STATUS OF
BROWN BEARS AND
OTHER NATURAL RESOURCES IN THE
McNEIL RIVER STATE GAME SANCTUARY AND REFUGE
IN 2005

ANNUAL REPORT TO
THE ALASKA STATE LEGISLATURE

Submitted by: McKie Campbell, Commissioner
Prepared by: Joe Meehan, Lands and Refuges Program Coordinator
Alaska Department of Fish and Game

January 2006

EXECUTIVE SUMMARY

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

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

As many as 144 individual bears have been observed along McNeil River during summer and as many as 72 bears have been seen at one time at McNeil River Falls, the primary bear gathering and viewing location. However, the number of bears at McNeil River has declined significantly since 1998 and has fallen below the level identified by sanctuary managers where it may affect the quality of the bear-viewing program.

One factor likely contributing to the decline is the low return of chum salmon to McNeil River, which has failed to meet escapement goals for 12 of the past 16 years. Compounding the low salmon escapement in McNeil River, nearby systems have experienced relatively good returns of chum and sockeye salmon over the past six seasons, which potentially drew bears away from the McNeil River system in search of a more abundant food source; however, these relationships are not well understood. Also not well understood, are the affects of the brown bear harvest outside the sanctuary on bear use at McNeil River. Harvest levels have increased above historic levels since the 1999 regulatory year.

The bear-viewing program at McNeil River again attracted people from around the world in 2005 and 960 people applied for the 185 regular permits and 57 standby permits selected by lottery. During 2005, 195 people participated in the sanctuary's bear-viewing program, which included lottery winners and 24 individuals issued Special Access Permits. The permit program generated $72,650 in 2005 that was deposited into the state's Fish and Game Fund.

Land use permits were issued to several commercial sport-fishing guides for camps and boat storage on the Kamishak River, for a commercial bear viewing camp on Chenik Lake, for a Department sponsored archeological survey of the McNeil River camp area and several other research and monitoring programs. In January 2005, the Department removed several cabins and other structures near Chenik Head in the refuge that were formerly part of a commercially operated wilderness lodge. The unauthorized facilities and surrounding federal lands were conveyed to the State of Alaska in 2003 when they were incorporated into the refuge.

I. INTRODUCTION

McNeil River, located in southwestern Alaska (Figure 1) supports the world's largest concentration of brown bears. The Alaska State Legislature established the McNeil River State Game ***Sanctuary*** in 1967 to: **(1)** provide permanent protection for brown bears and other fish and wildlife populations and their habitats so that these resources may be preserved for scientific, aesthetic, and educational purposes; **(2)** manage human use and activities in a way that is compatible with the permanent protection of brown bears and other purposes described in (1) and to maintain and enhance the unique bear-viewing opportunities within the sanctuary; and **(3)** provide opportunities that are compatible with (1) for wildlife viewing, fisheries enhancement, fishing, temporary safe anchorage, and other activities (AS 16.20.162(a)). Hunting, trapping and mineral entry are prohibited in the sanctuary.

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

This report 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). 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.

II. STATUS OF BROWN BEARS

Population Monitoring

The number of bears at McNeil River Falls fluctuates daily and annually. Variability in bear use may be influenced by several factors including: food availability, the strength and timing of salmon runs in McNeil River and in surrounding systems, changes in the regional bear population, 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 and 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. There are three methods for monitoring the population of bears at McNeil River: index counts, individual counts, and bear use days.

Index Counts- This monitoring program detects large, short-term declines *or* gradual, long-term declines in the average number of independent bears (not including cubs) at McNeil River Falls and includes a "bear threshold criterion," which represents a statistically significant lower level in the observed number of bears. A decline below this "criterion" may result in adverse

impacts to the purposes for which the sanctuary was established and would initiate an assessment of the possible causes.

This monitoring program involves the hourly counting of bears at McNeil River Falls from July 15 through August 5 and during the viewing period of approximately 11:00 a.m. to 7:00 p.m. The annual medians of the seven highest daily counts of bears at the falls from 1983 to 1992 were averaged to establish a standard of 48.6 bears as the benchmark for maintaining bear numbers and the quality viewing opportunities in the sanctuary. The "bear threshold criterion" (40.8 bears) represents the lower limit of these medians.

The highest individual hourly count in 2005 was 24 bears on July 20. In comparison, there were counts in excess of 40 bears on 11 days in 1997 and 1998 when as many as 66 bears were observed at one time (Table 1). The mean of the seven highest hourly counts (the count index) was 19.4 bears in 2005, well below the "bear threshold criterion" of 40.8 bears. This represents the lowest count index in the 23 years of monitoring bears at McNeil River and continues the steady decline in the number of bears observed starting in 1998. The highest count indices in past years were 61.0 bears in 1990, 58.0 bears in 1997 and 57.0 bears in 1985; however, these high indices include cubs (Figure 2).

Individual Counts- A second method of monitoring the sanctuary's bear population and the quality of the bear-viewing program is by counting the number of individual bears observed by sanctuary staff through the summer. Using unique identifying marks such as scars, coat color, sex and behavior, each bear visiting the sanctuary has been documented nearly every year since 1976. While this monitoring method only records the presence of an individual bear and not the frequency or amount of time it spends at McNeil River, it provides an additional index in evaluating the overall bear use and the quality of the bear-viewing program.

While the number of individual bears (including cubs) at McNeil River increased during the past year (from 78 in 2004 to 87 in 2005), it continues to remain below the long-term average of 104.6 individuals observed since 1983 (Table 2). It also remains well below the peak number of individual bears (144) observed in 1997. The decline in the observed number of individual bears mimics the trend observed in the index count monitoring method discussed above.

Bear Use Days- This method of monitoring bears at McNeil River is the annual summation of individual bears observed daily in the sanctuary. This monitoring method may be less reliable than the *individual counts* and *index counts* discussed above due to count variability among sanctuary staff and the opportunistic timing of the counts. However, it can be used to further the interpretation of these other monitoring methods and it generally follows the same trends as the other methods (Figure 3). There were 781 bear-use days in 2005, the lowest recorded since this monitoring method was established in 1982 and well below the annual peak of 1,863 use days in 1989. The long-term average (since 1983) of bear-use days was 1,347 days.

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 bears using McNeil River and McNeil River Falls have changed in the last several years and while males have

typically outnumbered females, this has become more pronounced in the past five years (Figure 4; Table 2). The percentage of male bears at McNeil River has steadily increased from 54% in the 5-year period of 1986-1990, to 67% in 2001-2005.

In addition to the composition of bears shifting to primarily males, the number of subadult bears (both sexes) has recently declined and only five were observed in 2005, approximately half of the long-term average of 10.2 subadults observed since monitoring began in 1976 (Figure 5; Table 2). The 2005 observation of five subadults is the second lowest count since observations began and continues a decline starting in 1999. The lowest number of subadults observed was four in 2003 and the highest was 15 in 1981, 1982 and 1987.

