

**YUKON DELTA NATIONAL WILDLIFE REFUGE
BETHEL, ALASKA**

**ANNUAL NARRATIVE REPORT
CALENDAR YEAR 2001**

**U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
NATIONAL WILDLIFE REFUGE SYSTEM**

Reviews and Approvals

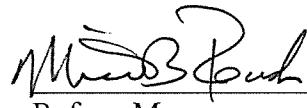
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YUKON DELTA NATIONAL WILDLIFE REFUGE

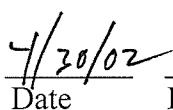
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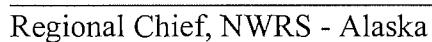
Refuge Manager


7/30/02

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Refuge Supervisor - South

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Regional Chief, NWRS - Alaska

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INTRODUCTION

The Yukon Delta National Wildlife Refuge (NWR), second largest of Alaska's 16 refuges, encompasses 19,166,094 acres of land and water on the Yukon-Kuskokwim Delta (Y-K Delta) in southwestern Alaska and stretches from Nunivak Island in the Bering Sea to the village of Aniak, nearly 300 miles to the east. Both the Yukon and Kuskokwim rivers, major salmon migration rivers, traverse the refuge. Over the course of time, these rivers have created one of the largest river deltas in the world. The delta, a generally flat marshland containing innumerable lakes and ponds, is the dominant landscape of the refuge. Upland areas, the Nulato Hills in the northern part of the refuge, and the Kilbuck Mountains along the refuge's eastern boundary, contain peaks of 2,000 to 4,000 feet.

The Y-K Delta supports one of the largest aggregations of water birds in the world. Over one million ducks and half a million geese breed here annually, and in some summers, up to a third of the continent's northern pintails can be found on the refuge. In addition, nearly 40,000 loons, 40,000 grebes, 100,000 swans and 30,000 cranes return to the refuge each spring to nest. Millions of shorebirds use the refuge for both breeding and staging. In terms of both density and species diversity, the Delta is the most important shorebird nesting area in the country, and the vast intertidal zone is the most important wetland for post-breeding shorebirds on the west coast of North America. The Delta meets all of the criteria for identifying wetlands of international importance under Article 2 of the Ramsar Convention.

The abundance of water in the form of lakes, ponds, streams, inlets, bays, and coastal areas provides habitat for waterfowl from all four North American flyways. The refuge supports a varied population of mammals, fish, and birds which are important in maintaining the traditional subsistence way of life of local residents. Nesting and brood rearing habitats for waterfowl, shorebirds, or seabirds give it national significance.

Refuge lands were first set aside as a preserve and breeding ground for native birds by President Theodore Roosevelt in 1909. In 1929, Nunivak Island was set aside as a refuge and breeding ground for wild birds, game, and furbearing animals. In 1930, the small islands and all lands under the waters surrounding Nunivak Island were added to the refuge. Additional lands were reserved by President Franklin D. Roosevelt in 1937 when Hazen Bay Migratory Waterfowl Refuge was established. The Kuskokwim National Wildlife Range, established in 1960, was enlarged in 1961, and its name changed to the Clarence Rhode National Wildlife Range.

On December 2, 1980, President Jimmy Carter signed the Alaska National Interest Lands Conservation Act (the Alaska Lands Act). With enactment of the Alaska Lands Act, these existing ranges and refuges were combined and enlarged to establish the Yukon Delta NWR. Two areas within the new refuge were designated as wilderness by the Alaska Lands Act: the Andreafsky Wilderness Area (1,300,000 acres) and the Nunivak Wilderness Area (600,000 acres).

Yukon Delta

National Wildlife Refuge

- Conveyed Land
- Selected Land
- Refuge
- Designated Wilderness



Land status represents USFWS interpretation of BLM records.



Bering Sea



INTRODUCTION

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K. FEEDBACK

A. HIGHLIGHTS

-An exchange with the Calista Regional Corporation finally reached completion during the year when final documents were recorded. As part of the deal, 29,579 acres of surface estate, 208,575 acres of subsurface estate, and a 16,998 acre conservation easement were added to the refuge. C.3

-A subadult polar bear decided to visit the refuge in June and July. The bear was near several coastal research camps. Efforts were made to monitor the location of the bear and provide additional training to field camp personnel on what to do should they encounter the bear around camp. The bear was eventually taken by Yup'ik subsistence hunters near Scammon Bay in July.

-While conducting Bar-tailed Godwit surveys from September 2-7, SFWB Broerman and BT Ruthrauff found six Mongolian plovers feeding in the tidal flats west of Tern Mountain. This species rarely occurs in Alaska and these sightings represent the highest concentration of Mongolian Plovers recorded in the state. G.5



One of the juvenile Mongolian plovers seen near Tern Mountain during the first week of September. DRR

-Thirty-six black scoter nests were found during the pilot year of a refuge and USGS, Alaska Science Center cooperative research project at Aropuk Lake. The project focuses

on investigating the breeding ecology and post-nesting movements of black scoters on the refuge. D.5

-A pilot study to determine overwintering habitat for rainbow trout in the Kwethluk River was initiated during the year. Forty-nine transmitters were surgically implanted in rainbows between August 22 and October 1 and telemetry flights were conducted throughout the remainder of the year. D.5

-ROS/Pilot Gene Peltola Jr. was selected for the Refuge Manager position with the Selawik NWR and transferred effective 12/30/01. E.1

-A major funding increase of 197K for subsistence fisheries management was added to the budget in FY01. The funding covered two new positions including a Subsistence Resource Specialist and a Refuge Officer, plus operational funds. The refuge's involvement with subsistence fisheries management increased dramatically during the year. E.5

-As part of a study initiated by NAES to identify habitat used by Steller's eiders, birds implanted with satellite transmitters near Barrow were tracked on the refuge in September. Over 5,000 apparently molting birds were located along the shoreline of a single barrier island (Kwigluk Island) or foraging over the adjacent eel grass bed off the southwest coast of the refuge near Kipnuk. The combination of satellite telemetry data and the refuge's aerial survey results suggest that a significant fraction of the threatened (i.e., Alaska-breeding) population of Steller's eiders molts in the coastal waters immediately adjacent to the refuge. G.2

-Two surveys on Nunivak Island in June failed to locate a breeding population of Steller's eiders as had been reported. G.2

-After 14 years of intensive study, it now appears that the Kilbuck Caribou Herd has been completely assimilated by the Mulchatna Caribou Herd. Survey efforts over the last three years have failed to locate what could be considered calving grounds in the Kilbuck Mountains. Due to the changes in calving patterns all caribou in southwest Alaska will be managed as a single entity until the caribou population again changes. G.8

-Chinook and chum salmon runs on the Yukon River were again considered weak. An estimated 11,000 to 15,000 chum passed through the Andreafsky River weir compared to an average of 115,000 for the years 1994 - 1996. Chinook and chum returns on the Kuskokwim River were somewhat stronger than expected with most monitored streams meeting escapement goals. No commercial fishing took place for either species on the refuge and significant restrictions to subsistence fishing were in place. G.11

-International Migratory Bird Day was a success when local author and former local village teacher Frank Keim read poetry, discussed his birding book, and showed slides of

the Hooper Bay and Scammon Bay areas. Frank was followed by three local birders who shared their secrets for attracting birds to feeders in Bethel. H7

-Law enforcement by refuge officers increased significantly this year and a record number of NOV's were issued by the station. In addition to the routine LE work, the refuge conducted the first spring subsistence waterfowl LE in the villages of Kongiganak and Kipnuk, made a major egging and emperor case on Baird Inlet Island, and spent many days on subsistence fisheries patrols on the Kuskokwim and Aniak rivers. H.17

-Alaska Natural History Association sales increased from \$3,000 in 1999 to \$15,000 this year. H.18

-Two arson caused fires occurred during the year in facilities for which we are a reluctant owner. The second of four buildings at an abandoned BIA school site in Nighthmute burned down during the summer. In August, part of a 55,000 square foot building which we were unaware even belonged to the refuge, was torched and partially burned at an old Air Force/BIA site near Bethel. I.8

B. CLIMATIC CONDITIONS

The low snow year that allowed a wildfire to consume 14,000 acres near the village of Kotlik in late December, 2000 continued for some time into 2001. However, by the end of the snow season we had 96.9 inches recorded in Bethel which is nearly double the normal amount. Part of this was the result of an unusual 20 inches received in April. Winter storms and cold weather gripped the area into early May. On May 3 a 9° overnight low was recorded in villages on the south coast which kept waterfowl activity to a minimum. In 2001 the Kuskokwim River in Bethel officially broke up on May 16 when the tripod moved far enough to trip the clock. H-Marker Lake broke up on May 22 and float planes were put in the water on the 23rd. The lake at Kanaryamiut broke and the first float plane landed a day or two later on June 8th. The initiation of nesting, and thus hatch, was nearly a week later than normal. Throughout the summer water levels were higher than normal. On the Aniak River snowmelt from the Kilbuck Mountains kept the water levels well above normal for all of June and July and hampered both rod and reel fishing and the ability of Fish and Game to get their sonar gear in place for counting salmon. The Kwethluk River weir was not installed until August 12 because of high water and as a result, missed much of the run. At least one other weir on a river draining the Kilbucks reported a standing wave as the only indicator that a floating weir remained in place. Airplanes were pulled off floats again around October 1 Little snow fell before Christmas and when we did accumulate a bit, warm weather and rain wiped it out. By the end of the year, temperatures were close to normal and snow began to accumulate.

C. LAND ACQUISITION

2. Easements

With the planned construction of a new airport in the village of Toksook Bay, a 17(b) easement required realignment. By mid-summer agreements were reached on the rerouting for the easement and a permit was issued for the sale of 350,000 cubic yards of material for runway construction.

3. Other Items

In the 2000 narrative we reported that the Calista Regional Corporation exchange/acquisition was expected to be completed in 2001 and in spite of a number of delays, this actually proved true. This exchange, which will implement a bill passed in 1998, added 29,579 acres of surface with subsurface estate, 161,998 acres of subsurface estate under village corporation lands, and a 16,998 acre conservation easement, plus the subsurface estate under the easement, to the refuge. An article in the Anchorage Daily News which ran on August 21 started out by stating "It's a win for Calista Corporation, and last week it became official: The U.S. government will give Calista and three Native village corporations \$39.4 million for land the government valued at less than \$5 million." The disparity in value was what kept the bill (HR 2000, Section 5) from receiving Congressional support for nearly 10 years until its final passage in 1998. The surface estate acquired includes parcels owned by the NIMA Corporation from Mekoryuk and located near Dall Lake, and by the Nunapilbiluraq Corporation of Hamilton and located near that village. The majority of the subsurface estate acquired is located in the Hooper Bay and Scammon Bay region. A map of the parcels is included as Figure 1.

Although sounding a bit repetitive (mainly because it is) we have to report again that the exchange with the village of Newtok continued to plug along with no real progress. This land exchange was proposed by the village in 1996 so that the village could be relocated due to erosion along the banks of the Ninglick River. Several meetings were held during the year with the village's consulting engineer, ASCG from Anchorage to discuss positions, progress, and alternatives. This consulting group was new on the scene this year and provided some positive scenarios which included planning - an element in the exchange and siting for the new village that has been lacking to this point. The only meeting held with representatives of the village took place on November 27 when we met with members from the Traditional Council, ASCG, and the Corps of Engineers to discuss options for conducting soil and material site testing in the vicinity of the proposed village. Although we stated that a permit would be issued for this soil testing, by the end of the year no application had been received.

The issue of the exchange acreage was still not resolved by year end. The last positions were that the Service would not negotiate for less than approximately a 16,000 acre exchange and the Newtok Corporation did not want the exchange to exceed approximately 12,000 acres. The Service's main concerns with this exchange include the likely impacts to upland areas on Nelson Island from four wheelers should the village relocate, and increased impacts to the brant colony on Baird Inlet Island from increased boat traffic past the island to the new village site. We have maintained that the corporation needs to acquire a sizeable amount of property for the new village site so that habitat disturbance is limited to non-refuge lands.

This impasse, and possibly other issues, lead to the drafting of legislation by Congressman Young's office in October that would effect the exchange. A review of the legislation was conducted and briefings were held for the Secretary's Special Assistant to Alaska, but by the end of the year the legislation had yet to be introduced. As background information related to this legislation, a briefing for the Secretary was prepared by the Realty office in October which discussed the issue.

Meanwhile, inquiries filtered in throughout the year from consultants and engineers working on various projects for the village including a new power plant and a new solid waste facility. A master plan for a new airport is scheduled to begin in 2004. All of these projects, if not on hold, are at least influenced by a pending land exchange and a determination of where the village will eventually be located. The last item causing confusion and conflict to this issue is the support from the village for the move. In several informal village polls to gauge support for a strategy, they have always been nearly evenly split on support for moving to Nelson Island or remaining where they are and backpedaling from the encroaching river as necessary. With an estimated eight years until the river starts to undermine the first structures in the village, some agreements need to be made soon. A map of the prospective exchange parcels is included as Figure 2.

The last exchange involves the NIMA Village Corporation from Mekoryuk on Nunivak Island. NIMA is interested in acquiring additional surface as well as subsurface estate on Nunivak Island in exchange for holdings they have near Dall Lake some 50 miles from the island. Approximately 20,000 acres will be involved in the exchange. Action on this exchange was pending completion of the Calista exchange discussed above. With that exchange now complete, it is expected that this one will proceed quickly. A single meeting was held in Bethel on June 9 at which Jeb Stuart (Realty) and refuge staff briefed the largely new NIMA board on the status of the exchange. There are no known conflicting issues. A map of the NIMA parcels that would be acquired is included as Figure 3.

The Alaska Native Veterans Allotment Act passed as part of ANCSA amendments in 1999. Throughout the year BLM accepted applications for allotments. Although we do not have figures on how many applications were received, it appears to be substantially below the estimated 250 that were eligible. Less than five requests were received during the year for permits to stake prospective allotments. Many potential beneficiaries of this legislation were disenchanted with the fact that the parcels of land that they qualify for

Yukon Delta National Wildlife Refuge



Section 5 H.R. 2000 Parcel Locations

- Dall Lake Parcel
- Hamilton Parcel
- Hooper Bay Parcel
- Kusilvak Parcel
- Nima Parcel
- Scammon Bay Parcel
- TKC Parcel
- Other Selections and Conveyed land
- Conflicting Selections

Notes

- Land status represents USFWS interpretation of BLM records. Land status current to 10/1/2001.
- Conflicting status is land that has been selected by more than one entity.
- Projected in UTM zone 3.



