse these are commonly found on alder, and also feed on willow, dwarf birch, aspen, and cottonwood. USFS Forest Health Protection and Alaska Department of Natural Resources (DNR)-Division of Forestry aerial detection surveys during 2013 mapped nearly 331,000 acres of Birch Leaf Roller defoliation, mostly in Southcentral and Southwest Alaska. The last outbreak of Birch Leaf Roller was in 2003, and the current upsurge may be the largest outbreak mapped to date. Of the current outbreak, there was 7,500 acres in the area of MRSGS-MRSGR (Iliamna quadrangle). Surveys also identified 65,400 acres of alder defoliation, 6,600 acres willow defoliation, and 650 acres of alder canker in the area. There was 21,322 acres of alder defoliation mapped within MRSGS and MRSGR (Fig. 4).

Outbreaks commonly persist for 3–5 years and defoliated plants can generally recover after a few consecutive years of defoliations; however, mortality of stems causes longer-term damage to the host. McNeil staff did not notice any significant changes and will continue observations during the 2015 season.

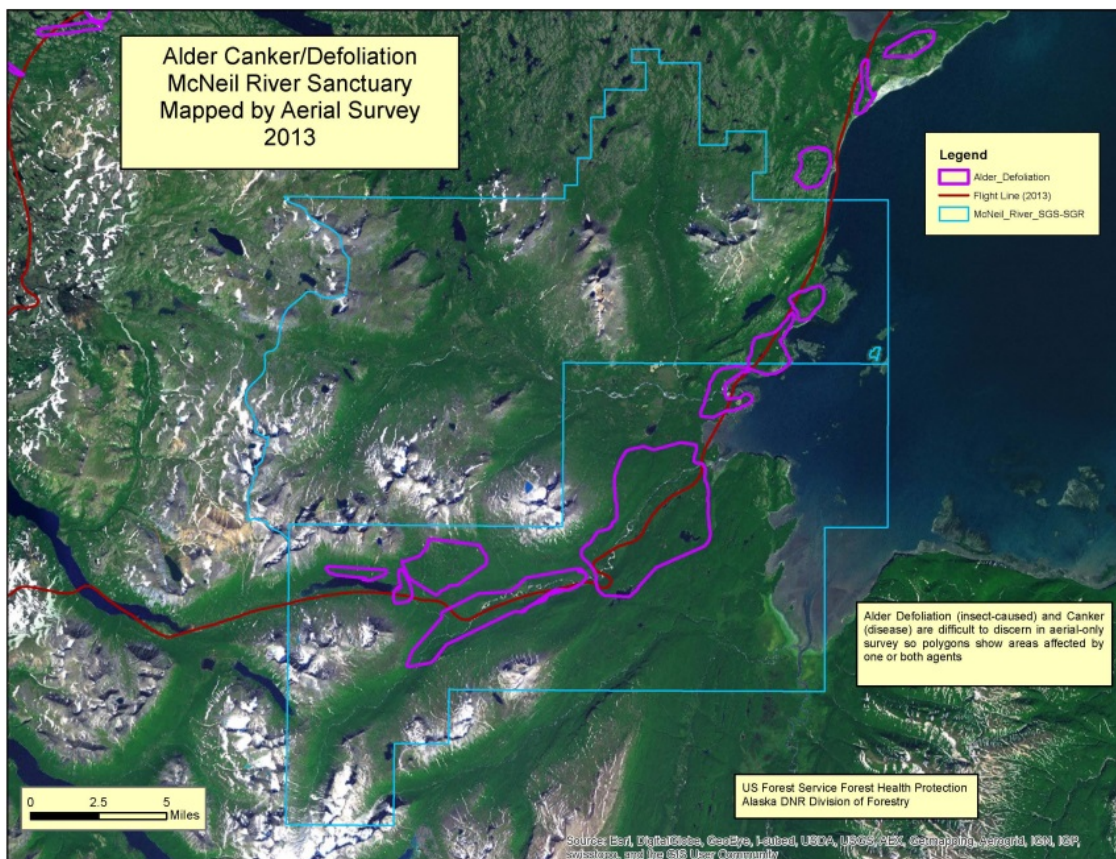


Figure 4. U.S. Forest Service and Alaska Department of Natural Resources mapping of alder defoliation within McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska.

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 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-MRS GR complex for the period 2000–2013 are summarized in Table 3. Data for regulatory year (RY) 2014 (regulatory year begins 1 July and ends 30 June, e.g., RY14 = 1 July 2014–30 June 2015) are still being gathered.

Brown Bear

Brown bear hunting, as well as hunting and trapping for other species are open on lands within harvest units north and west of MRS GS and MRS GR. During alternate regulatory years brown bear hunts are open during the fall of odd-numbered years and the spring of even-numbered years. Historic levels of reported bear harvests from areas surrounding McNeil sanctuary and refuge are presented in Figure 5 and Table 3. The area represented includes 2,100 mi² currently open to hunting.

The long-term average harvest from areas surrounding MRS GS (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 RY12–RY13, the most recent data available, the harvest in areas surrounding MRS GS and MRS GR was 73 bears.

Many brown bears have large home ranges, which include MRS GS, MRS GR, 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 MRS GS and MRS GR 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 refuge portion of the MRS GS-MRS GR complex is open for the legal harvest of species other than brown bear through hunting or trapping. Other furbearing or big game species that may be in the area include black bear, caribou (*Rangifer tarandus*), moose, beaver, lynx (*Lynx canadensis*), marten (*Martes americana*), river otter, wolf, wolverine (*Gulo gulo*),

Table 3. Reported harvests of selected big game and furbearer species within and around McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska, 2000–2013.