In 2005, there were 10 maternal females and 18 cubs counted at McNeil River (Figure 5; Table 2). While these figures represent only a minor decline over the annual averages from the 30-year monitoring period (11.6 maternal females and 23.8 cubs), it represents a decline in family groups starting in the mid-1980s. The peak number of maternal females observed on the river was 20 in 1996 and the number of cubs on the river peaked at 43 in 1997.

Chinik Creek

While the Department has not conducted standardized surveys of bears at Chenik Creek, a commercial bear-viewing company maintained a presence along the creek from July 1-14 and counted a peak number of individual bears of 17 on July 9.

Hunting

The sanctuary is closed to hunting by Alaska state statute (AS 16.20.162(b)), and in October 1995, the Alaska Board of Game closed the refuge to brown bear hunting effective July 1996.

The areas south of the sanctuary including Katmai National Park and state-owned lands between the sanctuary and national park (including the Kamishak Special Use Area, managed by the Alaska Department of Natural Resources) are also currently closed to brown bear hunting, the national park by federal regulations and the state-owned lands by Board of Game action. The McNeil River sanctuary and refuge are currently within an area of approximately 5,585 square miles where bears are protected from hunting. However, in March 2005 the Board of Game removed the brown bear hunting closure on state owned lands in the Kamishak Special Use Area (and outside the sanctuary) starting July 1, 2007 (5AAC 92.510(9)(C)).

Past research by the Department and observations by sanctuary staff have shown that bears at McNeil River range throughout the region including areas open to hunting west and north of the sanctuary and refuge. These areas have experienced higher-than-average brown bear harvests starting in 1998 (Figure 6). The harvest in these areas was 111 during the combined 2002 and 2003 regulatory years (July 2002 through June 2004), which is twice the long-term biennial average since the sanctuary was created in 1960. The 2005 regulatory hunt year (July 2005 – June 2006) is not yet completed but to date, 42 bears were reported taken during the fall 2005 portion of the hunt.

The increase in harvest in recent years is likely due, in part, to the liberalized bear hunting seasons in Game Management Unit 9B adopted by the Board of Game in an effort to bolster

recruitment into the local moose population and to provide more opportunity for a sustained harvest of this resource. Based on harvest levels, and the sex and age composition of harvested animals, it appears that legal hunting of bears outside the sanctuary is not significantly affecting the regional population.

Use Patterns

As discussed above, over the past seven years the brown bear monitoring programs at McNeil River indicate a significant decline in the number of bears and a shift in the sex composition, both of which have influenced the quality of the bear-viewing program at McNeil River. The reasons for these changes are not well understood but do not appear to be influenced by the sanctuary viewing program, sanctuary or refuge management actions or land use activities in the region. Department staff have conducted a preliminary assessment of historic bear-use at McNeil River including overall numbers and changes in sex and age composition, brown bear harvest from surrounding areas, and salmon escapement at McNeil River and surrounding systems. While results suggest some correlations may exist, more in-depth research is needed to better understand the affects that salmon escapement in McNeil River (and nearby drainages) have on McNeil River bears. Likewise, more information is needed to better understand the affects of legal hunting outside the sanctuary on bears at McNeil River.

As discussed in more detail in the *Fisheries* section below, McNeil River has experienced a long-term failure to meet chum salmon escapement returns. Observations from the sanctuary indicate low salmon returns will result in a short-term increase in bear-use as they expend more effort and time catching enough fish to meet their nutritional requirements. However, long-term fish shortages will alter established use patterns as bears seek alternative sources for salmon or other sources of food. These long-term changes in use patterns appear to have started in 1998 and have continued to date. In addition to the size of the salmon run, the timing of the run also appears to influence the number of bears utilizing McNeil River. An evenly distributed run will generally attract more bears to the falls while a similarly sized run that arrives in a relatively short period will not afford a larger number of bears the opportunity to catch fish, thus they seek food elsewhere.

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

Compounding the chronic low salmon escapements at McNeil River, comparatively strong chum salmon returns throughout Lower Cook Inlet during the past six years (with the unique exception of the McNeil River system), and exceptionally large sockeye salmon returns to some nearby

Bristol Bay drainages, may also be contributing to the decline in bear numbers by attracting bears away from McNeil River.

Based on the Department's review of fisheries escapements at McNeil River, and considering that commercial harvest of chum salmon in the McNeil River Subdistrict has been negligible for the past 12 years (and has been closed for the duration of the chum salmon return during every season since 1997), staff determined that changes in commercial fisheries activities were not warranted. Management actions such as artificial enhancement of the chum salmon population were also considered. However, sanctuary managers felt that these actions would have minimal or no affect on the McNeil River bear population or, in the case of fisheries enhancement, would not be feasible nor would it be consistent with management goals of the sanctuary. Managers did feel that further study of the McNeil River chum salmon spawning habitat and other parameters would assist in the future management of these resources and the sanctuary. This study was initiated in 2003 with a spawning habitat assessment. A chum salmon life history study was initiated in 2005 and will be completed in 2006 (see *Fisheries* section below).

III. WILDLIFE OBSERVATIONS

Notable wildlife observations from the 2005 field season included three new mammal species: coyote, snowshoe hare, and Steller sea lion (swimming near the spit at high tide). Caspian terns and two Say's Phoebes were also observed for the first time in the sanctuary.

Although finding the carcass of an adult bear is rare, sanctuary staff found the carcasses of two adult males in June of 2005. Both of their skeletal remains were found within approximately 200 yards above the falls. Staff estimated that one bear died 2-5 years before its remains were discovered while the other is suspected to have died in late summer of 2004. The latter may have been a recognizable bear and would have been 29 years old at the time of its death.

IV. FISHERIES

Commercial Fisheries

The cumulative Mikfik Creek sockeye salmon escapement index for 2005 was 5,970 fish while the McNeil River chum salmon escapement was estimated at 17,411 fish (Table 3). There was no commercial fishing effort targeting sockeyes in the McNeil River Subdistrict this season, and the subdistrict was closed for the duration of the chum return. As a result, no harvest occurred and the entire Mikfik Creek sockeye and McNeil River chum returns entered their respective drainages to spawn. The 2005 Mikfik Creek estimated escapement of almost 6,000 sockeyes fell about 5% (or 330 fish) short of the lower end of the sustainable escapement goal (SEG) range of 6,300 - 12,150 sockeyes.

This season was the seventeenth consecutive year the McNeil River chum salmon run failed to produce a significant harvestable surplus. However, chum salmon escapement achieved the established escapement goal range (presently a SEG set at 14,000 – 26,000 chums) for only the fourth time in the past sixteen seasons (Figure 7). In a continuing recent trend, chum returns to

the nearby Big and Little Kamishak Rivers and Bruin Bay River were relatively strong, while chum returns to more northerly Kamishak Bay systems between Ursus Cove and the northern limits of the district were also once again very strong in 2005. In addition, for the sixth successive season, significant commercial effort directed at chum salmon occurred in the Kamishak Bay District, primarily in the northern portion of the district at Cottonwood/Iliamna Subdistrict, resulting in a district-wide harvest of nearly 84,000 fish, the third highest total for the district since 1988.