0 10 20 30 40 50
Miles
0 20 40 60 80
Kilometers

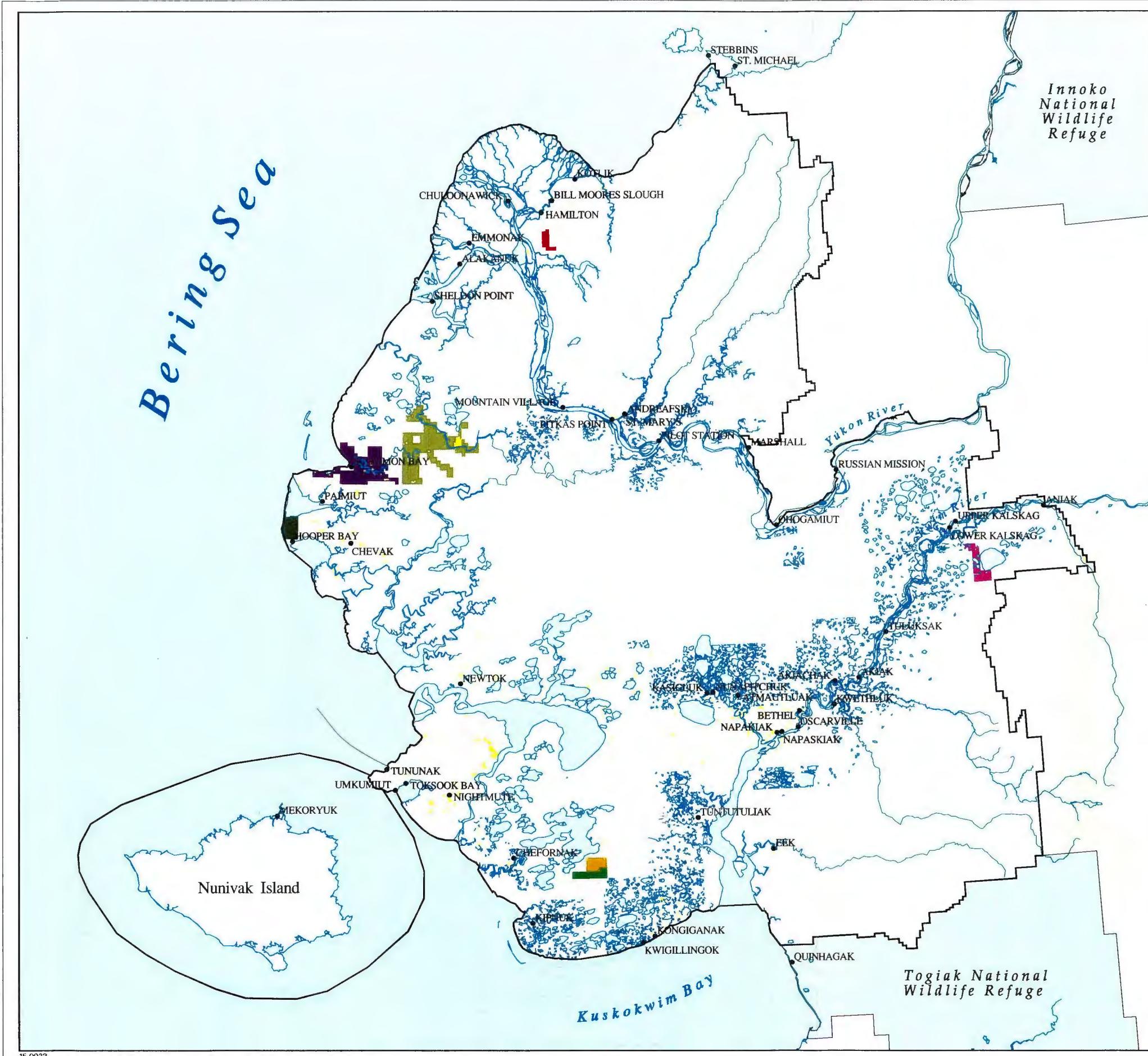


Figure 1. Parcels acquired via the Calista Regional Corporation exchange.

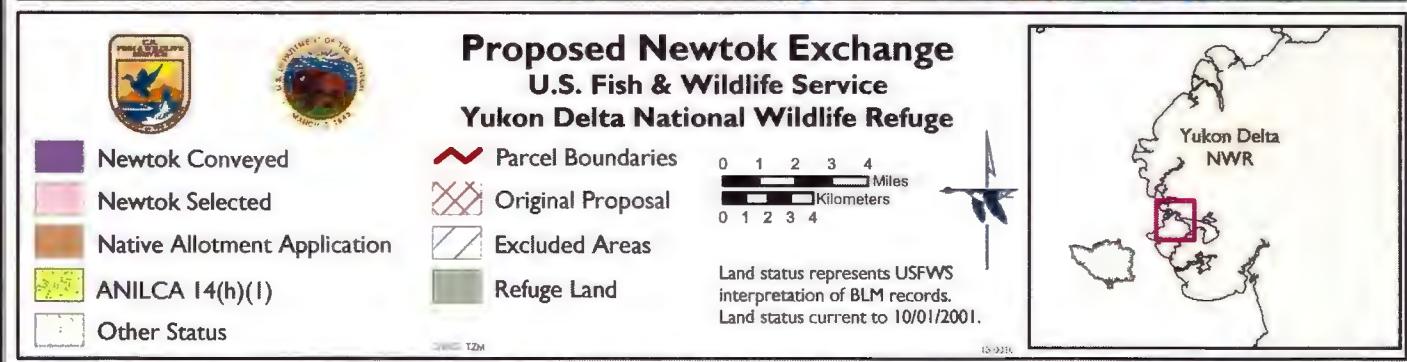
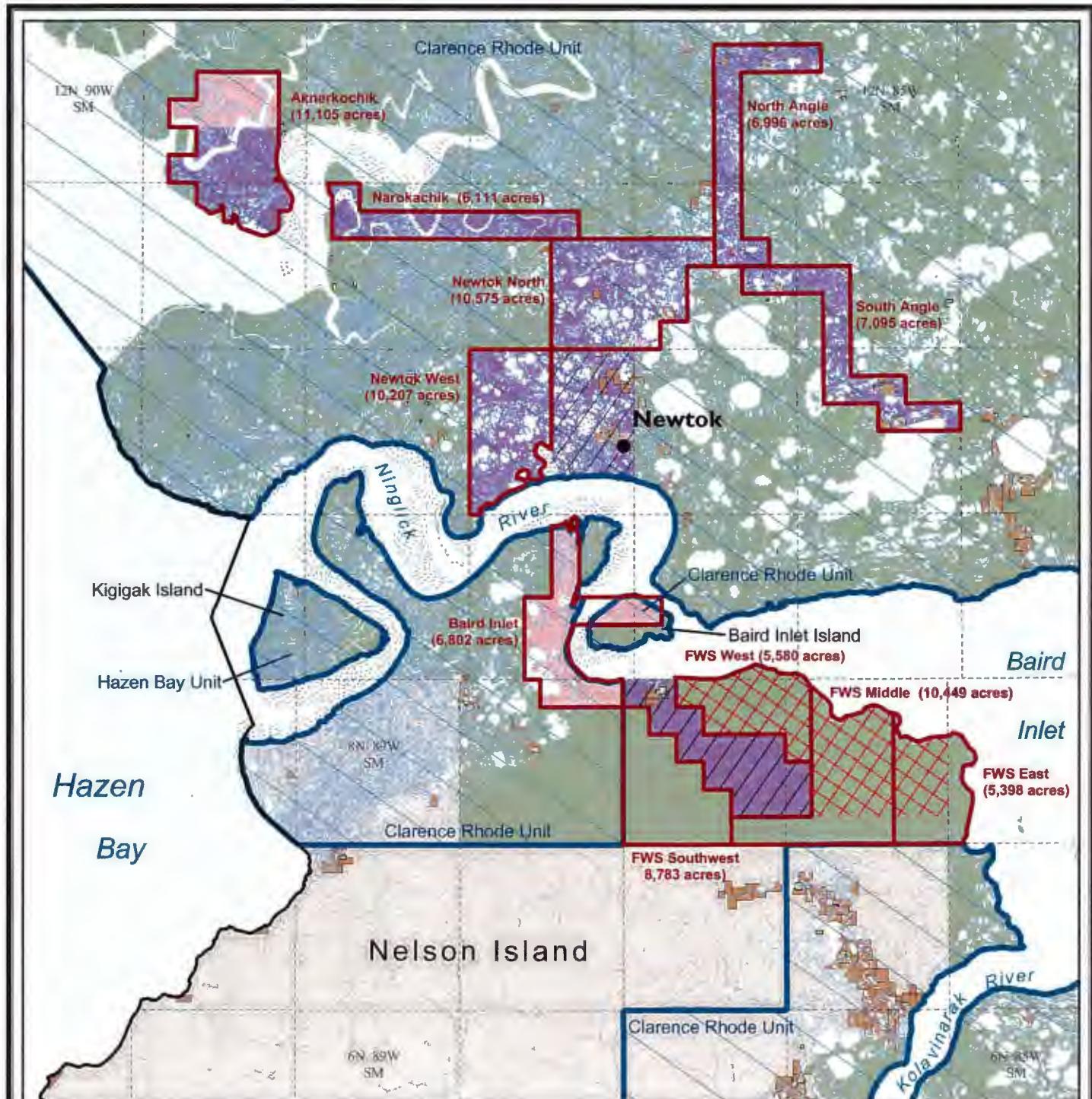
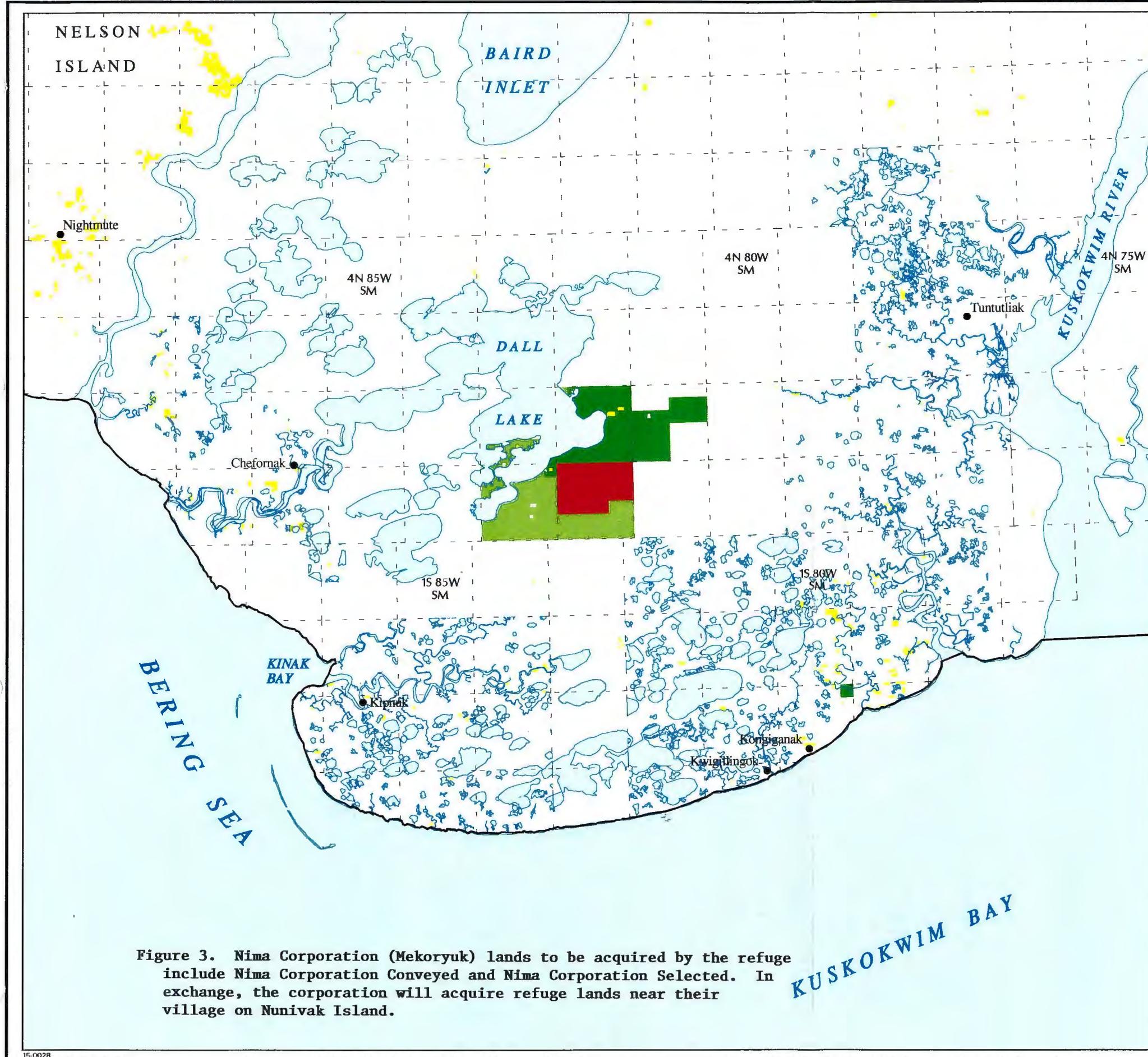


Figure 2. Tracts involved in the Newtok exchange include the FWS holdings (FWS West, Middle, and east) and Newtok lands (Aknerkochik, Narokachik, and Baird Inlet).

Yukon Delta National Wildlife Refuge



Section 5 H.R. 2000 Nima Parcel



- Nima Corporation Conveyed Surface and Calista Corporation Conveyed Subsurface for Sale to U.S.
- Nima Corporation Conveyed (Village of Merkoryuk)
- Nima Corporation Selected (Village of Merkoryuk)
- Other Selections and Conveyed land
- Conflicting status

Notes

- Land status represents USFWS interpretation of BLM records. Land status current to 10/01/2001.
- Conflicting status is land that has been selected by more than one entity.
- Projected in UTM zone 3.



Miles
0 2 4 6 8 10
Kilometers
0 4 8 12 16



11/06/01 JGB

have been largely taken already by the village corporations and are not available for selection. The application period extends through January 31, 2002 and at that time we should have an idea of how many new allotments may eventually be located within the refuge.

The process to review all ANCSA 17(b) easement across corporation lands began in 2000 but no work was done on the refuge this year. BLM, with significant involvement of the refuge will be responsible for the review, and recommendations to retain or abandon the easements. This will be a significant amount of work when we finally start the review.

D. PLANNING

3. Public Participation

Neither the Western Alaska Brown Bear Management Working Group (WABBMWG) nor the Kilbuck (Qavilnguut) Caribou Working Group met during the year. The WABBMWG largely was initiated to review and provide input on the brown bear collaring project taking place on the refuge. With more acceptance of the study and its near completion (in 2003 when collars are removed) the interest in the group has diminished. Similarly, the Kilbuck Caribou Working Group was initiated to provide input toward management and utilization of that herd. With the influx of Mulchatna caribou into the region each winter, the need for this working group has diminished.

4. Compliance with Environmental and Cultural Resource Mandates

Dr. Dennis Griffin, who has worked on the Y-K Delta off and on for many years, spent a portion of August in Nunivak Island collecting vegetation samples from the south side of the island. He later met with Mekoryuk residents to learn more about traditional and historic use of the plants. In mid August, with funding from the regional archaeologist, Dennis traveled to Kotlik to conduct interviews about archaeological and historic sites that may exist in the area east of the village near the Nulato Hills that was consumed by a 14,000 acre wildfire in December of 2000. No significant sites or use of the area was identified.

5. Research and Investigations

Kilbuck Mountains Caribou Study

Surveys of the Kilbuck Caribou Herd (KCH) have been conducted annually since 1986 following an approved study plan. The Kilbuck (Qavilnguut) Herd Cooperative Management Plan (1994) calls for radio telemetry applications to document movement, estimate population size, composition, and calving ratio. These data are used to develop harvest parameters.

Between 1986 and 2000, 100 caribou (10 males and 90 females) were radio-collared. As of December 2001, 34 radio-collars were believed to be functioning. Uncertainty in the number of functioning radio collars comes from the fact that several have begun to malfunction and are transmitting in mortality mode despite the animal still being alive. Aerial telemetry surveys (30 by refuge staff and an additional 10 by Togiak NWR, ADF&G - Bethel, or ADF&G - Dillingham staff) conducted in 2001 documented 397 radio relocations for radio-collared caribou both on and off the refuge. Eleven caribou radio collared in previous years were found dead during routine radio telemetry flights.

The highest number of caribou documented on the refuge occurred in April when 25,200 caribou were counted south and east of the Kuskokwim River. Weather conditions prevented adequate flying to cover the entire area; it is believed that more than 35,000 caribou were present on the refuge. Caribou began migrating off the refuge to their calving grounds in mid-April 2001.

Between June 1 and 9, 2000 we attempted to locate caribou on the "traditional" KCH calving grounds. While more than 2,500 caribou were located in the Kilbuck Mountains, less than 150 calving cows were located. We caught 11 yearling females among the calving groups for radio collaring. The purpose of going onto the calving grounds was to determine if any site fidelity remains and if the KCH can still be considered a distinct herd or is now just a subgroup of the Mulchatna Caribou Herd.

While 1,000 caribou were observed on the refuge in late August, large numbers of caribou were not observed on the refuge until early November. In previous years RM Rearden opened the Federal subsistence caribou hunting season when large numbers of caribou were present on the refuge. This year the season was opened on August 25, 2001 (the earliest date allowed under regulation) in an effort to reduce confusion among hunters and to reduce phone calls to the refuge inquiring when the season would be opened. This opening was again coordinated with the Togiak NWR as portions of Game Management Unit 18 includes that refuge.

The refuge again assisted ADF&G with a fall composition count. Due to seasonal mixing between the KCH and MCH since fall 1994, it is assumed that if a sufficient sample size of classified caribou are obtained then the data would be representative for both herds. The bull:cow:calf ratio for the 5,728 caribou classified on this and the Togiak NWR was 25.2:100:19.9, respectively. The proportion of both calves and bulls is lower than last year and is among the lowest recorded since composition surveys were initiated in 1993.