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

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

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

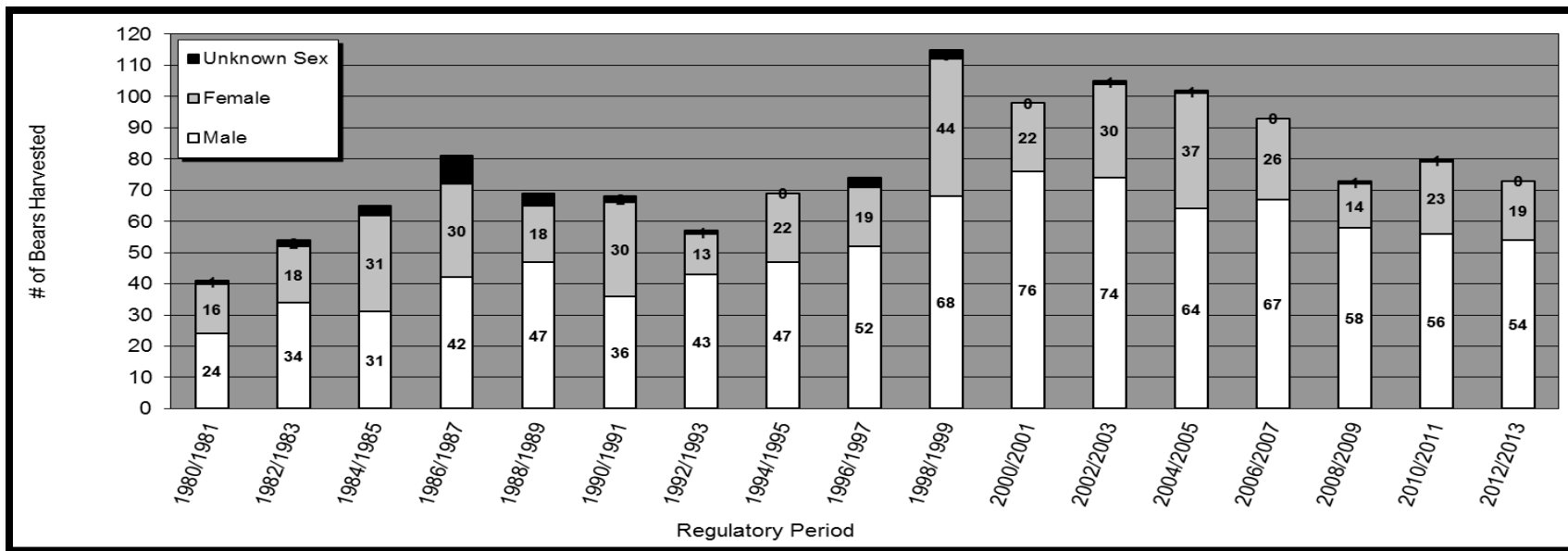


Figure 5. Brown bear harvest from areas surrounding the McNeil River State Game Sanctuary and McNeil River State Game Refuge, Alaska, 1980–2013 (harvest from Game Management Units/Uniform Coding Units: 9A/201, 301, 401, 501; 9B/301; and 9C/101, 201,301, 601, 702, and 703). Two consecutive regulatory years* (regulatory year begins 1 July and ends 30 June, e.g., regulatory year 1980 = 1 July 1980–30 June 1981) are lumped. This graph does not include harvest data for regulatory years 2014 and 2015 as the data are still being compiled.

coyote (*Canis latrans*), red fox, mink (*Neovison vison*), weasel (*Mustela nivalis*), muskrat (*Ondatra zibethicus*), arctic ground squirrel, and Alaska marmot (*Marmota broweri*). However, ADF&G only maintains harvest records on the first 9 of these.

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

Fisheries

MRSGS-MRSGR contains a number of river and stream systems that support both anadromous and resident fish populations. The Kamishak River drainages support all 5 species of Pacific salmon as well as Dolly Varden (*Salvelinus malma*) trout. The McNeil River drainage contains Dolly Varden trout, chum salmon (*Onchorynchus keta*), some coho salmon (*O. kisutch*), pink salmon, and small numbers of Chinook salmon (*O. tshawytscha*). The Mikfik Creek-Lake drainage contains sockeye salmon (*O. nerka*), Dolly Varden trout, and rainbow trout (*O. mykiss*). Chenik Creek-Lake system supports sockeye salmon, some coho salmon, lake trout (*S. namaycush*), and Dolly Varden trout. The Paint River system contains rainbow trout, Arctic grayling (*Thymallus arcticus*), and lake trout and has the potential for supporting a number of anadromous salmon species through fisheries enhancement. These fish resources contribute to annual sport fishing and commercial fishing effort and harvests within the lower Kamishak district.

COMMERCIAL FISHERIES

Periodic aerial surveys are flown to index the escapement of sockeye and chum salmon to Mikfik Creek and McNeil River, respectively. Remote video is also used to monitor the escapement of sockeye salmon into Mikfik Lake. In 2014, generally favorable stream conditions allowed for effective aerial surveys. One commercial fishing period targeted Mikfik Creek sockeye salmon in the McNeil River subdistrict on 16 June, resulting in the harvest of 1,728 fish. The McNeil River subdistrict was closed for the duration of the chum salmon run. Consequently, the majority of the Mikfik sockeye and the entire McNeil chum salmon runs entered their respective freshwater drainages this season.

McNeil River Drainage

The 2014 cumulative McNeil River chum salmon aerial survey escapement index was estimated at 17,475 fish (Table 4, Fig. 6). Chum salmon were consistently seen in significant numbers above the falls during aerial observations from 24 June through 8 July, with lower numbers observed through the last survey on 28 July. A peak daily aerial estimate of 5,630 chums upstream of McNeil River falls occurred on 29 June. This represents the highest single-survey estimate of chum salmon observed above McNeil falls since 1988, which bodes well for future returns from this brood year. By comparison chum returns to some other Kamishak Bay district systems in 2014 were relatively weak, resulting in low fishing effort and a districtwide commercial harvest of fewer than 4,500 chums, the fourth lowest total since 2007. The 2014 run timing of McNeil River chum salmon was earlier than previous years.

Table 4. Aerial escapement estimates of salmon in the Mikfik Lake and McNeil River drainages, McNeil River State Game Sanctuary, Alaska, 2014.

Survey date (mm/dd/yy)	Mikfik sockeyes (daily) ^a	McNeil chums (daily) ^a
6/5/14	1,531	0
6/11/14	5,920	0
6/18/14	3,680	0
6/24/14	163	4,513
6/29/14	0	5,670
7/8/14	0	2,530
7/14/14	0	2,122
7/23/14	0	7,280
7/28/14	0	2,410
8/20/14	0	21
Escapement index	18,062 ^b	17,475 ^c

^a All individual daily estimates are from individual aerial surveys and are considered to be conservative.

^b The escapement index for Mikfik sockeyes is the accumulative count from the remote video system at Mikfik Lake; data in the table above reflect aerial survey counts from McNeil-Mikfik Lagoon and Mikfik Creek, not Mikfik Lake.

^c The escapement index for McNeil chums was derived by dividing the area under the escapement curve by a 13.8-day stream life factor and then applying a run-timing expansion factor to account for fish entering the system after aerial surveys were terminated.