The number of spawning chum salmon documented upstream of McNeil River Falls in 2005 was lower than the previous season, with a peak daily count of nearly 1,500 fish made on July 5. Fish were consistently seen above the falls during aerial observations this season, beginning with the first survey on June 21, but unfortunately, these upstream sightings remained rather disappointing in terms of numbers.

Post-season evaluation indicates that run timing was reasonably close to normal for both the Mikfik sockeye return and the McNeil chum return. The three different methods used to derive the total McNeil River chum escapement index yielded mixed results: 1) the historic mean run timing curve, used to extrapolate the "tail" of the run after the last (August 3) survey, produced a cumulative total of 18,400 fish; 2) the preferred method (calculates area under the curve assuming a 17.5-day stream life factor), now used to estimate escapements for most pink and chum streams in Lower Cook Inlet, resulted in a cumulative estimate of 17,411 chums; and 3) simple accumulation of daily counts, made after the second observed peak on July 20, resulted in an estimate of 21,700 chums. The second method has been adopted as the standard methodology for generating escapement indices and is considered the most precise estimate of escapement. Another method for estimating escapements, using a video camera attached to a personal computer to record the video images (see below) was used at Mikfik Creek/Lake again this season.

Mikfik Creek Video Research

A remote video escapement recorder (RVER) was installed at the outlet of Mikfik Lake for the seventh consecutive season. Continuation of this project is expected to demonstrate that remote video and time-lapse recording technology is capable of largely supplanting 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 seven years ago, the Mikfik video system consisted of a single remote video camera and a time-lapse videocassette recorder (VCR) logging one frame per second onto analog VHS tapes. While this system produced images of sufficient quality to facilitate reliable fish counts, it had shortcomings. Weekly flights were necessary to refresh videotapes (producing a lag in the timeliness of escapement information), the analog tapes were fragile and cumbersome to review, and tracking individual fish was difficult at one frame per second. The next evolution of the Mikfik system, used from 2002 through 2005, recorded up to five digital frames per second and stored the images on a computer hard drive. However, relatively high power consumption by the computer resulted in recording downtime and has led to the development of alternative equipment. The new setup uses a time-lapse digital video recorder (DVR) in place of the personal computer, and tests at other locations to date show the

new configuration completely overcomes the power issues affecting the computer-based version. Additionally, in order 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 has also been tested with mixed success in recent years. The Department believes these problems can be successfully resolved and plans to continue the development of this promising technology, ultimately incorporating it into the Mikfik remote recording system.

In 2005, the video system at Mikfik Creek/Lake was powered up on June 8 and shut down on June 30. Due to insufficient solar and wind energy, the system operated 5-19 hours per day (mean = 12 hrs) and successfully recorded images 61% of the time that it was programmed to operate. During successful operation, digital images were recorded locally onto external hard drives.

As was the case in 2001, 2003, and 2004, a single camera mounted on the original (north bank) light pole, was used to collect all video images of fish passage in 2005. After experimenting with several configurations, recordings were made using a compression rate of three frames per second, in 5-minute video files that averaged approximately 8 MB in size. The resulting image quality was excellent. Fish were very easy to see, and specialized fish enumeration software facilitated efficient and convenient video review to estimate escapement. Upon preliminary review of the images collected at Mikfik Creek, 6,499 sockeye salmon were counted, representing approximately 529 more fish than were estimated by aerial surveys. The video-based estimate should be considered conservative, because the system was inoperable for about 39% of the 2005 season. However, it was operating at full or near full capacity (70-89%) during the peak of the sockeye return and likely missed relatively few fish. To remain consistent with the historical Mikfik Creek database, aerial survey data was once again chosen to generate the 2005 spawning escapement index.

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. Video reviewers documented 39 instances where brown bears transited the field of view of the camera, with a peak of eight bears recorded on June 20. Other wildlife observed included a wolf (June 29), and several eagles, beavers and river otters.

Sport Fishing

Limited sport fishing occurs in McNeil Lagoon and Chenik Creek and is incidental to bear-viewing activities. The only area in the sanctuary that attracts significant sport fishing interest is on the Kamishak River and, to a lesser extent, the Little Kamishak River and its tributary, Strike Creek. Due to the small number of anglers that fish in the Kamishak River relative to more accessible locations in Alaska, the annual survey of sport anglers conducted by the Division of Sport Fish does not accurately portray angler effort, catch or harvest in this area. Five Bristol Bay area lodges operated in the area during summer and, as a condition of their sanctuary access permits, are required to report their sport fishing activities. Their reports are thought to better reflect the level of angler activity in the area (Table 5).

These lodges brought 385 visitors to the sanctuary who sport fished; however, wildlife viewing, primarily brown bears, was a significant part of their activities. These anglers caught 5,752 fish,

of which 44% were Dolly Varden and 40% were coho salmon. Nearly all Dolly Varden were released as were most pink and chum salmon, and 85% of coho salmon were released.

Fisheries Research

The Department hired a graduate student intern in 2005 to begin conducting a radio telemetry project on McNeil River chum salmon to estimate freshwater streamlife, document spawning distribution and estimate predation by bears. Because the number of pre-spawning chum salmon killed by brown bears is much greater at McNeil River than other streams, the Department wants to determine the average freshwater residency of chum salmon at McNeil River in order to improve the accuracy of total escapement indices derived by aerial survey. This project will likely result in the development of a new sustainable escapement goal (SEG) for McNeil River chum salmon that more accurately reflects the high rate of in-river predation that occurs there.

Two remote data logging stations were installed in June 2005, one at the tip of McNeil spit and one approximately 300 m above McNeil Falls. Fifty radio tags were deployed between June 24 and July 28. Each tag was outfitted with a mortality sensor to indicate when fish became deceased. Tags that were recovered from deceased fish were redeployed inseason, resulting in a total of 70 chum salmon being tagged. The movements and lifespan of tagged chum salmon were monitored by a combination of the remote data logging stations, radio telemetry flights, and daily manual tracking between the spit and McNeil Falls. The graduate intern successfully completed his comprehensive exams in fall 2005 and has begun working on the telemetry data. More detailed results from this study will be forthcoming.