Kuskokwim Mountains Brown Bear Study

During 2001, 31 brown bear telemetry flights (14 by the Yukon Delta Refuge, 15 Togiak NWR, and 2 by ADF&G Dillingham) resulted in 437 relocations of radio-collared bears and 16 locations of non-radio-collared bears.

Findings of the project to date include: mean litter size for litters out of the den was 2.0; mean litter size for litters at weaning is 1.6; and mean age of offspring at weaning is 3.0 years. Survival of offspring to weaning increased to 36%. Age of first reproduction was established at 7.2 years; however, age of first successful reproduction was 8.9 years. Mean annual Kaplan-Meier survival estimate for radio collared females dropped to 95.6%. Minimum convex polygon home ranges varied from 233 km² to 2,740 km².

Arctic Nesting Goose Studies

Current population estimates for the four goose species of special concern continue to show mixed results. Cacklers (211,925), emperors (84,400), and whitefronts (517,475) continue to increase while brant (124,750) declined slightly. As anticipated, the Pacific Flyway Technical Committee decided to utilize a breeding population index that combines data from Bristol Bay along with interior and coastal zone YDNWR to monitor the Pacific population of greater whitefronts. Brant is the only species that continues to be monitored with wintering ground data.

Breeding ground aerial surveys showed increases for all categories except cackler pair index which was similar to 2000: emperor and whitefront pair indicies increased 13% and 46%, respectively. Cackler, emperor, and whitefront total bird indicies increased 13%, 74%, and 27%, respectively. See below for 2001 nest estimates.

In general, chronologies of break-up, migration arrival, and nesting were considered “late.” Float angles of eggs indicated average hatch dates of June 26 for brant, June 27 for emperors, and June 28 for cacklers and whitefronts. Fox depredation was severe and cool temperatures during nest initiation and a flood tide just after peak hatch also contributed to the loss of eggs and goslings. Production was poor for most waterfowl species.

The annual assessment of nesting goose populations in the coastal tundra region was done by estimating the number of total nests, active nests, and eggs from single searches of randomly located 0.4 x 0.8 km rectangular plots. The ground-based sampling of the coastal region of the Y-K Delta was based on a new single stratum design intended to improve efficiency and precision of estimates. A total of 81 plots were searched by crews from field camps located at Old Chevak, Tutakoke River, Hock Slough, Big Slough, and Kigigak Island, as well as five mobile crews based at Kanaryaraq field station. The survey estimated that 75,900 cackler, 14,600 emperor, and 113,125 whitefront nests were initiated on the 4,000 square kilometers of coastal habitat that contains about 90% of all geese on the Delta. While the whitefront total was the highest recorded for this survey, the cackler total was the lowest since 1997 and the emperor total was the lowest ever.

Clutch sizes were the lowest recorded for cacklers (3.7 eggs, n=729) and near record lows for emperors (4.8 eggs, n=127) and whitefronts (3.9 eggs, n=390). Nest success

was well below average for brant (53%), cacklers (61%), and emperors (78%), but near average for whitefronts (94%).

Migratory Bird Management continued an aerial survey to document emperor goose production, but results are unavailable at this time. Data from the 1999 survey (the last survey summarized by MBM) estimated 17,000 goslings present during late brood rearing. This is similar to the 1998 estimate of 15,000 goslings and more than double the 1997 estimate of 7,000 goslings for a year with poor egg production due to flooding. Comparison of the estimated number of eggs laid with the number of young in the October population indicates high mortality (average from 1986-1999 was about 89%) between mid- to late incubation and fall staging. An estimate of the number of young geese surviving to late in brood rearing is needed to determine how mortality is partitioned among various life cycle periods. The apparent survival rate from eggs in mid/late incubation to goslings late in brood rearing was 9% in 1994, 7% in 1997, 13% in 1998, and 16 % in 1999. In 1998 and 1999, an estimated 47% and 32%, respectively of goslings apparently perished between brood-rearing and arrival on fall staging areas.

The U.S. Geological Survey's Biological Resources Division (BRD) in Alaska conducted several projects on the refuge.

The first BRD project was aerial videography of brant colonies. Total nests estimated from five colonies (10,635) at Kokechik Bay, Tutakoke River, Kigigak Island, Baird Peninsula, and Baird Inlet Island were 46% below the long-term mean (19,856 nests). As mentioned above, weather delayed nest initiation and severe fox depredation were responsible this dramatic decrease.

The second BRD project was the seventeenth year of a cackler, emperor, and whitefront nesting ecology study near the Kashunuk River. Nesting plots in this area were first established in 1974. The continuing work provides the best long-term nesting ecology information for these three species. Break-up and nest initiation chronologies for the study area were among the latest recorded. Nest densities of all three species were higher than long-term averages but lower than the peak numbers recorded in 2000. Clutch sizes were smaller than long-term averages with cacklers, emperors, and whitefronts laying an average of 4.4, 4.1, and 3.8 eggs, respectively. Nest success for cacklers (41%) was among the lowest recorded, while those for emperors (47%) and whitefronts (58%) were lower than most other years of study. Plans for 2002 are under review.

The third BRD project was the eleventh year of a study of duck research on the lower Kashunuk River focusing on spectacled and common eiders, greater scaup, and oldsquaw. Objectives include estimating nest success, recruitment rates of marked ducklings, annual survival of adult females, duckling growth and survival during brood rearing, and lead exposure rates. As elsewhere, the late breakup and unusually high number of fox reduced the number of nests located to 430 from 600 normally. Only 5 of 165 nests monitored for success hatched. New work in 2001 involved sampling all

seaduck, brant, and emperor geese to examine exposure rates to two viruses recently identified on the North Slope of Alaska. One virus, a Reo-virus, was isolated from common eider females and a single common eider duckling, and appears to be the same virus that has lead to high mortality of ducklings in Europe. The second virus was isolated from oldsquaw and appears to have been associated with mortality of molting birds. In collaboration with the National Wildlife Health Center, virus samples were collected from all birds to further explore these viruses. Work in 2002 will again focus on spectacled eiders while continuing to monitor common eiders, increasing monitoring of oldsquaw to multiple refuge sites, and documenting recruitment of known age individuals into the breeding population. A new project will document the timing of scaup reproduction, particularly nutritional and physiological correlates with initiation of clutch formation.

The fourth year of sampling was conducted in lead shot settlement exclosures. This study followed a design similar to a previous experiment, but instead used five 10 m X 1 m exclosures seeded with #4 shot. A series of four sediment cores were taken annually from each plot using a modified clam gun. Cores were sliced into two centimeter sections starting at the surface and each section was sieved to identify shot. All shot in the new exclosures was recovered in the top three centimeters after one year of settlement. Subsequent years' sampling revealed a clear trend that lead shot was settling into the sediment at approximately one centimeter per year. These results conflict with an earlier study which indicated no downward movement of pellets after three years. This difference is likely related to lower precision of the earlier study which used a suction dredge and sampled in four centimeter layers. Additionally, the current study has an additional exposure year and a substantial change in lead shot distribution occurred in the fourth year of exposure. This apparent variation in settling rate may be related to differing ice dynamics during break-up or changes in sedimentation associated with flood tides. Nevertheless, lead shot does settle into sediments in tundra wetlands and most shot already present will eventually become unavailable to feeding waterfowl.

The fourth BRD project was the eighth year of an emperor goose nesting ecology study at Manokinak River. No results are available from work in 2001 which involved locating marked birds on a pre-selected set of plots and nest trapping unmarked birds to increase the marked population.

The fifth BRD project was the second year of a project to document reproductive success, contaminant exposure, and the link between breeding populations and their non-breeding distribution for red-throated loons. Results from 2001 are unavailable at this time.

Since 1984, the University of Alaska, Fairbanks, supported a study of brant ecology at Tutakoke River. The demographic aspect of the work included leg banding for the first time, observing previously banded birds, recapturing previously banded birds, and web tagging goslings. Analyses of results indicate: (1) handling during banding has no negative effect on first year survival; (2) by age 5 years virtually all females breed every

year; (3) as colony size has increased, gosling size and clutch size of females <5 years old have decreased significantly but no trend was detected in clutch size of older females or for the colony as a whole; (4) first year survival has declined from about 70% for the 1986 cohort to about 45% for cohorts in the early 1990's; (5) the largest goslings at capture survive at essentially adult rates (ca 80%) and the lower average first year survival is the result of poor survival by small goslings and explains the decline in first year survival of more recent cohorts. Study of controls over plant communities involved: (1) manipulation of frequency of tidal flooding, (2) manipulation of grazing intensity on *Carex subspathacea*, and (3) use of greenhouses and clipping and fertilization to examine effects of warmer temperatures on production and species composition of coastal communities. Preliminary analysis indicates little effect of weekly flooding. Trampling by biologists associated with performing the experiment converted *C. ramenskii* into *C. subspathacea*, and indicated that trampling by geese plays an important role in maintaining their preferred grazing areas. Vegetation reaches nearly one meter in height inside greenhouses and litter from the additional production of vegetation in salt marsh areas trapped several centimeters of silt during fall floods providing some insight into beach ridge development. Work continued to document individual breeding success in relation to known wintering areas. Manipulating forage available on a traditional brood rearing site by doubling the available forage area through mowing vegetation to a suitable height also continued. Results were impacted by severe fox depredation of nests, a flood tide during peak of hatch, and an unusual break-up chronology. Warm weather in early May led to an early migration arrival. After the first eggs were laid in mid-May, however, laying ceased and did not resume until late May. Weather conditions and abundant fox may have caused this delay. Number of nests on long-term plots (323) was 35% below the number found in 2000. Nest success (13%) was the lowest since 1985, the last year of elevated fox numbers. Less than 100 birds were captured during banding drives compared to several thousand during an average year. Four hundred plots were photographed to monitor stability and availability of *C. subspathacea* stands to brant broods. Artificially grazed plots were also sampled and and experimentally mowed brood rearing areas were reclipped to maintain simulated grazing pressure in the absence of geese. Work will basically be unchanged in 2002 with the addition of reducing fox presence by trapping and shooting. In addition, discussions with the Traditional Council of Chevak have indicated an interest in sampling geese for contaminants by collecting adults and raising goslings for dilution studies.

Brant Satellite Colony Survey

In conjunction with development of a brant population model by Dr. J. Sedinger of the University of Alaska, Fairbanks, the refuge initiated a study of distribution, abundance, and productivity of satellite colonies located within Clarence Rhode Natural National Landmark. This study area was chosen in part because a portion of the study was funded by the National Park Service. Objectives included: (1) document chronology of migration arrival and nest initiation, (2) document distribution, abundance, and productivity of colonies, (3) document presence of color-marked birds, and (4) leg band

birds in molting flocks with metal and colored, individually coded plastic bands. In previous years camps were maintained near the mouths of Big Slough and the Aknerkochik River. In 2001 the personnel selection process did not proceed in a timely manner to allow selection of sufficient personnel to staff both camps. As a result only the Big Slough camp was maintained from late April through early July during this final year of study. Brant were first observed on May 12 and peak arrival occurred on May 16. Peak nest initiation was June 2-3 and a total of 515 nests with clutch size of 2.9 eggs were located. Peak hatch for the 7% of successful nests occurred between June 29-30. No banding drives were conducted due to the extremely low nest success.

Kwethluk River Radio Telemetry Project

With the objective to determine overwintering and spawning areas for the rainbow trout in the Kwethluk River, twenty-five radio transmitters were surgically implanted in rainbow trout within a 33 mile section of the study area between August 22 and 29. This first phase of implantation involved floating approximately 80 miles of river in rubber rafts by three people (FB Dave Cannon, Volunteer John Tobin and local hire Jimmy Andrew). Between September 12 and 16 and September 27 and October 1, a jet boat was used to access and capture the remaining 24 fish in the lower portion of the study area. A fixed receiver was placed at the base of Three Step Mountain to record the date and time of fish passing this location, the expectation being that some fish would move downstream into deeper, slower water as water temperatures dropped and the river began to freeze. Aerial tracking began in September, and continued through the fall and winter.



FB Cannon performing surgery on a rainbow trout, while local hire Jimmy Andrew provides a steady supply of oxygen by irrigating the gills. (JT 8/01)



Kwethluk River rainbow trout post surgery and prior to release. (JT 8/01)

Shorebird Studies at Kanaryarmiut Field Station

In 2001, WB McCaffery hosted shorebird researchers from Humboldt State University, USGS-BRD in Idaho, and Simon Fraser University at the Kanaryarmiut Field Station. Dan Ruthrauff again led the western sandpiper project, now in its fourth season. In 2000, arvicoline rodent numbers reached a cyclic high on the Yukon-Kuskokwim Delta, and apparently led to very high productivity in arctic foxes. Subsequently, a mild winter in 2000-2001 resulted in high over-winter fox survival. As a result, fox numbers were very high along the outer coast of the Delta in spring 2001. Spring break-up in 2001 was also delayed about a week relative to 2000, and was considerably later than the long-term average. The combination of a late spring and high levels of fox predation led to a widespread failure among nesting waterfowl in the coastal zone of the Delta.

Western sandpipers initiated nesting significantly later in 2001 than in 1999 or 2000. The first egg of the season was not recorded until May 25th, in contrast to first egg dates of May 19th and 20th in 1999 and 2000, respectively. Nesting densities of 3.06 pairs/ha, however, were similar to those recorded in 1999 (2.95 pairs/ha) and 2000 (3.01 pairs/ha). In contrast to waterfowl along the coast, upland nesting western sandpipers did not experience complete nesting failure, but still had low rates of nest success (Mayfield nest success = 0.21; $n = 55$). Among clutches which hatched, fledging success, defined as a clutch fledging one or more young, was 58% (14 of 24 hatched nests). Brood attendance averaged 12.0 days for males ($n = 14$) and 7.4 days for females ($n = 14$); both sexes

exhibited significant seasonal declines in parental attendance. Although annual survival of banded females improved in 2001 (0.51 vs. 0.41 in 2000 and 0.24 in 1999), the 3-year mean of 0.38 is still well below the male survival rate of 0.68.



Dan Ruthrauff again led the western sandpiper project from the Kanaryaraq Field Station. Banded females continued to show a much lower survival rate than males in 2001. (DR 6/02)

We expanded the scope of our work at Kanaryaraq in 2001 to include a pilot study on the implementation of a large-scale shorebird survey methodology in cooperation with Dr. Jon Bart. Under the auspices of PRISM (Program for Regional and International Shorebird Monitoring), we sampled 29 randomly selected plots within a 24 km² study area centered on the Kanaryarmiut Field Station. The study area included approximately 17 km² of upland heath tundra and 7 km² of lowland sedge meadows. Overall shorebird density was estimated to be 250 birds/km². Estimated densities (in birds/km²) for the four most frequently detected species were: western sandpiper – 74.9, red-necked phalarope – 74.2, rock sandpiper – 34.0, and dunlin – 25.2. We plan to expand the survey area in 2002 to include 2,850 km² of the central Yukon-Kuskokwim Delta.

Black Scoter studies at Aropuk Lake

A cooperative research project with USGS Alaska Science Center and the refuge was initiated in June to study the breeding ecology and post-nesting movements of black scoters on the refuge. Aropuk Lake was chosen as a study site as it was identified as a

high density area of black scoters from aerial surveys conducted by MBM Office from 1989-1992 and by WB McCaffery in 1998. A camp was established southwest of Aropuk Lake's large island in June. Seven female scoters were mist-netted and implanted with conventional radio telemetry transmitters. While many man-hours of walking through dense tundra vegetation (up to a meter in height) yielded only one black scoter nest in June, similar hard work in July produced 35 more nests. Nests were found in shrubby dense stands of dwarf birch, spiraea and willow often on the sides of pingos. None of the BLSC females implanted with radios in early June was detected on nests. However, six females were radio-tagged during nest trapping efforts late in incubation. Four of the six nest-trapped females successfully fledged young. Broods moved considerable distances from nesting to brood rearing areas. Three of the early radio-tagged scoters and three of the nest-trapped scoters were detected in coastal areas of the refuge. One of these birds was found in Hazen Bay in late August, while the remaining birds were found in offshore waters between Kinak Bay and Goodnews Bay in late September or early October. An aerial photo map of Aropuk Lake with all the black scoter nests marked and the dates they were found is included as Figure 4.

Plans for 2002 are to capture and radio-tag as many birds as possible early in June and aerially track them to their nests. This method may aid in finding more nests. Aerial telemetry will continue through September to document timing of departure and use of near-shore areas along the coast.