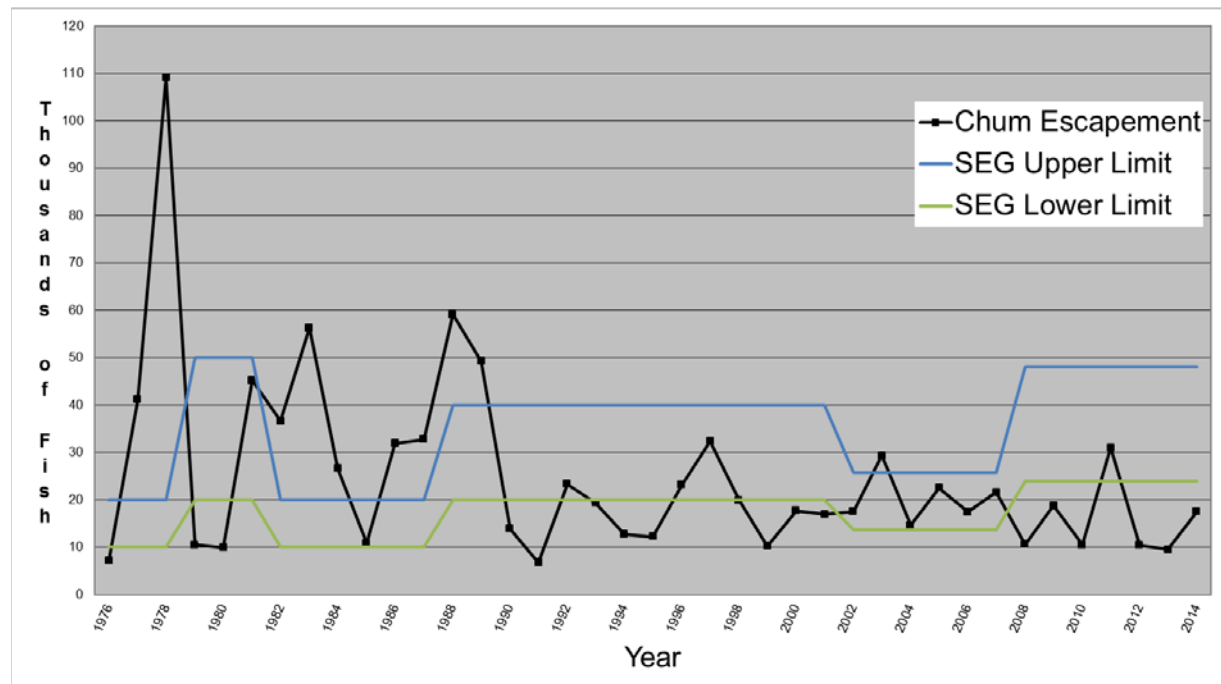


Figure 6. McNeil River chum salmon escapement 1976–2014, McNeil River State Game Sanctuary, Alaska.

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

In an effort to better understand factors affecting the freshwater production of chum salmon at McNeil River, the department hired a graduate student intern in 2005 and 2006 to conduct a 2-year radiotelemetry project to estimate freshwater stream life, document spawning distribution, and estimate predation by bears (Peirce et al. 2011; Peirce et al. 2013). The study determined that

- The average stream life of a McNeil River chum salmon was less than the stream life estimate used for other lower Cook Inlet chum stocks.
- The average stream life for fish spawning above McNeil River falls was much higher than the stream life for fish spawning below McNeil River falls.
- Ninety percent of the tagged fish above McNeil River falls lived long enough to spawn, whereas, 47% of the tagged fish below McNeil River falls were killed by bears before getting a chance to spawn during 2005–2006.
- The study also corroborated aerial survey observations regarding the inconsistent use of quality spawning habitat above McNeil River falls.

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

AUC remains the best available method for deriving the total annual escapement index for McNeil River chum salmon, as well as most other pink and chum salmon stocks in lower Cook Inlet. The AUC method calculates the area under the escapement curve, points for which are determined by periodic aerial surveys, and then divides the resulting total “fish-days” by an average stream life factor to estimate the total annual escapement. Stream life, defined as the number of days salmon resided in the survey area and were available to be counted by aerial

surveyors, is one of the key parameters in the AUC model. The AUC method resulted in a cumulative estimated escapement of 17,475 chum salmon for McNeil River in 2014.

Mikfik Creek-Lake System

The 2014 Mikfik Creek-Lake estimated escapement as determined through aerial surveys was 18,062 sockeye salmon. A video camera attached to a digital video recorder (see below), used to document sockeye salmon escapement into Mikfik Lake again this season, showed a cumulative total of 18,062 fish actually escaping into the lake. Significant predation by bears occurs in Mikfik Creek, so only those fish documented reaching the lake are considered escapement. The video estimate of 18,062 fish was used as the final escapement estimate. This value is above the sustainable escapement goal (SEG) range of 3,400–13,000 (Table 4). Post-season evaluation indicated that run timing of sockeye salmon into Mikfik Lake was early, with 90% of the escapement reaching the lake by 18 June.

Commercial fishing periods which targeted Mikfik Creek sockeye salmon in the McNeil River subdistrict occurred on the afternoon high tide of Sunday, 15 June and Monday, 16 June lasting about 2 hours each. A total of 1,728 sockeye salmon were harvested on the first day with none harvested the second day due to stormy weather. There were no interactions between commercial fishermen and bears reported.

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 2014, with resulting annual commercial harvests ranging from just under 5,500 sockeye salmon (2010) to over 171,000 fish (2008). Additionally, the established sockeye salmon SEG for Chenik Lake of 3,500–14,000 sockeye salmon has been met or exceeded each year beginning in 2003, with the 2014 escapement cumulatively estimated by remote video as 17,797 sockeye salmon.

SPORT FISHING

A limited amount of sport fishing occurs within MRS GS and MRS GR. This occurs primarily in the Kamishak River area. There is also a small amount of effort in the McNeil lagoon area associated with the bear-viewing program.

McNeil Lagoon

Sporadic sport fishing occurs in McNeil lagoon associated with staff and visitors in camp for bear-viewing activities. Fishing effort was low in 2014. Visitors and ADF&G staff harvested approximately 5 sockeye salmon, 3 chum salmon, 0 pink salmon, and 0 coho salmon.

Kamishak River

The only area in the sanctuary that attracts significant sport fishing interest is the Kamishak River area including the Little Kamishak River and its tributary, Strike Creek. The target species are coho, chum, and pink salmon and Dolly Varden. Fishing activity at the Kamishak River and tributaries typically begins in mid-July and ends in mid-September. During the 2014 season, 6 lodges and transporters reported a total of 390 angler use days during 116 days within the sanctuary for sport fishing. Wildlife viewing, primarily brown bears, was also a significant part of their activities. These anglers reported catching 5,677 fish, of which 82% were Dolly Varden, 11% were coho salmon, and 5% were chum salmon (Table 5). Nearly all Dolly Varden were released as were most pink and chum salmon. Ninety-four 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, 2014.