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 the Kamishak Bay District sockeye stocks have made significant contributions to commercial salmon harvests during some years. In 2005, an estimated 2,000 sockeye salmon returned to the mouth of the Paint River, located approximately two miles north of McNeil River, but no harvest of these fish occurred. The Paint River Lakes were first stocked with sockeye salmon fry in 1986 in an effort to develop a new sockeye salmon return to this salmon-barren drainage, which is blocked to upstream fish migration by a steep waterfall at tidewater. From 1991 to 1996, approximately 600,000-750,000 sockeye salmon fry were stocked annually in the Paint River Lakes. Although construction of the Paint River fish ladder was completed in October 1991, the number of returning adult sockeye salmon has only ranged from 30 (in 2000) to 2,000 (in 2005). Consequently, the structure has never been opened to allow fish passage upstream through the ladder.

Although the Paint River sockeye stocking project was formally suspended after the 1996 season, the Cook Inlet Aquaculture Association (CIAA) experimentally stocked Upper Paint Lake in early October 2002 with 536,000 sockeye fry/pre-smolts. An amendment to the 2002 Trail Lakes Hatchery Annual Management Plan granted the aquaculture association authorization for a one-time release of juveniles that were surplus to the 2002 Annual Management Plan stocking schedule. Unlike previous releases, when the Paint Lakes were stocked with smaller spring fry and no smolt evaluation was conducted, stocking these larger fingerlings in October fostered hope that predator avoidance and overwinter survival would

increase. A condition of the 2002 release mandated that efforts be made to evaluate smolt production during the 2003 spring smolt migration from the lakes. Results of this assessment showed a total of only 6,900 outmigrating smolts. Additional hydroacoustic assessment in the fall of 2003 indicated little juvenile biomass in the lakes, indicating that few if any of the stocked pre-smolts remained, or were "holding over" in the lakes for an additional year. The previously described return of an estimated 2,000 sockeye salmon adults in 2005 likely resulted from this one-time experimental release, suggesting that the earlier smolt evaluation efforts may have missed a significant portion of outmigrating juveniles. Anticipated numbers of additional returning adults in 2006 are expected to be fewer than in 2005, and at this time no further stocking, efforts are planned for the Paint River system.

Prior to consideration of future Paint River fish ladder operations, several issues will need to be addressed: (1) the construction site has not revegetated and is subject to erosion; (2) water levels at the upstream exit to the ladder are very shallow and bears would likely be attracted to salmon as they emerge from the ladder, making bears vulnerable to being swept over the 40-foot waterfall; and (3) the fence installed along the lower portion of the ladder has been destroyed by high water, potentially allowing bears to gain access to the uncovered portions of the ladder.

V. LAND STATUS/USE

Land Use Permitting

Kamishak River- Five lodges in the Bristol Bay region operated sport fishing and wildlife viewing operations on the Kamishak River within the sanctuary and adjacent Katmai National Park in 2005. The lodges stored riverboats on the lower reaches of the river and three of the lodges operated a guide camp at this location. These activities are managed through Special Area Permits and Access Permits issued by the Department, and Land Use Permits issued by the Department of Natural Resources. This area is also part of the Kamishak Special Use Area, which is managed by the Department of Natural Resources. Concerns about conflicting permit and management requirements on the Kamishak River between the Department, the Alaska Department of Natural Resources and the National Park Service have been mostly alleviated by coordinating permit requirements and by jointly addressing management concerns and conducting joint field visits.

The area will continue to be monitored for permit compliance and identification of possible impacts to the sanctuary. 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. Additionally, concerns have been expressed about overcrowding, boating safety and impacts to the fisheries, bears and other resources on the Kamishak River. Several operators and guides have suggested that visitor limitations be placed on this area.

Chenik Creek- One commercial bear viewing operator working with a local non-profit educational organization, obtained a Special Area Permit for a camp near the outlet of Chenik

Lake for the purpose of bear viewing and bear educational workshops along Chenik Creek. The camp was occupied from July 1 through July 14.

Archeological Survey- In cooperation with the National Park Service, an archeological survey was conducted in the McNeil River camp area including the areas along the trails and viewing areas at Mikfik Creek and McNeil River. Six previously undocumented prehistoric sites were noted and mapped, and included at least 58 identifiable structures. The previously documented "McNeil Ranch" site containing remains from Charlie McNeil's cabin and other structures was mapped and photographed.

Other Land Uses- Several ongoing land use permits were in effect during 2005 and included: camp facilities at McNeil River, remote Internet camera placement at McNeil River Falls, fisheries remote video camera at Mikfik Creek/Lake, fisheries research cabin at Chenik Lake, and a GPS recording station in the refuge.

Chenik Lodge- In January 2005, the Department burned the facilities that formally comprised the *Chenik Wilderness Lodge* located near Chenik Head in the refuge. These facilities included the main lodge, three guest cabins and other support buildings and structures. These facilities came under state ownership in October 2003 when 6,871 acres of federally owned land within the refuge were conveyed from the Bureau of Land Management to the State of Alaska and were incorporated into the refuge. With this land transfer, the state assumed ownership of the unauthorized facility as the former owner had relinquished all interest in this site.

VI. SANCTUARY MANAGEMENT

Staff

Sanctuary Manager Larry Aumiller logged his 30th season at McNeil River, and retired from state service in October 2005. Tom Griffin (Wildlife Technician) returned for his sixth season; Polly Hessing (Wildlife Technician) who worked for the sanctuary in 1984-1987 and 1995-1998 returned for her ninth season. Josh Peirce (Graduate Intern) and Kelly Peirce (Volunteer) conducted research on McNeil River chum salmon.

VII. PUBLIC USE

McNeil River Falls/Mikfik Creek

Public use and access to the sanctuary, with the exception of the McNeil Cove spit and beach, requires an access permit from the Department (5 AAC 92.065). Since 1973, bear-viewing at established sites on McNeil River and nearby Mikfik Creek has been limited to ten people daily between June 7 and August 25, and Viewing Access Permits for this period are issued by lottery. 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 regular permits are issued as Special Access Permits at the Commissioner's discretion for scientific, educational, media and other purposes. Ten regular and three standby permits are issued for each of the established four-day permit periods.

The number of people visiting the sanctuary in 2005 was 195, slightly below the annual average for the previous 10-year period (Table 4). During the same period, the lowest annual number of visitors occurred in 2002 when only 175 people visited the sanctuary. The maximum number of people able to visit the sanctuary under the existing permit program is 257 people. The average number of permits used each day at the sanctuary in 2005 was 8.0 (out of a maximum of 10.0), which is significantly higher than the low of 6.6 in 2002. These annual fluctuations were likely attributable to several factors including the streamlining of the permit system, limits placed on campground capacity, limits placed on the number of nights each individual is allowed to stay in the sanctuary, lottery winners either not purchasing or not utilizing their permits and more recently, the reduction in the number of standby permits issued. The utilization of permits has improved since 2002 partly as a result of selling unclaimed permits to the next applicant on the draw list.