Mist netting black scoters in early June at Aropuk Lake. (PLF 6/02)



A hard to find black scoter nest is well hidden beneath willow branches, dwarf birch and other vegetation. (PLF 7/02)

6. Other

The subsistence waterfowl harvest surveys on the Yukon-Kuskokwim Delta have been conducted in its present form since 1985 except for 1988 where there was no survey conducted.

Through 1999 the harvest survey was coordinated by the Migratory Bird Management division of the Service and the Refuge Information Technicians of the Yukon Delta NWR. Since then the refuge assumed the task of overseeing the survey after MBM approves villages and survey methodology. This survey is supported by the Y-K Delta Goose Management Plan (YKDGMP) and supported by the Association of Village Council Presidents (AVCP) Waterfowl Conservation Committee.

Villages to be surveyed are randomly selected each year. Once selected, the village Tribal Council is contacted by the Refuge Information Technician and presented with a resolution whereas the Council gives the authorization to contract with a local village resident to conduct the waterfowl harvest survey for the Service.

In 2001, the Service contracted with 28 local residents in 24 villages throughout the Refuge to conduct these surveys. The surveyors are trained by the RITs. Surveyors make household visits and receive permission from each household that had been

randomly selected during the training. Each household is numbered and changes each year. No names are used to maintain confidentiality. Five surveys are conducted with each household that had been selected starting from spring, early summer, mid-summer, late summer and fall. Bethel is surveyed twice - spring and fall.

The Subsistence Waterfowl Harvest Surveyors under contract with the Service were as follows:

From the North coast: Benedict Aparezuk- Kotlik, Allen Moore- Emmonak, Hilda Stern-Alakanuk, Catherine Kromwall-Nunam Iqūa.

Mid-Coast: Roberta Bell-Scammon Bay, Jerry Moses-Hooper Bay, Agnes Carl-Hooper Bay, Elsie Hooper-Tununak, Bernice Pitka-Toksook Bay, Alexie Flynn-Chefornak, Viva Smith-Mekoryuk.

Yukon: Jimmy Kozevnikoff-Pitka's Pt., Christopher Mike-St. Mary's, William Elia-Andreafsky, Simeon Housler-Russian Mission.

Kuskokwim: Ralph Kvamme-Aniak, Frank One-Upper Kalskag, Olga Evan-Lower Kalskag, Larry Lamont-Tuluksak, Henrietta Nicolai-Kwethluk, Bessie Nicori-Kwethluk, Richard Larson-Napaskiak, Ralph Pavilla-Atmauthluak, Eddie Alexie-Nunapitchuk, Connie & Henry Peter-Bethel.

Southcoast: Sarah Mayeda-Kipnuk, Jimmy Lupie-Tuntutuliak.

Villages that were not surveyed were Chevak, Mt. Village, Marshall, Newtok, Nigmute, Akiak, Akiachuk, Oscarville, Napakiak, Eek, Kongiganak, and Kwigillingok.

A total of \$56,075.00 went directly into local village economies as payments to these surveyors. Each surveyor earned an average of \$2000. This may seem like a small amount but it is significant given the scarcity of jobs in this region. For some of the surveyors, the survey was their only source of cash income other than yearly State dividends and public assistance.

Survey forms were tabulated and submitted to Migratory Birds late in the year for analysis and reporting.



Waterfowl harvest on the delta continues to be a major subsistence activity but this young fellow from Newtok quit after taking just one bird. (PAL 5/98)

E. ADMINISTRATION

1. Personnel

Permanent

1. Michael B. Rearden Refuge Manager, GS-0485-14, EOD 6/95, PFT
2. Paul A. Liedberg Deputy Refuge Manager/Pilot, GS-0485-13, EOD 5/96, PFT
3. Gene R. Peltola Jr. Refuge Operations Spec./Pilot, GS-0485-12, EOD 9/99, PFT, Transfer 12/30/01
4. Patrick A. Snow Refuge Operations Spec., GS-0485-07, EOD 7/00, PFT
5. Fred Broerman Supervisory Wildlife Biologist, GS-0401-12, EOD 6/00, PFT
6. Michael L. Wege Wildlife Biologist, GS-0486-11, EOD 4/83, PFT
7. Brian J. McCaffery Wildlife Biologist, GS-0486-11, EOD 10/86, PFT

8. Steve Kovach	Wildlife Biologist, GS-0486-11, EOD 11/96, PFT
9. Dave Cannon	Fisheries Biologist, GS-0482-11, EOD 7/98, PFT
10. Robert Sundown	Subsistence Resource Spec., GS-0401-12, EOD 5/00, PFT
11. Ignatius Andrew	Native Contact Rep., GS-1040-11, EOD 1/14/01, PFT
12. Jacob Isaac	Assistant Interpreter, GS-1040-9, EOD 2/97, PFT
13. Donna Hanley	Education Specialist, GS-1701-9, EOD 8/99, PFT
14. George Walters	Airplane Pilot, GS-2181-12, EOD 7/87, PFT
15. Bernice M. Albright	Computer Specialist, GS-2210-9, EOD 12/96, PFT
16. Phillip P. Paniyak	Refuge Clerk, GS-0303-05, EOD 1/92, PFT
17. Martha Perry	Refuge Clerk, GS-0303-04, EOD 2/87, PFT
18. Pat Jennings	Maintenance Worker, GS-4749-8, EOD 12/97, PFT
19. Victor Anvil	Maintenance Worker, GS-4749-8, EOD 8/99, PFT
20. Chris Harwood	Biological Tech., GS-0404-7, EOD 3/91, PFT
21. Henry E. Ivanoff	Biological Tech., GS-0404-5, EOD 8/91, PFT
22. Raymond Ayogan	Biological Tech., GS-0404-5, EOD 5/92, PFT
23. Michael A. Jimmy	Refuge Info. Tech., GS-1001-8, EOD 11/84, PFT (Seasonal)
24. James Sipary	Refuge Info. Tech., GS-1001-8, EOD 2/96, INT
25. Joe Asuluk Sr.	Refuge Info. Tech., GS-1001-8, EOD 1/94, INT
26. Leo Moses Sr.	Refuge Info. Tech., GS-1001-8, EOD 6/90, INT
27. Andrew Kelly	Refuge Info. Tech., GS-1001-7, EOD 7/98, INT
28. Eva Hopoff	Refuge Info. Tech., GS-1001-6, EOD 10/99 INT, Resigned 6/30/01
29. David Enoch	Refuge Info. Tech., GS-1001-6, EOD 1/28/01 INT
30. Jonathan Paul	Refuge Info. Tech., GS-1001-6, EOD 10/21/01 INT
31. Christine Moran	Student Trainee, GS-0499-7, EOD 9/95, Transfer 3/11/01

Temporary

Tracy Shield	Office Clerk, GS-0326-04, EOD 6/11/01, LWD 8/11/01
Kevin Whitworth	Student Trainee (Biology), GS-0499-02, EOC 5/21/02, LWD 8/20/02, SCEP
Norma A. Evan	Security Guard, GS-0085/02, EOD 9/5/01, LWD 10/6/01
Zach Fairbanks	Logistics Expediter, WG-6907-4, EOD 4/16/01, LWD 9/8/01
Amanda Lloyd	Biological Tech., GS-0404-5, EOD 4/30/01, LWD 8/11/01
Darren Mayers	Biological Tech., GS-0404-6, EOD 4/30/01, LWD 6/2/01
Daniel Ruthrauff	Biological Tech., GS-0404-7, EOD 5/10/01, LWD 9/22/01
Jacob Wilson	Biological Tech., GS-0404-3, EOD 5/06/01, LWD 9/8/01
Howard Wiseman	Biological Tech., GS-0404-4, EOD 5/06/01, LWD 9/8/01
Valerie Yff	Biological Tech., GS-0404-5, EOD 4/16/01, LWD 9/8/01
Chadd Fitzpatrick	Biological Tech., GS-0404-5, EOD 10/1/01
Melanie Spies	Biological Tech., GS-0404-5, EOD 11/9/01



Anvil, Cannon, Walters, Rearden



Albright, Fitzpatrick, Wege, McCaffery, Perry
Sundown, Kovach, Broerman, Snow
Liedberg, Hanley, Spies



Isaac, Paul, Enoch, Polty
Andrew, Asuluk, Kelly, Moses

Bio Tech Chris Harwood continued to operate out of the Fairbanks office while remaining on staff with Yukon Delta NWR. This allowed he and his wife to attend classes at the University of Alaska Fairbanks during the winter and return in the summer to perform field duties. Chris will return full time to Bethel full time in the spring of 2002.

SCEP student Tina Moran completed her Master's program and was appointed to a permanent Wildlife Biologist position with the Selawik NWR effective March 11.

On June 30 Eva Hopoff resigned her Refuge Information Technician position, to take care of her new family member.

Jacob Isaac was selected to fill the Assistant Interpreter position vacated by Alex Nick and moved to Bethel from his RIT position in Marshall effective August 26.

Two new RIT's were hired; David Enoch, from Tuntutuliak, was hired on January 28 and Jonathan Paul, from Kipnuk, was brought on November 21.

ROS/Pilot Gene Peltola Jr. was selected for the Refuge Manager position at Selawik National Wildlife Refuge in Kotzebue and transferred effective December 30.

3. Other Manpower Programs

The Student Career Experience Program (SCEP) has been used by the refuge for several years. This season one SCEP student was brought on to gain a variety of biological experience. Kevin Whitworth (University of Alaska - Fairbanks) spent several weeks performing nesting surveys based out of the Kanaryamiut field camp, searching for black scoter nests at Aropuk Lake, conducting a range assessment survey on Nunivak Island, flying an aerial spectacled eider survey, and other projects.

4. Volunteer Programs

This year there was an increase from 14 to 18 in the number of volunteers working for the refuge. Nine volunteers worked in our summer field camps or research projects and nine worked as visitor center staff conducting environmental education, interpretation, and outreach programs for the public.

Stephan Koruba and John Tobin assisted FB Dave Cannon with the rainbow trout radio telemetry tracking research project. Stephan Koruba also assisted SB Fred Broerman with cleanup of the Aropuk Lake black scoter camp. Howard Wiseman and Jacob Wilson worked with WB Michael Wege in preparing for summer field camps. Francis Lincoln worked with SB Broerman organizing the supply room, the biologist lab and the USGS map files. Emma Betts, supervised by Fred Broerman, banded black brant and sampled vegetation at the Tutakoke River brant camp. She also participated in the black scoter study at Aropuk Lake and in the range inventory at Nunivak Island. Dennis Strom presented two 2- day steel shot clinics in late August and early September, one in Kasigluk and one in Kipnuk. Total clinic attendance was approximately 55 village residents.

In May for International Migratory Bird Day, poet and former village middle school teacher, Frank Keim, was the featured guest speaker. He volunteered to lead guided bird walks for the weekend. In addition, he presented his Yup'ik migratory bird curriculum in a two hour program to local teachers and residents, and read his poetry both at an evening program for the general public and to children's classrooms in Bethel. For one Saturday in May and one in June, Christine McCaffery volunteered to co-lead a guided bird walk with ES Donna Hanley.

The wildlife training of visitor center volunteers by refuge biologists continued for the second year. Volunteers Ellen Gladys, John Gladys, Christina Lim, and Heather Johnson received Bear Safety Training. Volunteers Heather Johnson, Sheila Shilling and June Johnson were given an aerial tour of the refuge by Pilot George Walters pointing out the field camp sites and how the refuge utilizes the airplane in conducting biological research projects.

Seven volunteers staffed the visitor center, offered museum tours and hosted "Wildlife at the Movies" on Saturdays from 1-4 pm. Four volunteers helped staff Alaska Natural History Association (ANHA) sales tables in October, November and April. Sheila Shilling and Heather Johnson both completed 100 hours of volunteer work and received certificates of appreciation and awards.

5. Funding

The funding table for the past five years and a discussion follow.

Table E1. Funding for the Yukon Delta NWR, FY-97 thru FY-01

<u>Activity Code</u>	<u>FY-97</u>	<u>FY-98</u>	<u>FY-99</u>	<u>FY-00</u>	<u>FY-01</u>
1943 Army National Guard					25K
1230/31 (Mig Birds)	40K	40K	70K	135K	120K
1260 (Refuge Ops)	2,080K	2,340K	2,369K	2,243K	2,565K
1937 (Subsistence Fisheries)				75K	272K
1971 (NPS)	76K	19K	17K	17K	25K
1113 (End. Species)	13K		15K		
Total	2,209K	2,399K	2,471K	2,650K	3,007K

Funding to operate the refuge came from a number of different sources. Reimbursable funds were provided from two different sources. The National Parks Service provided 25K to conduct a project on black scoters in support of the designated National Natural Lands Site, and the Army National Guard provided 25K for the spectacled eider study on Kigigak Island.

A major increase in funding of \$197K was appropriated to subsistence fisheries. The subsistence fisheries budget includes salaries for a Fisheries Biologist, Subsistence Resource Specialist, a Law Enforcement Officer and 85K for administrative support.

The first year funding for an approved RONS project provided for the hiring of a sea duck biologist position and operating costs. The project was originally funded for \$193K, but was reduced to \$85K because hiring of the biologist was not scheduled until 2002. It was agreed that the position would be filled with a graduating SCEP student.

6. Safety

Bear and Firearms Safety Instructors Steve Kovach and Patrick Snow conducted bear and firearms safety training for 12 refuge staff, five volunteers, one Alaska Department of

Fish and Game staff (cooperator), and three Lower Kuskokwim School District (cooperator) employees during the spring and summer of 2001.

Fisheries Biologist Dave Cannon held two boat safety training classes for ten seasonal and permanent employees.

F. HABITAT MANAGEMENT

1. General

Yukon Delta NWR encompasses approximately 19.2 million acres within the northern boreal zone of southwestern Alaska. About 70% of the refuge is below 100 feet in elevation and consists of a broad, flat delta dotted with countless waterbodies. The delta was created by the Yukon and Kuskokwim rivers and their tributaries. The Yukon River delta is in the process of building up, while the Kuskokwim delta is slowly being eroded by normal river processes. Many streams and sloughs are former tributaries of the two major rivers. Flooding of riverine and lowland areas is common, particularly in spring. The refuge's extensive tidal wetlands are scarcely above sea level and is frequently inundated by Bering Sea tides.

The coastal plain is contrasted by uplands and mountains to the north, east, and south. Several small mountain groups are scattered across the coastal plain. The southern extension of the Nulato Hills is located near the refuge's northern boundary. These rounded hills, rising from 1,000 to 3,000 feet in elevation, are the western extension of this large geographic feature. The Askinuk Mountains are located along the refuge's western coast, immediately south of Scammon Bay. They are approximately 10 by 40 miles in size and are the only part of the coastal plain that has been glaciated. The Kusilvak Mountains are located approximately 40 miles west of the village of St. Mary's and are directly south and east of Nunavaknuk Lake. They are eight miles from north to south, and five miles east to west, rising 2,300 feet. The Ingakslugwat Hills north of Baird Inlet are a group of small volcanic cones, lava flows, and craters. The tallest of these is 650 feet. These hills may be one of the most recently active volcanic areas on the Delta. The Kilbuck Mountains are the southern extension of the Kuskokwim Mountains and are located in the southeast part of the refuge. These mountains range from 2,000 to 4,000 feet in elevation.

Two major islands are located within the refuge. The million-plus acre Nunivak Island lies 20 miles off the coast and is of volcanic origin with several peaks from 1,000 to 1,600 feet. Coastal bluffs range from 100 to 450 feet high. Sandy beaches along the southern coast merge into active sand dunes greater than 100 feet in height. These dunes are particularly susceptible to erosion because protective foredunes and extensive beaches are absent. The second largest island is Nelson Island which is separated from the mainland by the Ninglick River to the north, Baird Inlet to the northeast, and the

Kolavinarak River to the east. The southern portion of the island is low-lying and covered with small lakes and streams. To the north, the terrain becomes more rugged with several peaks ranging over 1,300 feet in elevation.

Refuge vegetation is primarily subarctic tundra, underlain by permafrost, and includes a variety of scrub, peatland, heath meadow, marsh, and bog habitats. Tall scrub and forest habitats are found in the eastern interior areas. Alpine tundra occurs in the mountainous areas at higher elevations. Most of these habitats remain essentially untouched by man. Virtually no habitat management as practiced in the lower 48 states occurs on the refuge. Habitat related activities involve mapping and inventory efforts associated with specific wildlife studies and wildlife management.