# 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	
116	170	390	0	312	294	6	283	0	150	19	4,613	3

FISHERIES ENHANCEMENT

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

Paint River Fish Ladder

Paint River Lakes were first stocked with sockeye salmon fry in 1986 in an effort to test the feasibility of developing a new sockeye salmon return to this salmon-barren drainage. Paint River, located approximately 2 miles north of McNeil River is blocked to upstream fish migration by a steep waterfall at tidewater. The Paint River fish ladder was envisioned to potentially provide access to unutilized salmon spawning and rearing habitat upstream of the falls. Construction of the Paint River fish ladder was completed in October 1991, and it was formally declared operational in 1993. From 1986 to 1996 (except for 1987), and also in 2002, between 0.5 million and 2.2 million sockeye salmon juveniles were stocked annually in the Paint River Lakes. However, the number of returning adult sockeye salmon resulting from these stocking efforts was disappointing and only ranged from 30 (in 2000) to 2,000 (in 2005). Consequently, the structure was never opened to allow fish passage upstream through the ladder.

In 2008, CIAA, responsible for building and operating the Paint River fish ladder, informed ADF&G-Division of Wildlife Conservation (DWC) that grant monies to conduct maintenance on the Paint River fish ladder had been acquired. Under the grant CIAA intended to make repairs, cover open cells, and perform other maintenance to prepare the ladder for formal operation and fish passage. During 2010, CIAA performed maintenance repairs and improvements on the fish ladder to reduce potential bear problems associated with the operation of the ladder and other needed maintenance work. The “Paint River Salmon Enhancement Project Operational Plan,” drafted in 1993 but never approved, was also updated in 2010. A working draft was presented to the Cook Inlet Regional Planning Team at its April 2010 meeting. While the document is not a complete plan for the Paint River facility and is intended to be periodically updated, the Cook Inlet Regional Planning Team voted to accept the document as an appropriate planning document for the time being.

CIAA obtained approximately 1.2 million pink salmon eggs from brood stock in the Bruin Bay fishery during 2014. After being raised over winter, plans call for the release of about 1 million fry into the Paint River in early spring 2015.

CIAA opened the Paint River fish ladder to allow water flow between 13 June and 7 September 2014; for evaluation purposes and potential salmon colonization. During their 3 visits on 13 June, 18 July, and 7 September they conducted minor maintenance, site cleanup, and conducted stop log adjustments. During the 7 September visit, naturally colonizing salmon were observed using the ladder. One live coho salmon was observed passing through the ladder and several other carcasses tentatively identified as coho were observed within the ladder. In addition, CIAA did an aerial survey of the Paint River and Dunuletak Creek on that day and found a group of about 10 salmon (presumably coho) in Dunuletak Creek. No bears were observed in the area of the fish ladder during the visits; however, 1 bear was noted feeding on sedges about 2 miles away during the 13 June visit.

Public Use and Land Management

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

MRSGR is open to most public uses provided the activity does not damage refuge resources, disturb wildlife, or disrupt existing public uses. Allowed activities generally include legal hunting, trapping, fishing, wildlife watching, hiking, boating, and snowmachining, and camping; except that MRSGR is closed brown bear hunting. Other activities and land uses are managed through an ADF&G special area 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 ADF&G (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 during 7 June–25 August, and viewing access permits for this period are issued by lottery. Ten regular and 3 standby permits are issued for each of the established 4-day permit periods. Currently, 185 regular permits (guided viewing access permits) and 57 standby permits (camp-standby viewing access permits) are issued in the lottery. An additional 15 guided viewing permits are issued as special access permits at the commissioner’s discretion for scientific, educational, media, and other purposes. The maximum number of people able to visit the sanctuary each season under the existing permit program is 257 people.

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

The lottery application fee is \$25.00 per person. If selected in the lottery, each guided viewing permit holder is assessed a permit fee of \$150 for Alaska residents and \$350 for non-Alaska residents. Camp-standby viewing permit holders are assessed a permit fee of \$75 for each Alaska resident and \$175 for each non-Alaska resident. The special access permit application fee is \$50.00 per person. If selected by the commissioner of ADF&G to receive a special access permit, there is a use fee of \$150.00 for each Alaska resident and \$350.00 for each non-Alaska resident.

In 2014, ADF&G received 1,075 applications for McNeil River guided and standby bear viewing permits. Applications were received from 16 different countries and 64% of applicants were Alaska residents. Payments were received for 151 guided viewing access permits and 28 standby viewing access permits. There were 11 special access (science-education/commissioner) permits granted by the commissioner. Overall, 190 permits were issued and 171 permit holders (guided viewing, camp standby, and special access) visited the sanctuary (Table 6) in 2014. The 5-year annual visitation average (2010–2014) is 178. The average number of permits used each day (permittees that bear viewed) at the sanctuary in 2014 was 7.6 (out of a maximum of 10.0). There were 18 guided permit holder no shows, 7 standby permit holder no shows, and 1 special access permit holder no show. The 171 participants in bear viewing during the 2014 season came from 6 countries, including Canada, Great Britain, Israel, Japan, Poland, and the United States. Of the 171 bear viewing visitors to McNeil River in 2014, 65% were Alaska residents and 35% were nonresidents. Of the 190 people who purchased permits, the ratio was 65% resident to 35% nonresident.

Table 6. Visitor use at McNeil River State Game Sanctuary and McNeil State Game Refuge, Alaska, 1984–2014.