There were 960 applications submitted in 2005 for the 185 regular and 57 standby permits issued through the permit lottery. While this represents a slight increase from the previous year (860 applicants), it is significantly lower than the annual average for the previous 10 years (1,310). The peak number of applicants received was 2,150 in 1993. While the number of applicants fluctuates annually, there was a general decline starting in 1993 when the Board of Game started requiring a 4-year waiting period for successful applicants to reapply. This general decline stopped in 1999 when the Board of Game reduced the waiting period to one year and then applicant numbers increased for the next three years. Since 2002, applicant numbers have generally declined. A contributing factor to these annual fluctuations and perhaps the reason for the recent decline in applicants is the availability of commercially guided bear viewing operators in the region.

Ten applications for 17 individuals were received for Special Access Permits to the sanctuary and included projects under the Department's criteria for scientific, educational, media or other projects. Fourteen of these applicants and ten additional visitors were issued access permits which included representatives of federal agencies involved in the management of bear-viewing programs, a Japanese Broadcasting Company, Governor's and commissioner's office staff, Congressional staff, Conoco Philips senior staff, and two Alaskan writers.

In 2005, $72,650 was generated from the McNeil River sanctuary permit program and all revenues were deposited in the Fish and Game Fund.

Kamishak River

Five Bristol Bay area lodges operated on the Kamishak River in 2005 and brought 385 visitors to the sanctuary and adjacent Katmai National Park (Table 5). Their primary activity was sport fishing; however, they also engaged in wildlife viewing activities, primarily of brown bears.

Bear-Human Conflicts

There were no known adverse interactions between bears and people in the sanctuary or refuge during the 2005 season.

VIII. ACKNOWLEDGEMENTS

Sanctuary Manager Larry Aumiller and his staff, Tom Griffin, Polly Hessings, and Josh Peirce gathered data on bear use and visitor activities. Aaron Christ provided information on the bear-monitoring program; Lee Hammarstrom, Mark Dickson, Ted Otis and Nicky Szarzi prepared the narrative on fishing activities; Liz Solomon prepared the GIS map; Marian Snively helped compile the data and draft the report, and Lem Butler edited a draft copy of this report.

Figure 1. Map showing location of the McNeil River State Game Sanctuary and Refuge in southwestern Alaska.

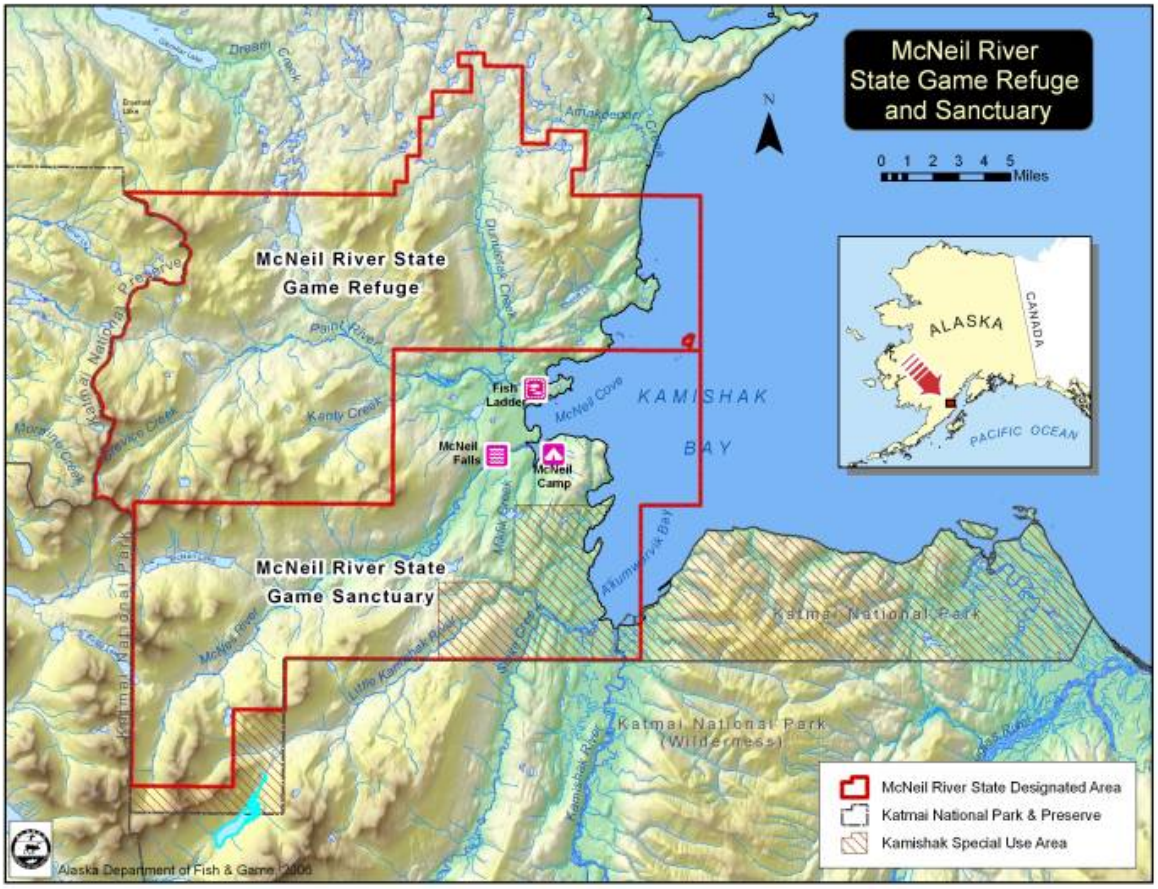


Figure 2. One-sided Shewhart control chart for the seven highest daily and hourly bear counts at McNeil River Falls, McNeil River State Sanctuary, Alaska, 1983 - 2005 (α = 0.01).

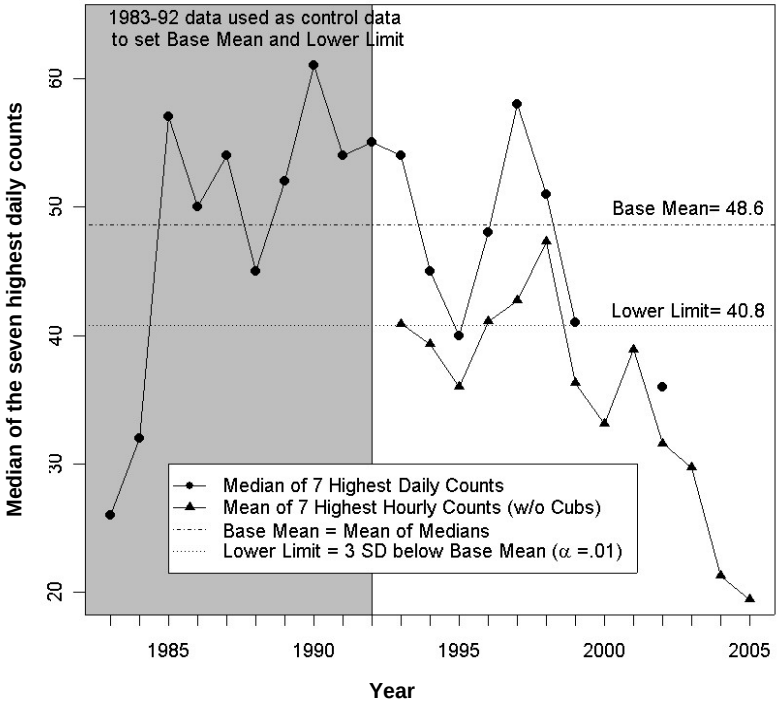


Figure 3. Bear use days at McNeil River Falls, McNeil River State Game Sanctuary, Alaska, 1982 – 2005.