2. Wetlands

The two largest rivers in Alaska, the Yukon and the Kuskokwim, flow across the refuge and are the primary elements which created the refuge's landscape. Approximately half of the refuge is covered by water, with innumerable ponds, lakes, and sloughs. For the most part, aquatic habitat on the refuge is considered to be relatively unaltered, but past and present mining activities have simplified stream habitat in several areas adjacent to the refuge boundary (e.g., Tuluksak River), and may have reduced those streams overall productivity levels.

Most of the refuge is a vast, flat wetland/tundra complex dotted by countless ponds, lakes, and meandering rivers. The refuge's most productive wildlife habitat is the coastal region bordering the Bering Sea. This narrow strip of land is unquestionably the most productive goose nesting habitat in Alaska. As a result of the Alaska Submerged Lands Act, additional selected acreage on and adjacent to this coastal strip could eventually be conveyed to Native corporations.

3. Forests

Less than five percent of the refuge is forested. Narrow bands of riparian, black spruce-hardwood, mixed black spruce-balsam poplar, and balsam poplar woodlands extend onto the delta along the Yukon and Kuskokwim Rivers and their tributaries. In addition, pockets of black spruce and white spruce are interspersed throughout the Kilbuck and Andreafsky Mountains. None of the wooded areas contain commercially harvestable timber.

7. Grazing

Rather than conducting an aerial survey to count reindeer on Nunivak Island in 2001 the refuge contracted with the Mekoryuk IRA Council to conduct a ground count of the reindeer herd. The ground count located 4,251 reindeer and 595 muskox. Three teams of two snowmachiners each surveyed the island from March 30 through April 4.

On December 5 and 6, refuge personnel participated in gathering data on the physiological status of 59 reindeer processed by Nuniwarmiut Reindeer and Seafood Products, an organization within the Mekoryuk IRA. Each year villagers herd the reindeer and drive them to Mekoryuk where selected animals are harvested, processed, and sold. For the past several years, there has been no USDA inspection of the meat so marketing was limited to within the state. Warren Eastland, a Wildlife Biologist with BIA initiated the project and was assisted by ADF&G and refuge personnel. The data will be correlated with previously gathered data from vegetation plots in order to determine overall range conditions as well as carrying capacity of the reindeer on the island. Initial information suggest the reindeer are thin, however overall sample size is limited and additional sampling is required in order to develop proper conclusions.

In 1989 and 1990, 10 study sites were established on Nunivak Island to monitor range conditions as they relate to grazing, primarily by reindeer and secondarily by muskox. The study sites were selected by an interagency team composed of staff from the refuge, the Soil Conservation Service (now Natural Resources Conservation Service), and the University of Alaska. The study was established to document the condition of primary forage species (primarily lichens) utilized by reindeer and muskox during the winter and to measure recovery of the habitat as agreed upon in the Nunivak Island Grazing Plan. Sites were to be revisited on a 5-year basis. The first revisit occurred in 1995. The second revisit was to occur in 2000 but was postponed until 2001.

A team of five botanists, ecologists, and biological technicians visited the island from August 3rd through the 15th. Personnel included: Lisa Saperstein from Kanuti NWR; Della Person from Yukon Flats NWR; and BT Dan Ruthrauff, SCEP student Kevin Whitworth, and volunteer Emma Betts from this refuge. Nine of the 10 sites were revisited; the tenth site was dropped in 1995 as it was determined not to be representative of wintering habitat. Each site was accessed using a Robertson R-44 helicopter. Weather was generally bad but virtually all the data were collected.

Data are now being entered into the computer and will be analyzed against the 1990 and 1995 data. A final report is expected in late 2002.



Warren Eastland, BIA, collects information on fat content of reindeer slaughtered by Nuniwarmiut Reindeer and Seafood Products on Nunivak Island. (CEF 12/01)



Seven to nine hundred reindeer have been slaughtered on Nunivak Island each of the past few years but this has not been enough to reduce the herd to the 2,000 animal level required by the management plan. (CEF 12/01)

9. Fire Management

Year 2001 was the 18th operating season under the Alaska Interagency Fire Management Plan used by all agencies and most private landowners in the state. The plan incorporates four management options for wildfire suppression, ranging from limited to critical suppression areas. Approximately 50% of the refuge is contained in the modified category which dictates suppression during critical burning dates but allows less suppression after those dates. The remainder of the refuge is in the full suppression category.

Fire suppression responsibilities on the refuge have been delegated to the Alaska Fire Service. The State of Alaska, Department of Natural Resources, conducts wildfire suppression on the refuge from their base of operations in McGrath - some 150 miles from the nearest point on the refuge, and 450 miles from the farthest refuge holding.

With the exception of a single carry-over fire from 2000, no fires were reported on the refuge in 2001.

12. Wilderness and Special Areas

Two wilderness areas occur on the refuge, the Andreafsky Wilderness which contains approximately 1,300,000 acres, and the Nunivak Wildernesses containing approximately 600,000 acres. Both were established by ANILCA in 1980. Both are remote and receive little public use.

The Andreafsky River and all its headwaters, including its East Fork, were designated as a Wild River under ANILCA. This designation covers approximately 265 miles, of which approximately 198 are within the Andreafsky Wilderness, 54 miles cross private lands, and 13 miles cross non-wilderness refuge lands. There are presently no commercial fishing, wilderness, or float-boating guides operating on the Andreafsky River. The upper half of both forks of the river receive almost no float-boat use because of limited aircraft access, and a lack of suitable landing locations. There is one large game guide, Eric Williamson, who operates out of the Andreafsky Wilderness area.

Portions of the old Clarence Rhode National Wildlife Range and the Hazen Bay Migratory Waterfowl Refuge were designated the Clarence Rhode National Natural Landmark in 1968. A plaque identifying this designated area is displayed in the refuge headquarters entry.

Shore and water birds visiting the refuge each year number in the millions. Many shorebirds come to breed on refuge tundra, shorelines, and mountaintops. By August, they flock to coastal, lacustrine, and riparian mud-flats to build fat reserves for long migrations. In 2000, the Andreafsky Wilderness and vast expanses of the refuge's coastal meadows were designated as a hemispheric reserve in the Western Hemisphere Shorebird Reserve Network (WHSRN).



Nanwaksjiaak Crater lies near the northern border of the Nunivak Wilderness area on Nunivak Island. (DRR 8/01)

G. WILDLIFE

1. Wildlife Diversity

The refuge hosts approximately 80% of the continental breeding population of black brant and nearly all emperor geese. As mentioned earlier, the brant population has remained stable and averaged 130,000 birds since 1981. The 2001 population for emperor geese - 84,400 - was well above the average of 59,500 since 1983. This species has not responded well to the local goose management plan. Cackling Canada and Pacific greater white-fronted geese numbered about 400,000 and 500,000, respectively, 30 years ago. The 2001 estimates for cacklers and whitefronts are 211,900 and 517,500, respectively. Undoubtedly, these four species have been a significant factor in shaping the coastal ecosystem.

Despite the reduction in geese from historical levels, the refuge still supports large numbers of ducks. The 2001 breeding pair survey indicated 1.9 million ducks on the refuge in early June. Principal species were northern pintail, green-winged teal, and greater scaup. American wigeon, northern shovelers, mallards, and scoters are also regularly reported in good numbers. Harlequin ducks breed in many of the watersheds draining the Kuskokwim Mountains, as well as other suitable habitats. Common eiders are locally "common" in the vicinity of some brant colonies, while Steller's eiders are

virtually extinct as a breeding species. The formerly abundant spectacled eiders have declined precipitously over the last 25 years. From an average breeding population of about 100,000 birds in the early 1970's, the population declined to a low of about 1,800 breeding pairs in 1993. The 2001 estimate was about 2,100 breeding pairs. Sea ducks in general have been declining throughout the continent and region; oldsquaw and black scoter have been added to the refuge's list of species of concern.

2. Endangered and/or Threatened Species

Eskimo curlews formerly staged in both spring and fall on the tundra near St. Michael, but they have not been detected there since the 19th century. Small numbers of threatened Steller's sea lions haul out on the rocks at Cape Romanzof and on Nunivak Island. Several thousand spectacled eiders nest on the refuge, as do (at least occasionally) tiny numbers of Steller's eiders (i.e., probably < 10 pairs). Steller's eiders breeding in Alaska constitute only a small fraction of the Pacific-wintering population of Steller's eiders, most of which breeds in Russia. The waters adjacent to the refuge are extremely important to a large fraction of this Pacific population. Tens of thousands stage each spring on Kuskokwim Shoals along the refuge's southern coastline prior to moving to their arctic breeding grounds, and tens of thousands migrate south past Cape Romanzof in the fall. In addition, several thousand molt each fall on Kuskokwim Shoals and along the shoreline of Nunivak Island. Prior to 2000, we did not know whether or not the flocks migrating and/or moulting along the refuge's coast included any individuals from the threatened Alaska-breeding population of Steller's eiders. In summer 2000, cooperators from Northern Alaska Ecological Services (NAES-FWS) and the North Slope Borough (NSB) attached satellite transmitters to four Steller's eiders at Barrow, the most well-known and predictable breeding location on Alaska's arctic coastal plain. All three that migrated south of the Seward Peninsula stopped on the Kuskokwim Shoals, and two apparently molted there. These detections were the first to explicitly link the threatened breeding population with the birds molting in the shallow waters just off the refuge coastline.

In 2001, NAES and NSB again implanted satellite transmitters in Steller's eiders at Barrow, five in males and five in females. Among the 10 birds, six occurred (and apparently molted) in the refuge's coastal waters – five at Kuskokwim Shoals and one near Cape Mendenhall on Nunivak Island. On September 6th and 14th, WB McCaffery and DRM Liedberg flew to Kuskokwim Shoals to estimate the number of Steller's eiders in the vicinity of the satellite locations. They found over 5,000 apparently molting birds; 95% of these were along the shoreline of a single barrier island (Kwigluk Island) or foraging over the adjacent eel grass bed. They did not locate additional eel grass beds associated with any of the other shoals or barrier islands surveyed. On July 26th, McCaffery and P Walters surveyed the same area; on that date > 80% of the Steller's eiders were flying.

Overall, there are probably at most only a few thousand pairs of Steller's eiders nesting in Alaska, with the vast majority of those on the arctic coastal plain. The combination of satellite telemetry data and the refuge's aerial survey results suggest that a significant fraction of the threatened (i.e., Alaska-breeding) population of Steller's eiders molts in the coastal waters immediately adjacent to the refuge.

Spectacled Eider Aerial Survey

While conducting a duck brood survey by helicopter in August 1990, WB McCaffery observed 6 spectacled eider broods between Kipnuk and Kwigillingok in the southern coastal portion of the refuge. Since then there has been a certain amount of speculation as to the extent of nesting in this area by this species, especially since both the coastal zone and breeding pair aerial surveys conducted by MBM have not detected spectacled eiders on their transects through the area. The Western Ecological Services Office funded the refuge to fly aerial transects at a higher resolution than the annual waterfowl surveys conducted in this part of the refuge.

Twenty-nine east-west transects spaced 0.8 km apart were established south of 60° N and flown June 4-6 using the refuge's Cessna 206. With SFWB Broerman and SCEP student Whitworth as observers, DRM/Pilot Liedberg and Pilot Walters flew the surveys on June 4 and on June 5-6 respectively. Transects were flown at an altitude of ~45 m agl, and a speed of ~150 km/hr. Observations were restricted to within 200 m on each side of the plane. To minimize the chance of double-counting birds dispersed from a previously flown transect, odd numbered transects were flown first, followed by even numbered transects. No spectacled eiders were observed on the 29 transects. Three common eiders were seen while making turns between transects. Observations of 28 species of water birds besides eiders were recorded surveying the transects.

Eider Survey on Nunivak Island

Steller's eiders are essentially absent today as a nesting species on the Yukon-Kuskokwim Delta, although historically they were likely more abundant. Based on a report from Nunivak Island that "dozens" of Steller's eiders nested on a small island within Duchikthluk Bay as recently as 1999, two trips were made to southern-most portion of the island to investigate the report. Tim Bowman (Migratory Bird Management - Anchorage) and Greg Balogh (Western Alaska Ecological Services - Anchorage) surveyed the area from June 1-5. Bowman returned to the island with SFWB Broerman and Student Trainee Whitworth from June 27-29.

During the June 1-4 visit, searches were made from the USFWS cabin at the mouth of Duchikthluk Bay to: 1) south along the coast to Cape Mendenhall, 2) the wetland complexes on the north side of the Bangookthleek Dunes, 3) the shoreline and wetlands behind the dune ridges on the east side of Duchikthluk Bay, 4) the island in the bay. Flocks of Steller's Eiders were seen just offshore and many birds appeared to be paired.

There were also 20-30 pairs of common eiders flushed from the island in Duchikthluk Bay. However no evidence of nesting was detected for any of the waterfowl seen, indicating that the visit was too early to find breeding pairs or nests.

On the June 27-29 visit, the freshwater ponds on the north side of Bangookthleek Dunes, as well as the island in Duchikthluk Bay, were searched for nests. No nests or nest bowls were found for any species in the wetlands, but 150 glaucous gull, 65 common eider, 10 greater scaup nests were found on the island, in addition to a small tern colony consisting of Arctic and Aleutian terns. It was concluded that reported observations of Steller's eiders were probably common eiders. The two visits suggested that the nesting chronology on Nunivak was 14-18 days later than the central coast of the Yukon-Kuskokwim Delta.

3. Waterfowl

Pintail banding was again conducted in 2001 as part of a cooperative program within the Pacific Flyway. Swim-in traps were used within marshy areas of Kgun Lake, which is located in the north-central part of the refuge. See Section G.16 for 2001 totals.

On September 1, WB McCaffery conducted a helicopter duck brood survey along streams in the Kilbuck and Kuskokwim mountains. The primary focus of this survey was harlequin ducks. Because of the difficulty in distinguishing some female harlequins from older Class III ducklings and the uncertainty of female departure dates, tightly-bunched ducks are referred to here as "groups" rather than broods. The survey area includes 99 km of streams within the Kisaralik watershed which have been surveyed annually during late brood-rearing since 1995. Thirty-two, 25, 11, 11, 17, 23, and 20 harlequin ducks groups were detected in this area in the years 1995-2001, respectively. These groups included 172, 104, 50, 43, 75, 83, and 94 birds (i.e., young and hens) during the same seven years, respectively.

4. Marsh and Water Birds

Loons, grebes, and sandhill cranes are widely distributed on refuge wetland areas. Populations of red-throated loons have declined dramatically in the tundra habitats of western Alaska over the last 25 years. On the Y-K Delta, populations estimated from aerial surveys have declined from over 11,000 in 1977 to fewer than 6,000 in 1997. Aerial survey data indicate that populations of Pacific loons have remained stable over the same period. Sandhill cranes are quite abundant on the refuge and constitute an important component of the ecosystem, including subsistence harvest.

5. Shorebirds, Gulls, Terns, and Allied Species

Gulls, particularly glaucous gulls, are common along the entire refuge coastline from spring through autumn. Glaucous-winged, mew, herring, Sabine's and Bonaparte's gulls

also nest on the refuge. The only continental nesting records for slaty-backed gulls are from Aniktun Island off Kokechik Bay, just south of Cape Romanzof. One pair nested there in 1996 and 1997. In addition, an adult dive-bombed refuge observers on Neragon Island (just northeast of Cape Romanzof) in 2000. Slaty-backed gulls are also rare but regular visitors to Nunivak Island.

Arctic terns are common and widespread breeders on the refuge, and Aleutian terns have nested at several widely scattered sites as well. A small colony of Caspian terns nest on Neragon Island. Nests and/or young have been observed on Neragon in 1996, 1997, and 2000. Although ornithologists have suspected that Caspian terns nest in low numbers around Prince William Sound, the birds at Neragon Island represent the first confirmed nesting records for the species in Alaska.

Cliffs and islets along the coast of Nunivak Island provide nesting sites for an estimated 500,000 seabirds, primarily common murres and black-legged kittiwakes, but also pelagic, red-faced, and double-crested cormorants, glaucous-winged and glaucous-winged x glaucous gull hybrids, horned and tufted puffins, parakeet and crested auklets, and pigeon guillemots. Fork-tailed storm-petrels are not known to nest on the refuge, but they are occasionally seen near shore during autumn storms.