Year	Footnotes	# of Applicants	# of Bear Viewing Visitors 6/7-8/25*	Bear Viewing User Days in Sanctuary 6/7-8/25**	Total Sanctuary Bear Viewing Visitor Days 6/7-8/25***	Total Sanctuary Visitor Days 6/7-8/25****	Visitor Days Viewing @ McNeil Falls 7/1-8/25 (560 possible)*****	Season Length
1984	A, F	992	159			574	377	6/5 - 8/27
1985	A	832	216			816	449	6/10 - 8/25
1986	A	806	255			967	430	6/9 - 8/25
1987	A, G	1,757	252			1,054	473	6/9 - 8/23
1988	A	1,094	304			1,328	498	6/1 - 8/29
1989	A	1,306	264			1,183	488	5/22 - 8/26
1990	A	1,481	299			1,435	524	6/8 - 8/25
1991	B, E	1,818	249			1,415	526	6/1 - 8/27
1992	C, E, H	1,672	245			1,210	478	6/1 - 8/25
1993	D	2,150	225			1,128	516	6/7 - 8/25
1994	D, I	1,766	228			1,086	484	6/7 - 8/25
1995	D, I	1,486	212			1,074	475	6/7 - 8/25
1996	D, I	1,502	219			1,158	494	6/7 - 8/25
1997	D, I	1,474	228			1,197	489	6/7 - 8/25
1998	D, I	1,159	219			1,096	504	6/7 - 8/25
1999	D, I, J	1,223	208			1,122	398	6/7 - 8/25
2000	D, J, K, L, M	1,322	198			1,051	424	6/7 - 8/25
2001	D, J, K, L, M, N	1,329	186			1,012	437	6/7 - 8/25
2002	D, J, K, L, M, N	1,434	175			930	351	6/7 - 8/25
2003	D, J, K, L, M, N, O	1,314	188			995	451	6/7 - 8/25
2004	D, J, K, L, M, O, P	860	201			1,034	462	6/7 - 8/25
2005	D, K, L, M, O, P	960	195			983	431	6/7 - 8/25
2006	D, K, L, M, O, P	783	183			970	420	6/7 - 8/25
2007	D, K, L, M, O, P	1156	157	540	781	832	356	6/7 - 8/26
2008	D, K, L, M, O, P	932	167	617	863	913	413	6/7 - 8/26
2009	D, K, L, M, O, P	725	181	639	948	1266	452	6/7 - 8/25
2010	D, K, L, M, O, P	714	176	593	932	1100	433	6/7 - 8/25
2011	D, K, L, M, O, P	751	195	674	1017	1089	447	6/7 - 8/25
2012	D, K, L, M, O, P	719	180	641	969	1041	458	6/7 - 8/25
2013	D, K, L, M, O, P	934	156	574	842	890	388	6/7 - 8/25
2014	D, K, L, M, O, P	1075	171	603	882	923	424	6/7 - 8/25

Footnotes Table:

A =	No limit on standby or camp numbers.
B =	1st come, 1st served for standby with no camp limit.
C =	1st come, 1st served for standby with camp limit of 15.
D =	All permits (regular & standby) by lottery including June.
E =	Unlimited permits prior to June 15 then 10 a day.
F =	\$5 application fee instituted in 1993.
G =	\$10 application fee and \$40 user fee instituted.
H =	\$20 application fee and new user fees (\$100 Resident/\$250 Non-resident) instituted.
I =	Visitors to the sanctuary must wait four years to re-apply.
J =	Lower staffing levels prevented late arriving or early departing visitors from joining the group.
K =	\$25 application fee and new user fees (\$150 Resident/\$350 Non-resident) instituted.
L =	Number of standby permits drop from 5 to 3 per period (95 to 57 annually).
M =	Visitors to the sanctuary must wait one year to re-apply.
N =	A major air taxi operator retires, leaving only one primary carrier to serve MRS GS.
O =	Includes Resale permits (Unissued permits were reissued and used).
P =	Includes "fill in" permits.
*=	Sum of all Guided, Standby, & Special Access Permittees that visited McNeil River State Game Sanctuary.
**=	Sum of all Guided, Standby, & Special Access Permittees that bear viewed each day of season.
***=	Sum of all Guided, Standby, & Special Access Permittees in Sanctuary each day of season.
****=	Sum of all Guided, Standby, & Special Access Permittees each day during approximate McNeil Falls season.
*****=	Sum of all Guided, Standby, & Special Access Permittees each day during approximate McNeil Falls season.

There were a total of 923 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 882 days within the sanctuary, logging 609 actual bear viewing days. On average there were 11 visitors at McNeil River camp on any day, slightly lower than the 5- and 10-year averages of 11.6 and 11.5, respectively. There was an average of 7.6 bear viewers per day, slightly lower than the 5- and 10-year average of 7.7, respectively. Permitted visitors spent an average of 5.2 days each in the sanctuary and participated in the bear-viewing group an average of 3.6 days each.

The 11 special access permits issued in 2014 included the following recipients: ADF&G Hunter Education and Wildlife Education volunteers, USFS (Anan Creek) and National Park Service (Katmai National Park) staff, ADF&G and USFS (Stan Price MRSGS/Pack Creek staff), Alaska Board of Game (Robert Mumford), and a National Geographic film crew.

During 2014, 9 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 \$67,150.00 was generated from the 2014 McNeil River sanctuary permit program and deposited in the state's General Fund.

KAMISHAK RIVER

Lodges and air charter services conduct sport fishing and wildlife viewing trips within the Kamishak River drainages within MRSGS and adjacent Katmai National Park. This area is also part of the Kamishak Special Use Area, which is managed by 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 and an ADF&G commercial access permit. The primary management concern is the food-conditioning of Kamishak River bears, which also visit Mikfik Creek and McNeil River. Food-conditioning of bears would not be consistent with the purposes for which the sanctuary was established and would jeopardize the bear-viewing program at McNeil River.

Businesses operating in this area holding ADF&G special area and commercial access permits are required to report the number of guides, clients, fish harvested/released, as well as the number of bear observed on a data sheet titled "Annual Report for Guides, Transporters, and Lodges."

Six commercial sport fishing guide services operated in the Kamishak River area of MRSGS in 2014 and spent 560 visitor use days in the sanctuary, which included 390 angler use days and 170 guide use days. These operators also held special area permits for the storage of boats and operations in the Kamishak River area. Their primary activity is sport fishing; however, they also engage in wildlife viewing activities, primarily viewing of brown bears.

CHENIK AREA

One commercial bear-viewing guide service from Homer brought clients to the Chenik area in 2014. This service obtained a special area permit for a temporary tent camp at Chenik Lake in

2014 and reported a total of 27 visitor use days, including 9 guide use days and 18 bear-viewing (non-angler) use days. Private groups were also known to have visited the Chenik area in 2014. Limited information indicated that at least 52 user days were expended by 3 user groups.

BEAR-HUMAN CONFLICTS

As detailed above there were 923 user days associated with ADF&G's bear-viewing program at the McNeil River camp. An additional 639 user days were reported by area guides utilizing the Kamishak River and Chenik Creek areas of MRSGS-MRSGR. All 1,562 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 2014 season, there were no reported adverse interactions between bears and people in MRSGS or MRSGR.

LAND USE PERMITTING

ADF&G-DWC has a special area permit and an Alaska Department of Natural Resources Interagency Land Management Assignment (5-year term, 2009–2014) 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 5 special area permits and 14 commercial access permits were issued during 2014. These included the special area and commercial access permits issued to the commercial operators in the McNeil River, Kamishak River, and Chenik Creek areas.

The U.S. Department of Agriculture-Natural Resources Conservation Service (NRCS) continues to operate a snowpack telemetry (SNOTEL) site at Mikfik Lake. The site is part of the NRCS Snow Survey and Water Supply Forecasting program that collects snowpack and related climatic data throughout the United States. SNOTEL site 1191 was established 26 June 2012 at Mikfik Lake (latitude 59.0835, longitude 154.2777) within MRSGS. Hourly data on temperature, precipitation, winds, snow depth, and soil moisture for the site can be accessed through the NRCS website at: <http://www.wcc.nrcs.usda.gov/nwcc/site?sitenum=1191&state=ak>.