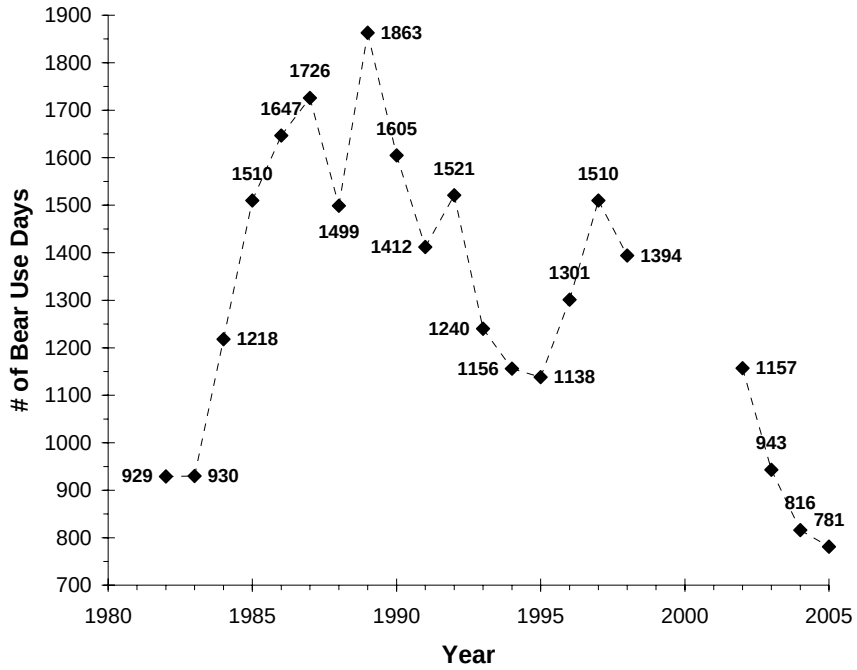


Figure 4. Average annual proportion of male and female bears observed at McNeil River Falls, McNeil River State Game Sanctuary, Alaska, 1986 – 2005 (in five year increments).

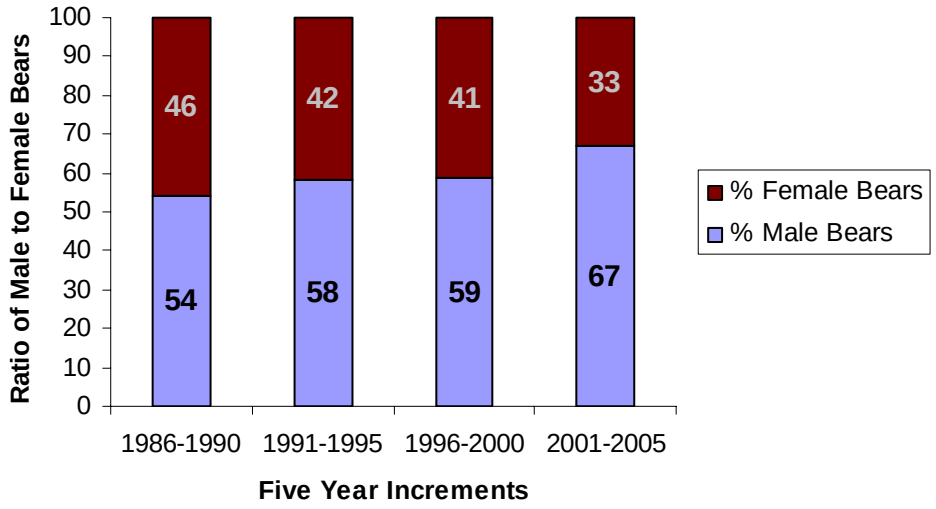
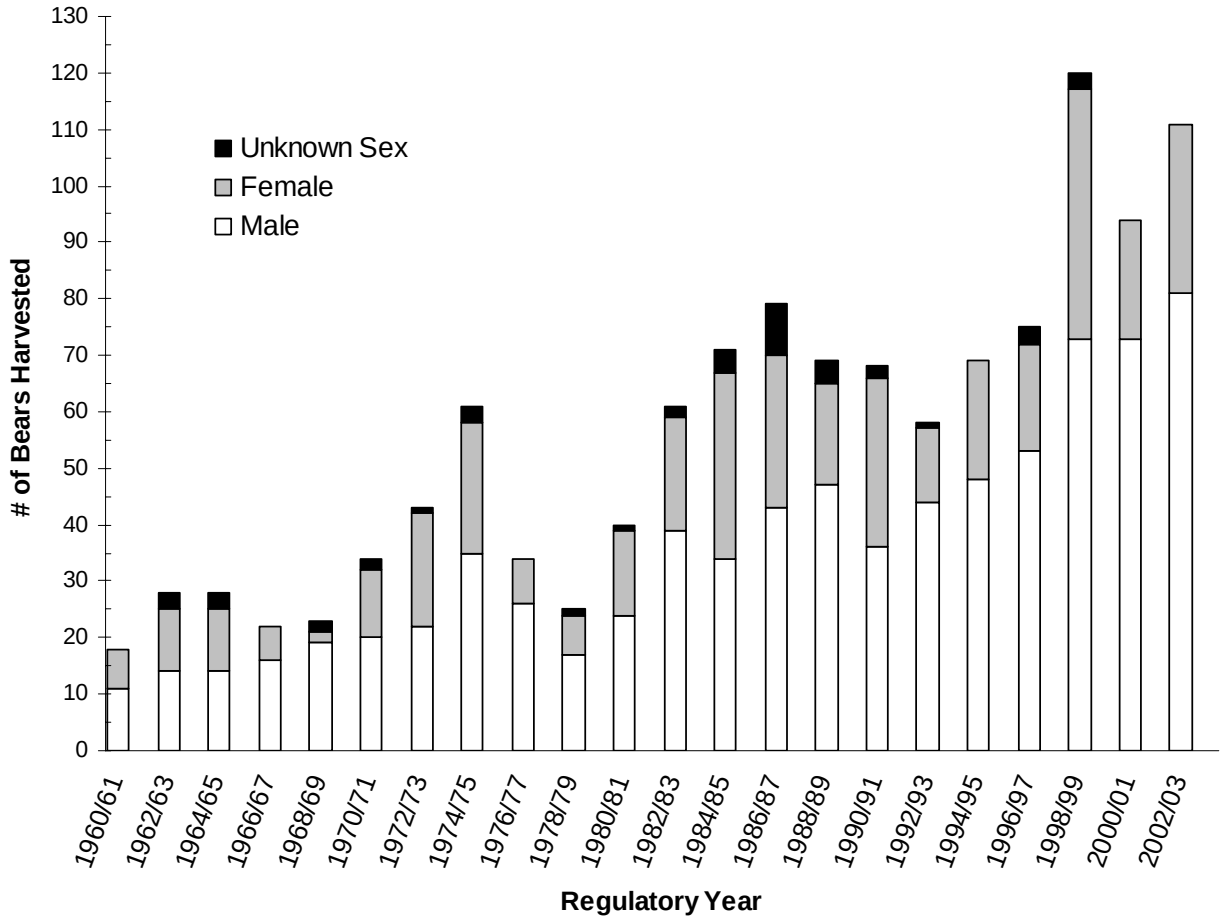