While conducting Bar-tailed Godwit surveys near Tern Mountain from September 2-7, SFWB Broerman and BT Ruthrauff found at least six Mongolian plovers feeding in the tidal flats surrounded what has been traditionally called Bob's (for Robert Gill, USGS) Island. The birds were seen on three days and their plumages ranged from juvenile to breeding adults. This species rarely occurs in Alaska and the sightings represent one of the highest concentrations of Mongolian plovers recorded in the state.

Bar-tailed Godwit monitoring near Tern Mountain

Observations of pre-migratory flocks of bar-tailed godwits were made along the coast near Tern Mountain ($60^{\circ}02' N$, $164^{\circ}30' W$) from September 2 -7, 2001 by SFWB Broerman and BT Ruthrauff. This was a continuation of field work conducted at the same site in 1999 by WB McCaffery and USGS researcher Bob Gill. Following the protocol established by McCaffery and Gill, flocks of godwits were scanned to identify color-banded individuals and determine the proportion of juveniles present. Ten different color-flagged/banded bar-tailed godwits were identified, including three with orange flags from Australia, two with green flags from northeast Australia, four with white flags from New Zealand, and one with a white band also from New Zealand. Flock sizes ranged from 3,050 to 4,100 godwits. Most were in complete basic plumage making it difficult to use plumage characteristics to separate individuals having identical band/color flag combinations. Therefore, the number of banded individuals (10) reported is a very conservative estimate. This year's efforts detected no juveniles during sampling scans, compared to 1999 when juveniles comprised 2.83% of all flocks sampled. This year's field work detected ≤ 5 juvenile bar-tailed godwits total. While the relative

number of juveniles to adults seems startling for both 1999 and 2001, it is not known whether juveniles stage at different times and/or locations than adults. Subsequent autumn work on this species should include additional sites over longer periods of time to better address such questions.

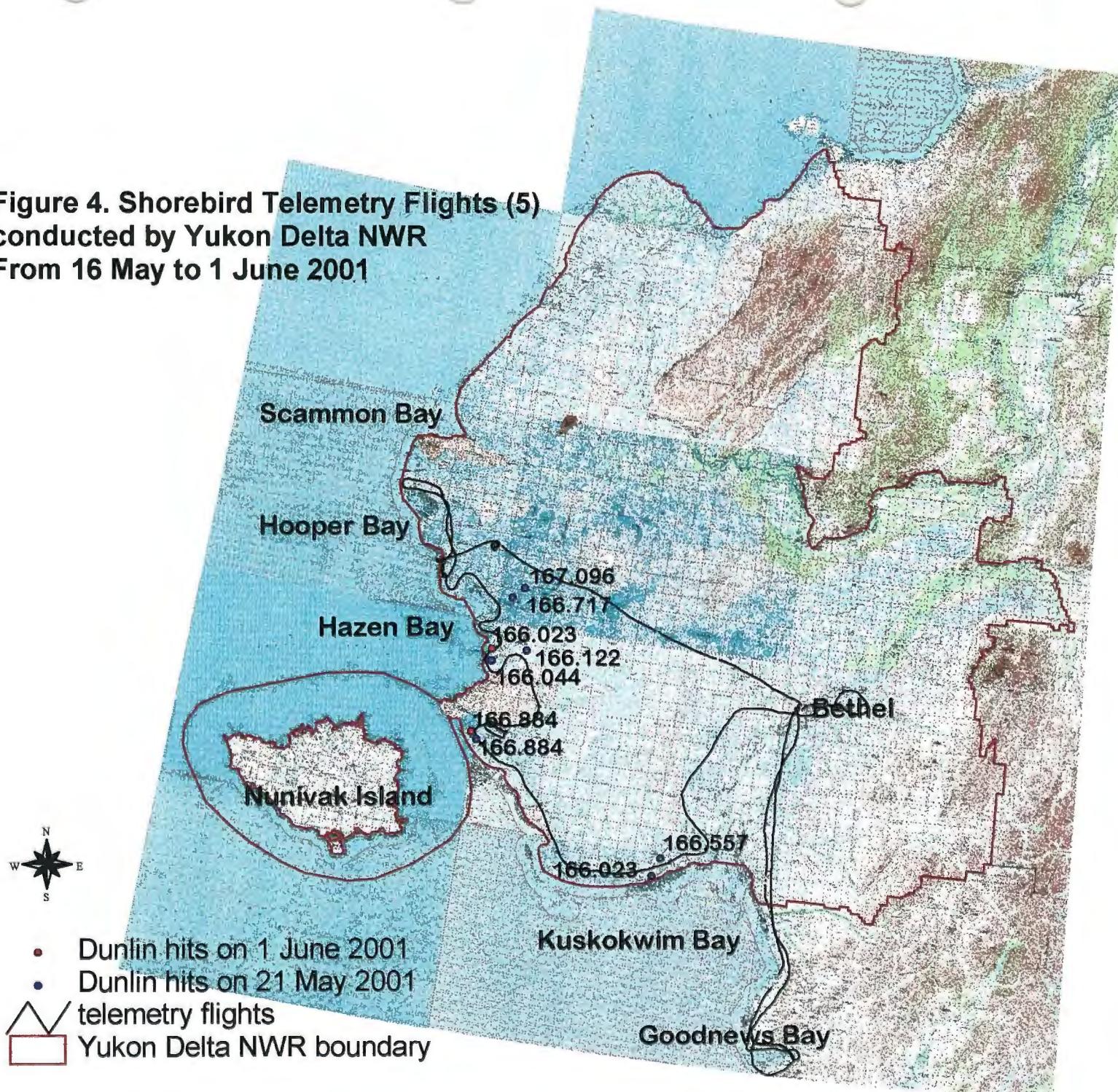
Shorebird Aerial Telemetry Flights

The refuge participated in a cooperative effort with Point Reyes Bird Observatory, Prince William Sound Science Center and USGS, at San Francisco Bay to track the spring migration of radio-tagged dunlin, long-billed, and short-billed dowitchers along the Pacific Flyway. Ninety-one shorebirds were banded at San Francisco Bay (52) or Grays Harbor (39), Washington. Telemetry monitoring was conducted at several migration stopover sites from Humboldt Bay, Willipa Bay, the Yakutat Forelands, the Copper River Delta, and the Bristol Bay region as well as breeding areas on the Yukon Delta. SFWB Broerman and Pilot Walters conducted telemetry flights on May 16, 17, 21, and 24, and June 1 along coastal areas from Cape Romanzof to Goodnews Bay. Seven radioed dunlin were detected on May 21 and two were detected on June 1. Both birds detected on June 1 had been detected on the May 21 flight. For one of the birds (frequency 166.884) both its detections were within a few km of each other just south of Nelson Island. However, the other bird (frequency 166.023) traveled from Kwigillingok to Hazen Bay north of Nelson Island in the ten days between flights. Figure 4 depicts the shorebird flights and locations.



An adult Mongolian plover in breeding plumage as seen through a spotting scope near Tern Mountain during the first week of September. (FJB 9/01)

Figure 4. Shorebird Telemetry Flights (5) conducted by Yukon Delta NWR From 16 May to 1 June 2001





Coastal mudflats near Tern Mountain where bar-tailed godwit surveys were conducted in early September. (DRR 9/01)

6. Raptors

Nineteen species of raptors have been recorded on the refuge, including golden eagles, bald eagles, and peregrine falcons. The Kisaralik River is among the most important areas on the refuge for nesting raptors, and supports one of the densest breeding populations of breeding golden eagles in North America. For the eleventh consecutive year, the refuge conducted a helicopter survey for cliff-nesting raptors in the Kisaralik watershed (to include the Kisaralik River and Quicksilver Creek). Along approximately 100 km of river in late April and early May, WB McCaffery located 16 active cliff nests, including 10 golden eagle and 6 gyrfalcon nests within 1.6 km of the river (study area = 320 km²).

Since 1998, productivity of this golden eagle population has fluctuated dramatically, generating the four most extreme years of the 11 year study. In 1998 and 2000, 17 and 21 young, respectively fledged in the study area. In both 1999 and 2001, however, only four young fledged in each year. Overall in 2001, nesting pairs, successful pairs, total fledglings, fledglings/nesting pair, and fledglings/successful pair were all below the 11-year mean.

For the second straight year, WB McCaffery and SWB Broerman completed surveys of cliff-nesting raptors in both the Askinuk Mountains and the Ingakslugwat Hills. These data have yet to be analyzed.

7. Other Migratory Birds

In 1998, the refuge initiated a widescale landbird monitoring program of the Lower Yukon and Lower Kuskokwim rivers. The purpose of the project was three-fold: (1) to develop a Refuge-specific monitoring program; (2) to assist other land management units in monitoring “Species of Concern” for the Western Alaska Bioregion (now, WALU BCR [i.e., Western Alaska Lowlands/Uplands Bird Conservation Region]), and; (3) to remedy the lack of ornithological data in the study areas. Eighteen Yukon and 12 Kuskokwim breeding bird survey routes were established. Five of the Yukon routes have since been dropped (in 2000) to ensure that all routes can be completed, even in summers with poor weather. The Yukon and Kuskokwim BBS routes are run in even- and odd-numbered years, respectively.

Aby assisted by RIT Isaac, MW Jennings, SWB Broerman, and BT Whitworth who split duties as boat driver, BT Harwood conducted breeding bird surveys of 12 sloughs and tributaries of the Lower Kuskokwim River, between Aniak and Napaskiak from June 8 - 25, 2001 (Figure 5). They completed 11 of 12 routes in full (i.e., 50 stops).

Including official surveys and incidental observations, 89 bird species were detected during the project. While most species were detected on the surveys proper, some were only detected incidentally on routes or during travel along the Kuskokwim River proper (some 155 miles between Aniak and Napaskiak). The most “abundant” species on the survey (based on individuals detected per stop) was northern waterthrush - nearly 1.0 individuals/stop more than the next most abundant species. Additionally, northern waterthrush was the most widespread species based on detection frequency, being detected on nearly 95% of stops.

Abundance indices for “Priority Species” (a.k.a. “Species of Concern”) were also analyzed. The eight priority species for the Western Alaska Bioregion include: gyrfalcon, gray-cheeked thrush, varied thrush, blackpoll warbler, golden-crowned sparrow, McKay's bunting, rusty blackbird, and hoary redpoll. It appears from detection frequencies/rates that this survey, in conjunction with the lower Yukon River survey, can help to monitor four of the species. Gyrfalcon and golden-crowned sparrow were never detected, while hoary redpoll was never identified to species. McKay's bunting is unexpected, and probably does not breed on the refuge.

The project has exceeded expectations in terms of its contribution to our knowledge of the riparian avifauna on the refuge. While the thrust of the surveys is clearly passerines, we have gathered copious data on other taxa as well, including raptors and shorebirds. We will continue to conduct the two watershed surveys in alternate years, allowing us to monitor trends in a reasonable time frame. Additionally, we intend to conduct habitat analyses of all route stops to complement the surveying. This might permit us to make predictions on the avifauna of non-surveyed areas.

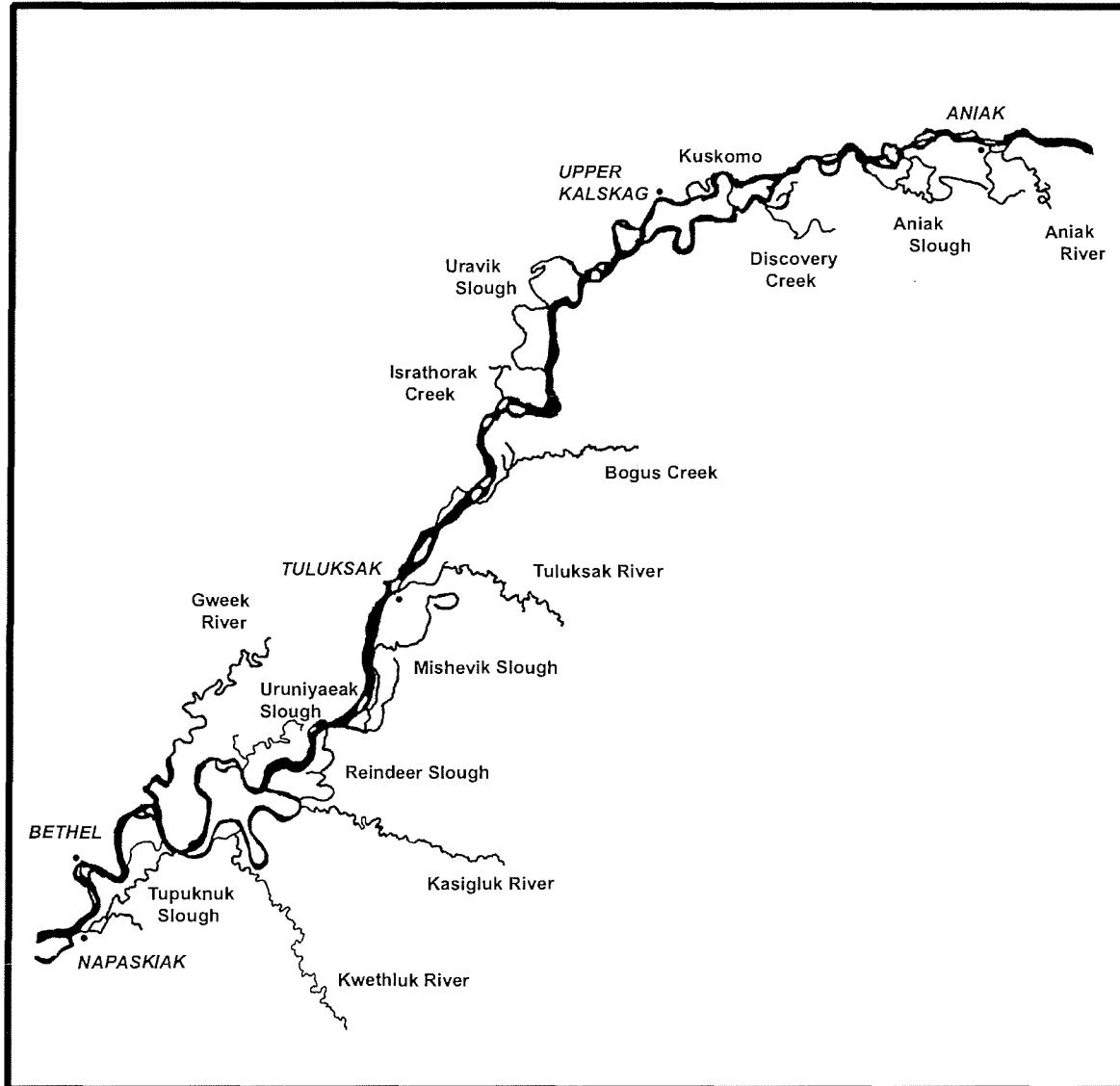


Figure 5. Distribution of 12 BBS routes in lower Kuskokwim River watershed, 8 - 25 June 2001.

8. Game Animals

Prior to 1950, moose were rarely seen on the Y-K Delta. During the following years, their numbers increased as they colonized the refuge's eastern boundary and riparian woodlands along the Yukon and Kuskokwim Rivers. Moose numbers are highest on the refuge (particularly in winter) along the Yukon River between Russian Mission and Holy Cross. In summer, moose are more widespread and are occasionally found as far west as the Bering Sea Coast. Overall, moose numbers are very low on the refuge.

Two census areas have been identified on the refuge (one along the Yukon River; one along the Kuskokwim River and Kilbuck Mountains). The refuge, in cooperation with ADF&G, attempts to conduct one census each winter (Kuskokwim River/Kilbuck Mountains in even numbered years). Complete snow cover is required to conduct a census. Ideally, censuses would be conducted prior to the antler drop in December so that herd composition data could be collected during the census. However, the refuge rarely has adequate snow cover in November to conduct a census. Therefore, censuses have traditionally been conducted in late February or early March when snow cover is more predictable and day-light hours are longer. As was the case in both 1996 and 1997, inadequate snow conditions in 2001 prevented any census from being completed.

Historically, caribou occurred on the Y-K Delta in large numbers and were the most abundant ungulate. Numbers peaked in the 1860's and during this period, caribou ranged over much of the refuge, even crossing the ice pack to Nunivak Island. Caribou subsequently disappeared from the region with the exception of small, remnant herds in the Kilbuck and Andreafsky Mountains. In recent years, the Western Arctic Caribou Herd (WACH) has occasionally migrated as far south as the middle portion of the Andreafsky River, but generally remain only a few weeks. A small segment of the WACH was last documented on the refuge as far south as the Yukon River in January 1998. Residents of Marshall reported harvesting caribou just south of the Yukon River near that community in December 1997.