There were no other mineral resource or development activities applied for, permitted, or reported to the department within MRSGS or MRSGR during 2014.

Fish and Wildlife Research

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

MIKFİK CREEK VIDEO RESEARCH

A remote video escapement recorder was installed at the outlet of Mikfik Lake for the 17th consecutive season. This project has already 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, ultimately incorporating it into the Mikfik remote video recording system and potentially applying it to similar projects throughout the management area.

In 2014, the video system at Mikfik Creek-Lake was installed on 23 May and shut down on 6 August. The system operated continuously (~24 hr/d) and successfully recorded images approximately 100% of the time that it was programmed to operate between 23 May and 6 August (1,798 hr). The peak of the run into Mikfik Lake was slightly earlier than past years (early to mid-June). Fifty percent of the run was in Mikfik Lake by 11 June and 90% by 18 June.

A single camera mounted on the original (west bank) light pole was used to collect all video images of fish passage in 2014. Recordings were made using a compression rate of 5 frames per second, which has proven to provide excellent image quality. Fish were very easy to see, and the DVR facilitated efficient and convenient video review to estimate escapement. Upon review of the images collected at Mikfik Creek, 18,062 sockeye salmon were counted into the lake,

representing 12,142 more fish than were estimated by the peak aerial survey of Mikfik Creek and McNeil lagoon. 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 18,062 fish was used as the final escapement index in 2014. The new video-based escapement goal for Mikfik Creek sockeye salmon is 3,400–13,000 fish and it went into effect in 2014.

One advantage of using a remote video-counting tower to count salmon escapement at Mikfik Creek is the opportunity to incidentally monitor other wildlife in the area. During 1,798 hours of recorded video 23 May–6 August, reviewers documented 141 instances where brown bears transited the field of view of the camera, an average of nearly 2 bears per day of video operation ($n = 76$ d). Nearly all sightings were of individual bears, but a few sightings were of females with 1 or 2 cubs. Other wildlife species observed included moose, eagle, beaver, red fox, various waterfowl, wolves, porcupine, river otter, and 1 black bear on 31 May at 11:13 PM. The latter observation was the first black bear ever documented in MRS GS.

During the course of genetic sampling and bear-viewing activities, ADF&G-CF and ADF&G-DWC staff expanded documentation of fish species use in several streams in the Mikfik drainage. Numerous chum salmon were observed ascending the lower reaches Mikfik Creek during the period 7–11 August. And also in the lower reaches of the water creek (known as Coleen Creek) behind camp. Numbers were sufficient enough to draw bears to those locations for feeding. This use may have been caused by high water within McNeil River causing fish to stray to these other streams. Rearing coho salmon were trapped by ADF&G-CF staff as part of genetic sampling operations in the lower reaches of Mikfik Creek, a Mikfik Creek tributary (Joes Creek) and in the lower portions of Coleen and Walker Creeks.

MCNEIL RIVER BROWN BEAR AND CHUM SALMON RESEARCH

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

ADF&G-CF Research Biologist Ted Otis, worked with graduate student Ian Gill to use the methodology and data in developing a model to address bear-salmon predation on fish escapement into McNeil River. Preliminary results and analyses determined that the data and modeling were useful tools for estimating the removals of pre-spawning chums at McNeil River falls. In 2014 ADF&G-CF continued the project, with minor changes to the equipment, to gather data to use in refining estimates of chum salmon spawning escapement into McNeil River. The current project is being conducted in collaboration with Dr. Brad Harris, a professor at Alaska Pacific University, where one of his students is reviewing the video.

ADF&G-CF continued collecting baseline genetic samples from wild pink, chum, sockeye, and coho salmon throughout Kamishak Bay in 2014. Ted Otis and his crew worked out of the MRS GS camp while collecting samples from McNeil River and nearby streams (e.g., Kamishak River, Amakdedori Creek). Assisted by the large run there this year, they were also successful collecting sockeye salmon genetic samples from Mikfik Lake in 2014.

Sanctuary Administration and Management

STAFFING

Sanctuary Manager Tom Griffin completed his 15th season at McNeil River, his 5th as manager. Drew Hamilton completed his 3rd season as Assistant Manager and his 5th season at McNeil River. Larry Aumiller (retired MRS GS Manager), Polly Hessing (retired ADF&G biologist), and Ben Hstand (Wildlife Technician III) joined sanctuary staff in 2014 to fill in as the 3rd staff member. Staff arrived at the McNeil River camp on 19 May and 21 May 2014 and pulled camp on 29 August 2014. We were very fortunate to have, Samantha McNearney (previous MRS GS staff) and Tony Carnahan (previous McNeil River Sanctuary Assistant Manager) fill-in this year as group leaders when regular staffs were on leave. In addition to their normal duties at the sanctuary, the McNeil staff completed the annual ADF&G firearms safety training in spring 2014.

Volunteers

Volunteers Robert Halpin, Randy Armstrong, and Brendan Barry assisted staff in upgrades to sanctuary trails and a variety of tasks prepping camp for the season. Volunteers and staff unloaded gear and supplies from the transport vessel Pacific Maiden on 21 May. The major task this year was the assembling and laying about 840 feet of Geoblock[®] to stabilize the trail through Mikfik Creek sedge meadows (Fig. 7). Volunteers also assisted with a number of tasks around camp including installation of wood stoves, painting, basic carpentry, stacking firewood, picking up marine debris and trash, preparing the buildings, and cleaning.

FACILITIES

In addition to performing the normal general maintenance tasks around camp throughout the season, a project to stabilize and improve the east Mikfik Creek Trail was undertaken. In late May 2014, staff and volunteers stabilized approximately 840 feet of trail within the sedge meadow on the east side of Mikfik Creek where the trail runs from the east bluff wall in the direction of Mikfik Creek riffles. The trail improvements were made to stabilize muddy trail sections and protect the sedge meadow vegetation. The application also improves visitor footing along the trail. Two hundred and fifty (20"×40") panels of Geoblock 5150 were attached end-to-end using 2" inch screws and 2"×4" lumber for support at the joints. Each individual section was anchored down with a duckbill earth anchor at one end. Project materials and a portion of transport costs were provided through a generous grant from the Alaska Conservation Foundation. This work plus the initial test sections constructed during 2011–2013 provide a combined length of over 1,000 feet of treated trail.