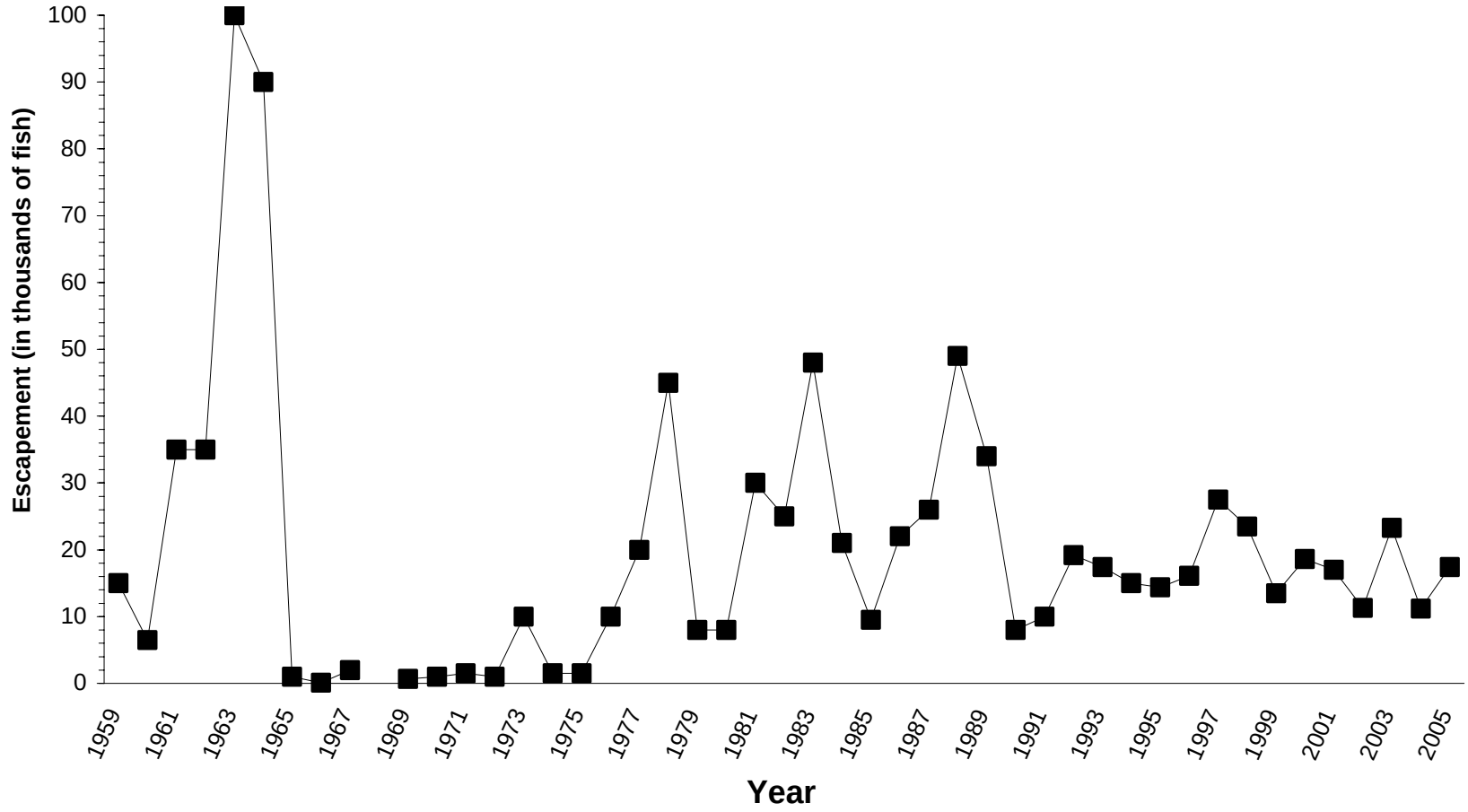
Figure 5. Average annual number of maternal females and sub-adult (both sexes) observed at McNeil River Falls, McNeil River State Game Sanctuary, Alaska, 1976-2005 (in five year increments).

Figure 6. Brown bear harvest from areas surrounding the McNeil River State Game Sanctuary and Refuge, Alaska, 1960-2005 (harvest from GMU/UCUs: 9A/201, 301, 401, 501; 9B/301; and 9C/201,301, 601, 702, and 703). Two consecutive regulatory years* are lumped.



* A regulatory year starts July 1 and ends June 30 of the following year. Harvest includes those bears taken as reported DLPs. Hunts occurred annually through 1975 and every other year thereafter.

Figure 7. McNeil River chum salmon escapement, McNeil River State Game Sanctuary, Alaska, 1959-2005.



Note:The Sustainable Escapement Goal (SEG) was established at 14,000 - 26,000 fish beginning with the 2002 season.

Table 1. Peak hourly counts of brown bears (not including cubs) at McNeil River Falls, McNeil River State Game Sanctuary, Alaska, 1993-2005.

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

Notes: Highest hourly count is the single highest count of the day taken on the hour.
High daily count is a one time count of the highest number of bears taken when the most bears are present.
(^) = Observations are generally made between 11:00am and 7:00 PM and average 6.5 hours a day.
(-) = Counts were not made.
Bold Numbers = 7 high daily counts for the season or 10 year average of 7 high daily counts

Table 2. Sex and age composition of brown bears at McNeil River State Game Sanctuary, Alaska, 1976-2005.