An aerial survey by ADF&G in January 1998 documented mixing of the WACH and the Mulchatna Caribou Herd (MCH) along the Yukon River between Russian Mission and Holy Cross. This was the first documented mixing of these two herds in recent history. These herds had been speculated as routinely mixing in winter on the Y-K Delta prior to 1900.

After 14 years of intensive study, we have a better understanding of population status and distribution of the small resident Kilbuck Caribou Herd (KCH). Before 1985, the KCH was considered by many to be part of the expanding MCH; however, we documented two distinct calving sites in the Kisaralik Lake area (1987 to 1994). Movements of radio-collared caribou over a six-year period (1988 to 1994) indicated the herd was expanding its range as evidenced by changes in seasonal distributions of bulls and cows. During the course of the initial study (1986 to 1992) and subsequent surveys (1993 to present), the

KCH has increased in size. Although the original study supported the hypothesis of a distinct, resident herd, significant increases in numbers and radio telemetry observations have documented annual mixing with the MCH since 1995. It now appears that the KCH has been completely assimilated by the MCH. Survey efforts over the last three years have failed to locate what could be considered calving grounds in the Kilbuck Mountains. Due to the changes in calving patterns all caribou in southwest Alaska will be managed as a single entity until the caribou population again changes.



Animals from the Mulchatna Caribou Herd crossing the Kwethluk River in September. (PAL)

9. Marine Mammals

Bering Sea marine mammals add an interesting diversity to the refuge's wildlife plus provide a vital subsistence resource for coastal villages. Pacific walruses, spotted seals, ringed seals, and Pacific bearded seals are hunted on the ice in spring, and some seal hunting continues during summer in bays and estuaries. Other marine mammals include harbor and Dall porpoises, northern fur and harbor seals, and beluga, fin, gray, killer, and minke whales.

The U.S. Fish and Wildlife Service manages polar bears, walrus, and sea otters in Alaska. The National Marine Fisheries Service, National Oceanic and Atmospheric Administration, has responsibility for all other marine mammals. Each year dead whales wash up on the coastline of the refuge which provide caron for arctic foxes and other wildlife. For the past two years we have conducted, in cooperation with ADF&G, a

survey for NMFS of the species and number of dead whales on the refuge. In particular, they have been interested in beaked whale sightings, of which there have been several.



The remains of this beaked whale were found on the coastline of the refuge in September. (MBR 9/01)

Alaskan Natives who dwell on the refuge coast (primarily Yup'ik Eskimos) may take walrus and other marine mammals for subsistence purposes. Sport or recreational hunting of marine mammals is illegal. Authentic Native articles of handicrafts or clothing may be sold or transferred to a non-Native, or sold in interstate commerce as long as the materials for these crafts were taken incidental to the subsistence harvest. Furthermore, handicraft articles must be "significantly" altered. For example, polishing or carving initials or signature on an ivory tusk would not qualify as a significant alteration. Service regulations require that all walrus tusks, polar bear hides and skulls, and sea otter hides and skulls taken by Native hunters be marked and tagged by a designated tagger. Resident Native taggers are now located in many coastal villages.

11. Fisheries Resources

Including the Bering Sea, refuge waters provide habitat for at least 40 species of fishes. The Yukon and Kuskokwim rivers, which flow through the refuge, support regionally and internationally significant salmon fisheries. Salmon originating from refuge streams contribute substantially to the commercial or subsistence harvests of chinook, chum, coho and sockeye salmon in Kuskokwim Bay, Norton Sound, the lower Yukon and Kuskokwim rivers. Yukon-Kuskokwim origin salmon also contribute to the commercial harvests (harvested incidentally in the sockeye fishery) in the Area M and False Pass

fisheries of the Alaska Peninsula and bycatch from the North Pacific groundfish fisheries; unfortunately, the extent of contribution is presently unknown and has been a highly controversial management concern. Other important freshwater resident species include several species of whitefish, sheefish, Alaska blackfish, burbot, northern pike, Dolly Varden and grayling. Nearshore ocean habitats harbor Pacific herring, halibut, tomcod and starry flounder.

Over the past decade, southwestern Alaska experienced several severe economic and social hardships as a consequence of unusually poor salmon runs; unfortunately, this year was no different. It's believed that significant atmospheric and oceanic changes, such as warmer water temperatures (up to 10°F), lighter winds, reduced currents, lower levels of nutrient upwelling, and algal blooms in the North Pacific Ocean and Bering Sea during 1997 and 1998, had profound effects on the entire marine ecosystem. This resulted in a reduced food base for developing juvenile and maturing adult salmon. Besides the lack of fish, other anomalies have been noted: later run timing, smaller than average fish, altered migration pathways, and reports of higher incidences of parasites and increased signs of predation. Considering that many of the salmon species spend three to five years in the ocean and the time it takes for stocks to rebuild, it'll be many years before we can hope for near "normal" returns. These conditions demonstrate how complicated ecosystems can be, and that far-off environmental influences can have significant implications on the refuge.

Fisheries Enumeration Projects

The vast size, remoteness, and fluvial diversity of the Yukon and Kuskokwim river drainages presents tremendous challenges in determining accurate salmon escapement numbers. Escapement is the term used for the number of fish returning each season to spawn future generations. Successful management requires accurate and timely knowledge about run timing and strength, commercial and subsistence harvest levels, and escapement levels. Within these drainages are numerous projects operated individually by federal and state agencies or private organizations, or through cooperative efforts. Unfortunately, despite the complexity and size of the systems, comprehensive information is generally deficient regarding the abundance and in-season dynamics of local salmon spawning populations. Any addition to the existing inventory of knowledge would make a significant contribution to the overall management of the aquatic resources.

Perpetuating healthy salmon runs are essential for the following reasons: 1) local people have relied heavily on the abundant aquatic resources for subsistence use, sustaining cultural values, and providing incomes, and 2) adequate salmon escapement is crucial for maintaining ecosystem health. Decaying salmon carcasses provide marine derived nutrients which are linked to both aquatic and terrestrial ecosystem productivity levels. However, the following results do not bode well for future returns of salmon into refuge streams.

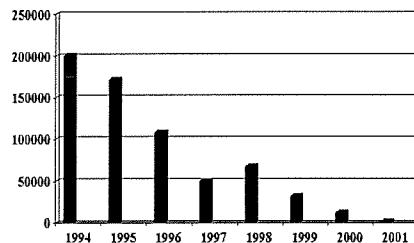
Yukon River Drainage - East Fork Andreafsky River Salmon Escapement Project

The East Fork of the Andreafsky River weir was operated again by the Kenai Fisheries Resource Office (FRO) in 2001. Although the weir facilitates Service monitoring of refuge spawning salmon stocks and other resident species, scale pattern analysis, age/sex/length, run timing and abundance data, all data are shared with ADF&G. The state uses the information for managing the commercial and subsistence chinook and summer chum salmon fisheries in the Yukon River. This information is also used in the Yukon River Joint Technical committee U.S./Canada Pacific Salmon Treaty negotiations.

This summer the weir operated from July 15 to September 15. Normally the weir is installed by mid June, but for the second year in a row a high water event delayed the installation. Another high water event in September hindered accurate counting of coho salmon. Because of the late start, not all king or chum salmon were counted. Only 2,086 chum salmon were observed passing the weir but it's estimated that between 10,000 and 15,000 returned. These numbers are alarmingly low, especially considering the poor return of 2000. By comparison, the 1994-1996 escapements ranged from 108,450 to 200,981. These low numbers are not unique to just the rivers within the refuge. Many miles upriver the Gisasa River weir on the Koyukuk NWR reported chum numbers 70 percent below the previous five year average.

The partial chinook salmon count was 1,148 - similar to last year's partial count of 1,344. The bright spot in this year's return was the coho salmon, of which 9,252 passed the weir; by comparison last year's return was 8,225. Other salmon returns included 15 sockeye and 820 pinks, while 4,581 whitefish, 13 Dolly Varden, and two grayling were counted passing through the weir. Weir counts on the pink salmon and resident species do not reflect their true abundance because most are able to squeeze between the pickets and move about undetected. Strong pink salmon runs occur during even numbered years in western Alaska, so it was not unusual for this year's numbers to be relatively low.

E. Fork Andreafsky River Chum Escapement
1994-2001



Kuskokwim River Tributary Salmon Escapement Projects

Chinook and chum salmon returning to refuge waters of the lower Kuskokwim River must pass through an intense mixed stock commercial fishery, as well as one of the state's largest subsistence fisheries. The local commercial fishery in the Kuskokwim River is primarily directed at chum and coho salmon, while chinook salmon are the principal target of subsistence users. Substantial numbers of chinook and sockeye salmon however are taken incidentally by the commercial fishermen. Throughout the Kuskokwim River drainage, the combined annual commercial and subsistence harvests have been as high as 1.5 million chum, 100,000+ chinook, and 900,000+ coho. Considering these high exploitation rates, there is very little information available regarding fish populations and their status in the lower Kuskokwim River, in particular on refuge waters. All other presently operating escapement projects are located upstream of the refuge, in what is considered to be the middle portion of the Kuskokwim River between Aniak and McGrath. These relatively few projects are considered indexes, and are intended to be indicative of what populations are doing throughout the drainage.

Kwethluk River Weir

The Kwethluk weir was one of two salmon monitoring projects administered by the Kenai FRO on the refuge in the Kuskokwim drainage. These projects are used to assess run abundance, run timing, and age and sex composition of the returning salmon. This project was funded by federal subsistence dollars which came about due to the Federal Government acquiring responsibility for fisheries subsistence management on federal waters in 1999. This was the second year that the weir was operated in cooperation with the Native Village of Kwethluk. Unfortunately, the weir wasn't installed until August 12 due to high water, so the vast majority of king, chum, and sockeye salmon had already passed. The target date for installation is mid June, just prior to when the king and chum salmon begin entering the tributaries (king and chum salmon runs peak about the second week of July). The weir was removed on September 13 to enumerate the later returning coho salmon.

1992 was considered an average to above average year for commercial and subsistence harvests, but over half of the escapement projects throughout the entire drainage did not reach escapement goals. There was no commercial season for chum salmon in the Kuskokwim River in 2001, therefore no incidental harvest of king or sockeye salmon occurred. Also, for the first time the subsistence fishery was reduced from seven days a week to four but it's not known at this time whether or not this resulted in a reduced subsistence harvest. It's believed that these management decisions contributed to the better than expected escapement for chum and king salmon in the entire drainage. However, there was commercial fishing for coho salmon, and for the second year in a row there is concern over the low returns to the Kwethluk River.

Table G1. Fish passage at the Kwethluk River weir.

Year	Chinook	Chum	Sockeye	Pink	Coho
1992	9,675	30,596	1,316	45,952	45,605
2000	3,547	11,691	1,049	1,407*	25,610
2001	129(p)	353(p)	67(p)	102(p)	19,196(p)

(p) Partial Count

*The spacing of the pickets on the weir in 2000 were a little further apart than what was in place in 1992, this allowed many of the pink salmon to squirt through without being counted. However, since 2000 was an even numbered year (pink runs are strong), and if it was close to being a “normal” sized run, more pinks should have used the counting chute. This low return is cause for alarm, not only for pinks but for the chinook, chum and coho because of the marine derived nutrients which pink salmon provide to the entire ecosystem.



Rainbow over the weir and Three Step Mountain. (DC 9/01)

Tuluksak River Weir

A weir administered by the Kenai FRO had been used in the Tuluksak River between 1991-1994, but the local perception that weirs killed fish resulted in the Village of Tuluksak insisting that it be removed. After negotiations with the village in 2000, approval was given to the refuge to reinstall the weir. Funding for the weir was obtained through the Office of Subsistence Management (OSM), and the Kenai FRO fabricated and operated the weir in conjunction with the Native Village of Tuluksak. Several villagers assisted in the construction of the panels, traps and chute in Bethel during the spring of 2001, and with its operation throughout the summer and early fall.

The weir was in place on July 6th and removed September 18th. Installation was delayed due to relocation upstream from the original proposed location. The Tuluksak River experienced exceptionally high water from mid August through September, with water level fluctuations ranging between 1.2 feet during installation and 8.04 feet on September 8th. Because of the delayed installation and high water, not all fish passing the site were counted. It's estimated that nine percent of the chum, 22 percent of the chinook, four percent of the sockeye, six percent of the pink, and about 57 percent of the coho had passed undetected. The 17,599 chum salmon that were counted was encouraging considering that this year's return was higher than any of the previous years when the weir was in operation.

Table G2. Fish passage at the Tuluksak River weir.

Year	Chinook	Chum	Sockeye	Pink	Coho
1991	697	7,675	34	392	4,651
1992	1,083	11,183	129	2,470	7,501
1993	2,218	13,804	88	210	8,328
1994	2,917	15,724	82	3,488	7,953
2001(p)	777(p)	17,599(p)	131(p)	45(p)	10,430(p)

(p) Partial Count

Whitefish Lake Outlet Weir

For years local residents of the Aniak area complained that whitefish numbers in Whitefish Lake have been declining, and saying that the decline was due to downriver fishermen catching too many fish who sell them commercially. Whitefish Lake is an important subsistence fishery, and the number of fishers, amount of harvest, and fish populations are unknown. This project was considered important enough that the Kuskokwim Fisheries Resource Coalition approved its pre-proposal and forwarded it on

to the Office of Subsistence Management. Funds were then allocated in 2000, and the rigid weir was operated by the Kenai FRO in conjunction with the Kuskokwim Native Association. Due to logistical complications counting began later than anticipated but it was fish tight September 21 and removed October 11.

The objectives of the weir are to enumerate daily passage into and out of the lake outlet, estimate age and length composition, and determine areas in the Kuskokwim River drainage where Whitefish Lake fishes are being harvested. All fish were marked with a grey colored *t* bar tag with the hope that fish caught elsewhere in the drainage will be reported. Genetic fin clips were taken from the first 100 fish of each species collected and archived for future analysis. Lengths, sex, stage of maturity, scales and otoliths were taken from many of the lake's subsistence caught fishes.

Three species of whitefishes of the subfamily Coregoninae inhabit Whitefish Lake, humpback *Coregonus pidschian*, broad *C. nasus*, and least cisco *C. sardinella*. Of the three species, humpback whitefish were most common, followed by least cisco then broad whitefish with 158, 94, and nine passing downstream, respectively. All fishes that passed upstream had already been tagged on their way down (four humpback and least cisco, and one broad).



Ken Harper (KFRO) inspecting the Whitefish Lake weir. (KFRO 09/02)

Contaminants in Salmon of the Kuskokwim River

The Refuge assisted the Northern Alaska Ecological Services Field Office in the collection of 20 chum and 20 king salmon to assess background contaminant levels, and to determine what effects any contaminants may have on the health and viability of those species populations. Coordination with public health agencies and corporations such as the Yukon-Kuskokwim Health Corporation, Alaska Native Tribal Health Consortium and Alaska Department of Health and Social Services is ongoing and results will be used to assess potential human health risks. Contaminants being assessed are organochlorine pesticides (DDT), polychlorinated biphenyls (PCB's), metals and persistent organic pollutants. In addition to contaminant analyses, each fish was evaluated for the presence of the parasite *Ichthyophonus hofferi*, which causes illness and mortality, particularly in king salmon.

Ichthyophonus has been observed in the Yukon River the past 10 years, and seems to be more prevalent in recent years. This apparent increased prevalence may be a function of biologists being more aware of its presence. However, it's been speculated that the disease may be contributing to the recent poor returns. A limited study was conducted in 1999 to determine the extent of the disease, with samples of 800 and 700 salmon collected in 2000 and 2001, respectively. Data indicate that the disease becomes more severe as the fish move upriver and that females tend to be more susceptible than males. Pathologic examination of chinook collected at Emmonak and Tanana revealed that 30% of sampled fish were infected, with less than 5% exhibiting clinical signs near Emmonak, but up to 30% showed clinical signs upriver near Tanana. Some years fish processors have reported as many as 20% of their fish had to be discarded because of muscle tissue damage.