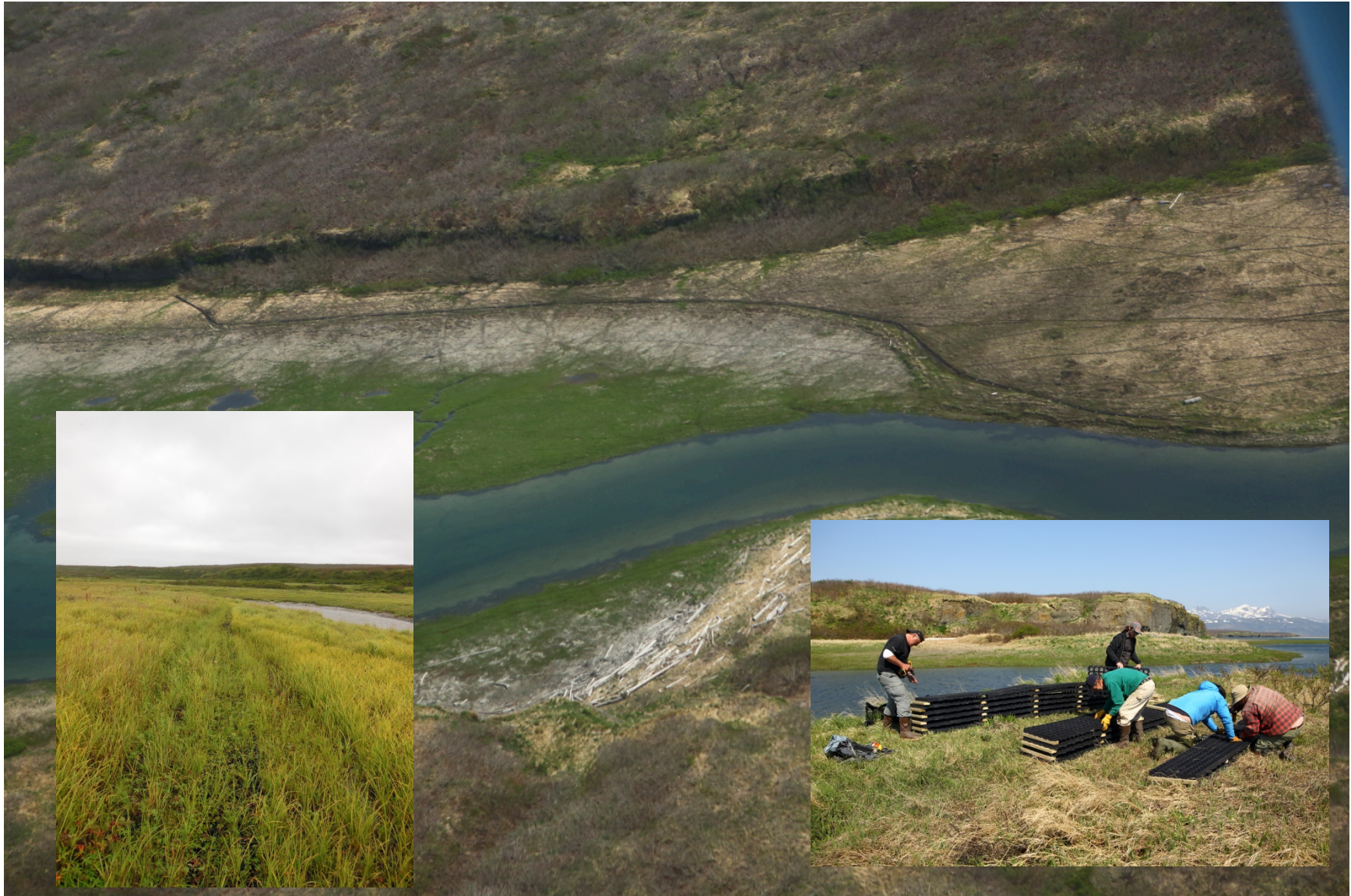


Figure 7. Aerial view of Geoblock® trail enhancement in Mikfik sedge flats, Alaska; with insets of trail section in July and work crew preparing trail sections for installation in May 2014.

Acknowledgments

Thanks to retired Sanctuary Manager Larry Aumiller, retired ADF&G Wildlife Biologist Polly Hessing, and Wildlife Technician Ben Histan who joined sanctuary staff in 2014 to fill in as the third staff member. Thanks to Samantha McNearney (previous MRSGS staff) and Tony Carnahan (previous McNeil River Sanctuary Assistant Manager) who filled-in this year as group leaders when regular staffs were on leave. 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) provided information on activities at the Paint River fish ladder. Mike Bouwkamp (ADF&G-DWC) provided bear-viewing applicant information. Megan Marie (ADF&G-Division of Habitat) provided special area permit information. Earl Becker (ADF&G-DWC) provided the revised Shewhart-CUSUM analysis. Laura McCarthy (ADF&G-DWC) provided formatting and editing changes and processed this document for publishing.

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Appendix. Daily wildlife observations in 2014, McNeil River State Game Sanctuary, Alaska.