Year:	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
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
Single Adult Females	5	8	6	8	8	10	9	15	16	12	11	13	13	14	16	12	19	19	15	12	14	19	19	**14**	**14**	12	8	16	12	13
Single Adult Males	16	18	18	19	23	26	20	22	22	27	31	34	34	42	37	41	39	48	45	49	46	55	54	**48**	**48**	53	45	45	39	41
Adult Sex Unknown	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	0	0	0	0	0
Total Adults	31	36	32	36	38	44	36	44	47	55	56	61	61	75	69	68	74	78	71	75	80	93	88	**73**	**69**	70	63	73	58	64
Sub-Adult Females	4	3	4	2	6	9	11	9	8	2	7	7	9	4	5	6	6	8	9	3	6	5	6	**4**	**4**	4	4	2	4	2
Sub-Adult Males	0	5	4	0	0	1	1	4	5	10	7	8	8	5	5	4	2	4	3	5	1	3	3	**2**	**2**	2	2	2	1	3
Sub-Adult Sex Unknown	3	4	5	3	4	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	0	0	0	0	0
Total Sub-Adults *(1)*	7	12	13	5	10	15	15	14	13	12	14	15	17	9	10	10	8	12	12	8	7	8	9	**6**	**6**	6	6	4	5	5
Total Adults & Sub-Adults *(2)*	38	48	45	41	48	59	51	58	60	67	70	76	78	84	79	78	82	90	83	83	87	101	97	**79**	**75**	76	69	77	63	69
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
Total Bears	58	69	65	58	60	73	67	70	77	95	96	106	109	126	113	108	113	114	105	108	122	144	128	**99**	**90**	87	90	103	78	87

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

(2) Only the bears that are recognizable as individuals and given names are included. In addition any bear that is recognizable but is seen less than three times and is not a regular user of Lower Mikfik, McNeil Falls or McNeil Cove are not included. Hence these figures represent minimum number of bears present at the sanctuary.

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

Table 3. Aerial escapement estimates of sockeye and chum salmon in the Mikfik Creek and McNeil River drainages, McNeil River State Game Sanctuary, Alaska, 2005.

Survey Date	Mikfik Sockeyes (Daily)[a]	Estimated Cumulative	McNeil Chums (Daily)[a]	Estimated Cumulative[c]
6/6	1,310	1,310		
6/13	5,070	5,070		
6/16	3,970	5,070		
6/21	4,170	5,070	60	60
6/24	4,070	5,070	2,440	2,440
6/27	640	5,070	4,450	4,450
7/1	220	5,070	1,620	4,450
7/5		5,070	11,110	11,110
7/11	1,200	5,070	6,500	11,900
7/15	1,200	5,070	6,800	13,000
7/20	400	5,070	8,140	13,300
7/27		5,070	5,820	13,500
8/4	900	5,970	2,560	13,500
CUMULATIVE TOTAL		**5,970[b]**		**17,411[d]**

[a] *All individual daily estimates are unexpanded live counts and considered to be conservative.*

[b] *Because of the number of days between the peak aerial survey estimate of sockeye salmon on 6/13 and the last aerial survey when sockeyes were observed (8/4), as well as the location of the fish on the 8/4, the cumulative estimate for sockeyes at Mikfik in 2005 represents the seasonal peak daily unexpanded live aerial count (5,070) plus the number of sockeyes observed during the last survey (900).*

[c] *The cumulative estimate is not the sum of daily counts, but is adjusted for fish schooled in the lagoon that may or may not have been observed in previous surveys.*

[d] *The cumulative total was derived by estimating area under the curve with 17.5-day stream life factor applied and compares favorably with the historical mean run timing curve for McNeil River chum salmon.*

Table 4. Number of applicants, visitors, user days and permit days at McNeil River State Game Sanctuary, Alaska, 1984-2005.

Year	Footnotes	# of Applicants	# of Visitors	Total User days in Sanctuary*	Total Permit Days July/Aug (560 possible)	Comments on Season Length
1984	A, F	992	159	574	377	6/5 - 8/27
1985	A	832	216	816	449	6/10 - 8/25
1986	A	806	255	967	430	6/9 -8/25
1987	A, G	1,757	252	1,054	473	6/9 - 8/23
1988	A	1,094	304	1,328	498	6/1 - 8/29
1989	A	1,306	264	1,183	488	5/22 - 8/26
1990	A	1,481	299	1,435	524	6/8 - 8/25
1991	B, E	1,818	249	1,415	526	6/1 - 8/27
1992	C, E, H	1,672	245	1,210	478	6/1 - 8/25
1993	D	2,150	225	1,128	516	6/7 - 8/25
1994	D, I	1,766	228	1,086	484	6/7 - 8/25
1995	D, I	1,486	212	1,074	475	6/7 - 8/25
1996	D, I	1,502	219	1,158	494	6/7 - 8/25
1997	D, I	1,474	228	1,197	489	6/7 - 8/25
1998	D, I	1,159	219	1,096	504	6/7 - 8/25
1999	D, I, J	1,223	208	1,122	398	6/7 - 8/25
2000	D, J, K, L, M	1,322	198	1,051	424	6/7 - 8/25
2001	D, J, K, L, M, N	1,329	186	1,012	437	6/7 - 8/25
2002	D, J, K, L, M, N	1,434	175	930	351	6/7 - 8/25
2003	D, J, K, L, M, N, O, P	1,314	188	995	451	6/7 - 8/25
2004	D, J, K, L, M, O, P	860	201	1,034	462	6/7 - 8/25
2005	D, K, L, M, O, P	960	195	983	431	6/7 - 8/25

Footnotes Table:	
A =	No limit on standby or camp numbers.
B =	1st come, 1st served for standby with no camp limit.
C =	1st come, 1st served for standby with camp limit of 15.
D =	All permits (regular & standby) by lottery including June.
E =	Unlimited permits prior to June 15 then 10 a day.
F =	$5 application fee instituted in 1993.
G =	$10 application fee and $40 user fee instituted.
H =	$20 application fee and new user fees ($100 Resident/$250 Non-resident) instituted.
I =	Visitors to the sanctuary must wait four years to re-apply.
J =	Lower staffing levels prevented late arriving or early departing visitors from joing the group.
K =	$25 application fee and new user fees ($150 Resident/$350 Non-resident) instituted.
L =	Number of Standby permits drop from 5 to 3 per period (95 to 57 annually).
M =	Visitors to the sanctuary must wait one year to re-apply.
N =	A major air taxi operator retires, leaving only one primary carrier to serve MRSGS.
O =	Unissued standby permits were reissued and used.
P =	Includes some "fill in" permits.
* =	Includes all visitors multiplied by the number of days they stayed in the sanctuary.

Table 5. Visitor use and fish harvest at Kamishak River, McNeil River State Game Sanctuary, Alaska, 2005.

# of Anglers	# of Non-Anglers	# Days Guided	COHO SALMON		CHUM SALMON		PINK SALMON		DOLLY VARDEN	
			Kept	Released	Kept	Released	Kept	Released	Kept	Released
385	0	109	358	1949	8	888	0	6	58	2485