Date	Comments
5/19/2014	First observations seen from camp: 30 Brant (<i>Branta bernicla</i>) in the lagoon, 1 Wilson's Snipe (<i>Gallinago delicata</i>), 2 Red Foxes (<i>Vulpes vulpes</i>) and 1 Green-winged Teal (<i>Anas crecca</i>).
5/20/2014	First observations seen from camp: 1 Bald Eagle (<i>Haliaeetus leucocephalus</i>), 1 Yellow Warbler (<i>Dendroica petechial</i>), 12 Northern Shovelers (<i>Anas clypeata</i>) in the lagoon, 1 White-crowned Sparrow (<i>Zonotrichia leucophrys</i>), 1 Mallard (<i>Anas platyrhynchos</i>), 1 Common Raven (<i>Corvus corax</i>), 2 American Robins (<i>Turdus migratorius</i>), 1 Northern Harrier (<i>Circus cyaneus</i>), 2 Tree Swallows (<i>Tachycineta bicolor</i>), 2 Savannah Sparrows (<i>Passerculus sandwichensis</i>), 12 Greater Scaup (<i>Aythya marila</i>) and 2 Arctic Ground Squirrels (<i>Spermophilus parryii</i>).
5/23/2014	First bloom: Nootka Lupine (<i>Lupinus nootkatensis</i>) in camp.
5/24/2013	First observation: 2 Harlequin Ducks (<i>Histrionicus histrionicus</i>) on the spit.
5/25/2014	First observation: several Sockeye (Red) Salmon (<i>Oncorhynchus nerka</i>) in the lagoon, 1 Tundra Swan (<i>Cygnus columbianus</i>) flying over the Mikfik area. First bloom: Alaska Violet (<i>Viola Langsdorfii</i>) along the water trail.
5/29/2014	First bloom: Tall Jacob's Ladder (<i>Polemonium acutiflorum</i>) in the Mikfik east sedge flats.
5/30/2014	First observation seen from camp: 1 Hermit Thrush (<i>Catherus guttatus</i>).
5/31/2014	First observation: 6 Pigeon Guillemots (<i>Cephus columba</i>) observed on the outside coast, 1 Pacific Harbor Seal observed on the outside coast. First bloom: Moss Campion (<i>Silene acaulis</i>) in the McNeil head area. Cow Parsnip (<i>Heracleum lanatum</i>) and Arctic Dock (<i>Rumex arcticus</i>) observed in the Mikfik area.
6/1/2014	First bloom observed along the water trail: Wild Geranium (<i>Geranium erianthum</i>) and Beach Pea (<i>Lathyrus maritimus</i> ssp. <i>maritimus</i>).
6/2/2014	First bloom: Chocolate Lily (<i>Fritillaria camschscensis</i>), Labrador Tea (<i>Ledum palustris</i> ssp. <i>groenlandicum</i>) and Bog Blueberry (<i>Vaccinium uliginosum</i>) observed along the McNeil River Trail. Potentilla Villosa (<i>Potentilla villosa</i>) observed on the west bluff and Marsh Marigold (<i>Caltha palustris</i>) observed near the Mikfik creek riffle.
6/4/2014	First observation from camp: 1 Wilson's Warbler (<i>Cardellina pusilla</i>).
6/6/2014	First observation from camp: 2 Common Redpoles (<i>Acanthis flammea</i>).
6/7/2014	First bloom: Wild Iris (<i>Iris setosa</i>) observed in camp. First observation from Mikfik creek riffle: 4 Glaucous-winged Gulls (<i>Larus glaucescens</i>), 2 Mew Gulls (<i>Larus canus</i>) and 6 Common Mergansers (<i>Mergus merganser</i>) in the Mikfik creek tidal area.
6/8/2014	First observation: 1 Gray Wolf (<i>Canis lupus</i>) behind camp.
6/9/2014	First bloom: Large Leaf Avens (<i>Geum macropyllun</i> ssp. <i>macrophyllum</i>) observed in Mikfik creek riffle and Dwarf Dogwood (<i>Cornus canadensis</i>) observed in the Mikfik

Date	Comments
	upper falls area. 1 Gray Wolf (<i>Canis lupus</i>) was observed fishing in Mikfik creek.
6/13/2014	First observation: 3 Whimbrels (<i>Numenius phaeopus</i>) observed flying over the lagoon and several Bank Swallows (<i>Riparia riparia</i>) observed flying over the spit and camp.
6/15/2014	First observation: 2 Golden-crowned Sparrows (<i>Zonotrichia atricapilla</i>) observed in camp.
6/18/2014	First observation: 1 Beaver (<i>Castor canadensis</i>) observed in the Mikfikcreek riffles.
6/24/2014	First observation: 3 Black Oystercatcher (<i>Haematopus bachmani</i>) observed on the beach in front of camp.
6/25/2014	First observation: 1 Willow Ptarmigan (<i>Lagopus lagopus</i>) observed on the McNeil river trail and 1 Sea Otter (<i>Enhydra lutris</i>) floating in McNeil cove just off shore after a storm.
6/27/2014	First observation: 8 Semipalmated Plover (<i>Charadrius semipalmatus</i>) observed on the spit.
6/28/2014	First observation: 1 Peregrine Falcon (<i>Falco peregrinus</i>) and 1 Brown Lemming (<i>Lemmus trimucronatus</i>) observed in camp.
7/1/2014	First observation: 7 Caspian Terns (<i>Hydroprogne caspia</i>) observed flying in the lagoon. First bloom: Beach Fleabane (<i>Senecio pseudo-arnica</i>) observed in Mikfik sedge west.
7/2/2014	First observation: 1 Jumping Mouse (<i>Zapus hudsonius</i>) observed in camp.
7/3/2014	First observation: 1 Common Merganser (<i>Mergus merganser</i>) observed flying over McNeil River falls. First bloom: Common Fireweed (<i>Chamaenerion Angustifolium</i>) observed along the McNeil river trail.
7/10/2014	First bloom: Monkshood (<i>Aconitum delphinifolium</i>) observed on the McNeil river trail just above McNeil river falls.
7/11/2014	First observation: 1 Common Redpoll (<i>Acanthis flammea</i>) observed at McNeil river falls and 1 Surf Scoter (<i>Melanitta perspicillata</i>) observed in the lagoon.
7/12/2014	First observation: 1 Alder Flycatcher (<i>Empidonax alnorum</i>) observed in camp.
7/18/2014	First observation: 3 Common Loons (<i>Gavia immer</i>) observed swimming in McNeil cove and 28 Western Sandpipers (<i>Calidris mauri</i>) observed on the spit.
7/20/2014	First observation: 1 Spotted Sandpiper (<i>Actitis macularius</i>) observed at McNeil River falls.
7/21/2014	First observation: 1 Belted Kingfisher (<i>Megaceryle alcyon</i>) observed in an Alder on Enders Island at the mouth of McNeil River.
7/30/2014	First observation: 2 Black-billed Magpie (<i>Pica hudsonia</i>) observed from Enders Island.

Date	Comments
8/2/2014	First observation: 1 Pine Grosbeak (<i>Pinicola enucleator</i>) observed flying over the lagoon.
8/10/2014	First observation: 1 Double-crested Cormorant (<i>Phalacrocorax auritus</i>) observed in lower McNeil river.
8/12/2014	First observation: 4 Black Turnstones (<i>Arenaria melanocephala</i>) observed on the spit at high tide during a storm and 3 Red-throated Loon (<i>Gavia stellata</i>) observed in the lagoon.
8/16/2014	First observation: 1 Merlin (<i>Falco columbarius</i>) observed flying over the McNeil River trail.
8/20/2014	First observation: 1 Wandering Tattler (<i>Tringa incana</i>) observed on the beach near McNeil head and 1 Porcupine (<i>Erethizon dorsatum</i>) observed on the farside of McNeil river falls.
8/23/2014	First observation: 2 Black-capped Chickadee (<i>Poecile atricapillus</i>) observed perched on Enders Island at the mouth of McNeil river.
8/26/2014	First observation: 6 Sandhill Cranes (<i>Grus canadensis</i>) observed flying over the lagoon.
8/28/2014	First observation: 1 Northern Shrike (<i>Lanius excubitor</i>) and 1 Moose (<i>Alces alces gigas</i>) observed along the McNeil river trail.