14. Scientific Collections

Nunivak Island

Due to the availability of a helicopter that was being used for muskox and reindeer vegetation utilization surveys, genetic and length frequency data were collected from several streams on Nunivak Island. The vegetative work was originally scheduled for mid to late July, but was postponed until early August. The original timing would have coincided well for collecting fresh chum salmon genetic fin clip samples from carcasses from most island streams, but as the carcasses decomposed and/or were eaten by avifauna, the majority were unusable. FB Cannon and BT Lloyd collected 275 samples from chum carcasses in the Dahloongamiut River, which may have a later run of fish than most other streams. Minnow traps were placed in the following streams with the hopes of collecting juvenile coho and Dolly Varden fin clips; Kiyakyaliksamiut, Dahloongamiut, Duchikmiut and Kewigimiut Rivers. Unfortunately, no river produced over 25 specimens, which is far below the desired amount of 200.

Genetic samples were collected from fin clips from 104 live Dolly Varden in the Kiyakyaliksamiut River. The presence of grayling was also verified in the Kiyakyaliksamiut River, where 15 fish were sacrificed in order to collect otoliths for a preliminary assessment of the population's age structure. Dooksook River, which is reported to have sockeye salmon, was flown via helicopter to document their presence. No fish were seen in the river. The lake at the headwaters was turbid due to several days of wind and rain which limited our ability to detect fish.



Dolly Varden being released after deploying a green floy tag and taking a genetic fin clip sample. (DC 7/01)

16. Marking and Banding

The USGS-BRD banded 290 cackling Canada geese near Old Chevak in July as part of their demographic study. Refuge personnel banded 413 cacklers at a site on the Aknerkochik River 55 km southeast of Chevak.

The refuge continued to participate in a cooperative program to band mallards and northern pintails within the Pacific Flyway. Ducks were trapped along the northwest shoreline of Kgun Lake and adjacent lakes from August 4-26. Waterfowl concentration areas were baited with whole corn and birds were captured using clover-leaf, swim-in traps. A total of 1,227 northern pintails, 84 green-winged teal, and 44 mallards were banded by refuge staff. One, one, one, two, four, two, nine, seven, three, and 16 pintails banded at Kgun Lake in 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, and 2000, respectively, were recaptured in 2001. Previously recaptured birds include one each banded in 1994, 1995, 1996, and 1998, and three banded in 1997. Seventeen of these 46 birds were banded as AHY males, nine as AHY females, seven as HY males, 12 as HY females, and one as a LO female. Additional recaptures included a male and female mallard originally banded as AHY and HY birds, respectively in 2000, a male

mallard banded as an AHY bird in 1994, and three male green-winged teal originally banded as AHY (2) and HY birds in 2000.

Table G3. Total numbers, age, and sex of waterfowl leg and/or neck-banded under station permit on Yukon Delta NWR, 2001.

Species	Age and Sex					
	AHY-M*	AHY-F	HY-M	HY-F	Unk.	Total
Cackling Canada geese	200	213	0	0	0	413
Northern pintail	751	370	53	53	0	1,227
Green-winged teal	68	10	4	2	0	84
Mallard	42	2	0	0	0	44

*AHY = after hatch year; HY = hatch year; M = male; F = female.



413 cackers in two drives! Or was it four drives? In any event, we completed the banding on the Aknerkochik River in two relatively mudless days. (MBR 7/01)

H. PUBLIC USE

1. General

More than 90% (estimated) of the refuge's public use involves subsistence activities (hunting, fishing, trapping, and berry picking). Other public use activities include sport hunting, mainly for moose, caribou, bear and muskox; fishing for salmon, rainbow trout, grayling, dolly varden, and other species; river floating; and wildlife viewing.

The refuge is isolated from common tourist travel routes in Alaska. Once people arrive in Bethel, they still must travel great distances to get to mountains, coast, or river systems other than the Kuskokwim River. Travel to scenic refuge areas is expensive and keeps the number of non-local visitors low.

The major public relations activity in 2001 continued to be the information and education efforts associated with the Y-K Delta Goose Management Plan and the four goose species of concern. The Refuge Information Technicians (RIT) conducted school programs during the year, discussing the Goose Management Plan and other refuge issues with students. While in the villages, they presented programs to an estimated 1,823 community school and council members.

Goose Calendar Contest

The goose calendar contest also helped facilitate the Refuge outreach and educational effort. The number of schools participating in 2001 was down from 28 in 2000 to 21 in 2001. However, the number of students participating was up from 700 combined entries in 2000 to 810 combined entries in 2001. Of the six refuges and their schools that enter the contest, the Yukon Delta Refuge had the most winners with five at the state level. Two of the five state winners were first place poster winners - Alexie Coral-Blessing age 11 of Bethel, and Matthew Cholok, age 14 from Chevak. The judges for the regional judging here in Bethel were Abe Friendly from AVCP, James Berlin from AVCP, Ida Alexie from ADF&G, Rose Kalistook from AVCP and Dean Swope from KYUK, our local public radio station. Contributors for the 2001 calendar were Ducks Unlimited, Incorporated (\$15,000), National Fish and Wildlife Foundation (\$10,000), National Audubon Society of Alaska (\$1,000 in prizes), and AVCP (editing comments). The remainder was contributed through a Challenge Cost Share grant of \$10,000. A new designer was contracted this year - Chris Hitchcock of Classic Design in Anchorage. Approximately 7,500 calendars were distributed to school children, village councils, and community members throughout the delta.

2. Outdoor / Indoor Classrooms--Students

Again this year the refuge participated in the Bethel Regional High School Career Day, on October 10, 2001. ROS Gene Peltola, Jr., WB Steve Kovach and FB Dave Cannon

presented to approximately 218 students. Gene Peltola, Jr. spoke about Student Career Experience Program, the Youth Conservation Corps and our local hire of biological technician's program. Steve Kovach talked about safety and handling of firearms and wildlife management. Dave Cannon discussed the life and work of a fish biologist.

Beginning this year, ES Donna Hanley guided two bird walks for kids ages 5-11 during the International Migratory Bird Day (IMBD) celebration in May. In addition, the refuge hosted two Friday morning guided bird walks for the Moravian Church camp. Sixty teens ages 10-16 attended. Children's binoculars were available for each child and time was mostly spent outside identifying and discussing the birds we sighted.

In April, ES Donna Hanley presented at the Youth Environmental Workshop hosted by the Yukon River Intertribal Watershed Council and APD of Andreafsky EPA Department in St. Mary's, Alaska. The presentation consisted of setting up a mock salmon stream and asking children to pretend they are salmon finding their home stream.

Approximately 400 students from K-12 attended.

In October, WB Brian McCaffery gave two 45 minute talks to two first grade classes at Mikelnquut Elitnauviat Elementary School on "The Wonders of Birds". Approximately 40 children were in attendance.

During the last weekend in March, WB Steve Kovach, representing the refuge, participated in the state-wide Alaska Science and Engineering Fair held at the University of Alaska at Anchorage. WB Kovach also headed the USFWS judging team to determine the winners of the George W. Steller Award, an award for the winner of the natural resource project that demonstrates excellence in solid scientific design and analysis, creativity, quality of work, quality of the presentation, and results of the project.

3. Outdoor Classrooms--Teachers

Teachers have been directly and indirectly involved with the refuge's many information programs. In August, ES Hanley, spoke at two LKSD teacher meetings, once to visiting site administrators and once to first and second year teacher orientation training. The presentations consisted of explaining what the refuge can offer teachers and students, and asking how we can help meet our mutual education goals. Total staff contact was over 350 educators. In addition, ES Hanley set up and staffed a table of USFWS and ADF&G wildlife curriculum for the two days of meetings. On the first evening of the meetings the refuge hosted an open house for the LKSD staff. The evenings offerings included round trip transportation to and from the refuge headquarters, interpretive tours of the refuge museum, exhibits of available curriculum, demonstration of an activity in the curriculum, and refreshments. Approximately 50 teachers attended.

In November, ES Hanley hosted a two and one-half day workshop for school district administrative staff of each of the five school districts within the refuge. Administrative

staff from the Kuspuk, Lower Yukon (LYSD) and Lower Kuskokwim (LKSD) school districts attended. The content covered the most essential and current wildlife conservation issues existing on the refuge and discussed ways to incorporate the related curriculum into their respective teachers' classrooms. Presentations were given on "All About the Yukon Delta Refuge", "Cow Moose Conservation", "Lead Shot Poisoning in Waterfowl", and "How Can I Start Monday Morning?". The Alaska Regional Project Leader of Sister Schools Shorebird Project (SSSP), Tamara Mills gave a presentation on SSSP, what it is, how it works, why it is important and how to use the shorebird kit. BT Teresa Tanner, from the Fairbanks Fisheries Resource Office (FFRO) gave a presentation on *Cyper Salmon*, the USFWS web page salmon classroom activities, how the (FFRO) assists teachers, and how to use the USFWS fish kit. To date one administrator from LKSD has demonstrated the shorebird kit and the fish kit to 21 Itinerant Language Teachers who travel monthly to assist teachers in the villages. Another administrator from LYSD has requested a repeat workshop for all of his 19 principals in January 2002.

6. Interpretive Exhibits/Demonstrations

The refuge visitor center is known as a location in Bethel for learning about refuge big game, birds, fish, plants and wildlife habitat, as well as Yup'ik culture. According to our guest register we had over 1,370 visitors. This is more than double of the 500 visitors we recorded last year. The increase is most likely due to: 1) improved record keeping, 2) being open on Saturdays, and 3) volunteers offering more interpretive talks during the year. Eighty per cent of the visitors have local addresses with the remainder coming from Anchorage and the lower 48. During 2001 several interpretive programs were either planned for the public or spontaneously presented by the visitor center volunteers. A popular program that grew in attendance this year was, "Tundra Tea Talk" which includes a 30 minute slide show of tundra plants pointing out each plant's nutritional/medicinal values and a guided tour of the plants near the office. Offered by visitor center volunteers Ellen Gladys and Christina Lim in both the spring and fall, the four Saturday talks drew an enthusiastic total attendance of over 100 local residents.

Yukon Delta Web Page

Currently ES Hanley, is scripting and web page designer, Alex Coles (IRM), is writing the revised refuge web page. The goal is to offer an opportunity for a diverse audience to enjoy learning about the refuge landscape, wildlife, weather, plus gain awareness of refuge educational offerings and biological research activities. The first posting of the initial pages is scheduled for March 2002 to kick off the countdown to the National Wildlife Refuge Centennial Celebration in March 2003.

Yukon Delta Refuge Brochure

Graphic designer, Cara Brunk, of Blue Mud Productions in Kentucky, has been contracted to produce a revised refuge brochure. As of this writing we are soon to critique the final draft of the brochure. Printing will hopefully begin by May 2002.

Emperor Goose Display

Wilderness Graphics in Tallahassee, Florida is designing an emperor goose exhibit for the Alaska Airlines Terminal in Bethel. The Yupiit Picirayarait Cultural Center and the refuge are sharing space in a glass cabinet at the Alaska Airlines terminal. To date we have agreed upon the final display layout and design. Target date for completion of the display is spring of 2002.

7. Other Interpretive Programs

Bird Walks and Boat Trip

Back by popular demand, and in conjunction with International Migratory Bird Day Celebration on the refuge, BT Harwood conducted a bird walk and a Gweek River boat trip. On the boat trip Chris averaged over 52 species sightings and had 12 people attend.

International Migratory Bird Day

The official IMBD celebration this year was hosted over a three day weekend on May 18-20. The theme this year was "Birds and Beans". The beans part of the theme signifies the education about and the promotion of shade grown coffee. The events consisted of scheduling presentations and guided bird walks with our featured speaker, Frank Keim, plus hosting a Bethel backyard birder's panel with three of Bethel's backyard birders. Frank Keim, a retired Hooper Bay and Marshall village teacher, has written a Yup'ik Bird Book including a short teacher curriculum. Frank led two guided bird walks, read two of his poems at an evening local event, presented a two hour talk at the refuge about his book and spent a full day reading his poetry in the classrooms in Bethel. Bethel's backyard birders and gardeners, Bev Hoffman, Jane Neeser and Betty Blake hosted a panel discussion on how to attract birds to a Bethel backyard.

In addition, and to continue the celebration and awareness of migratory birds arriving in Bethel, the refuge hosted guided bird walks on the weekends throughout the month of May and June. Bird walks were led by ES Hanley, WB Brian McCaffery, SWB Fred Broerman and assisted by volunteer Christine McCaffery,. The average attendance per bird walk was 10 participants and the average number of species sighted was 27.

Wildlife at the Movies

Every Saturday the visitor center hosts “Wildlife at the Movies”, where the public is invited to see a wildlife movie on the hour from 1-4pm. One of the five visitor center/museum volunteers staffs the visitor center, offers short interpretive tours, and is available to answer visitor questions. To date we are averaging 8 people per Saturday with some Saturdays reaching over 20 visitors.

National Wildlife Refuge Week - Open House

Events to celebrate the seventh annual National Wildlife Refuge Week and Open House were held on two days, Friday and Saturday, October 5 and 6. The theme this year was “The Raven - Evermore”. Guest speakers were Darlene Simono from the Bird Learning and Treatment Center in Anchorage, who brought a live raven, and Jack Dalton, a professional Yup’ik story teller who tells traditional stories of ravens. Darlene talked about the conservation issues and biology of ravens. Jack told Yup’ik raven stories. On Friday Darlene and Jack went to each school and the senior center in Bethel, and made a special appearance at the LKSD site administrators staff meeting. On Saturday afternoon, Darlene and Jack presented their programs at a free children’s matinee. For the Saturday evening program, the refuge, in partnership with the Bethel Council on the Arts, offered the program entitled “Raven Returns, The Story of Human Beings”. Total attendance for the two days exceeded 950 people including school children, school staff and the general public.

8. Hunting

Moose Check Station

The refuge continued to cooperate with the local ADF&G office in operating the moose hunter check station near Paimiut on the Yukon River. The check station program was initiated to acquire more detailed harvest data, including the location of and total number of harvested animals.

The 2001 effort represented the sixteenth year the Yukon River check station has been operated but it was done at a reduced level this year. The check station was operational from September 5 until September 19 and was staffed by ROS Snow and ADF&G Biologist Roger Seavoy. Fewer moose were checked through the station than past years which is possibly a result of two things - there are more moose down-river and hunters are successful without traveling up as far as the check station, and there is less money available than in past years for purchasing fuel and other supplies for the trip.

Two registered big game guides, Ed Shavings and Fred Don have traditionally taken out hunters in need of those services on Nunivak Island. However, in the past several years two transporters working on the island, Abe David and Charlie Spud, have taken an

increasing amount of business from the guides. Most hunts last only a day or two and the major component of the guiding or transporting service is to simply get the client to the animals. Consequently, although the definition and regulations related to the two services differ, in effect, there is a small amount of difference in the actual operations of the two services on Nunivak Island. The transporters of course charge considerably less for their services.

It is thought that the illegal harvest of muskox on Nunivak Island is minimal, while that which may occur on Nelson Island is unknown.

The reported harvest of caribou and moose is unreliable at best. Harvest tags are required for all caribou and moose hunts in game management units which are encompassed by the refuge borders, although many harvested animals go unreported. Caribou, most likely from the Western Arctic Caribou Herd occasionally enter the refuge through the Nulato Hills in the north, but only a small number are available for harvest. In recent years the majority of caribou which are available for harvest on the refuge are members of the Mulchatna Caribou Herd. This herd has increased its migration into the eastern portion of the refuge during the fall in recent years. A significant portion of this herd has over-wintered on the flats adjacent east and south of the Kuskokwim River.

Transporter and Guide Activity

Big game guides reported taking the following animals as part of their operations on the refuge in 2001.

	Clients	Days Hunted	Species Taken
Ed Shavings Sr., Nunivak Island Guide Service	12	14	12 muskox
Fred Don Sr., Nunivak Outfitters (did not hunt)	0	0	0
Bob Adams, Adams Guide Service	3	15	3 bears
Eruk Williamson, Eruk's Wilderness Floats	1	1	0

The transporters permitted to operate on the refuge reported the following animals taken as part of their operations.

Abe David, Nunivak Island Experiences	12	16	12 muskox
Charlie Spud, Spud's Transporting and Tendering	18	22	18 muskox
Steve Williams, Ptarmigan Air	20	36	4 moose 8 caribou

An influx of the Mulchatna caribou herd into Game Management Unit 18 took place in late August and early September. As a result, an emergency order opened the caribou season south of the Yukon River on August 25 and remained in effect until the closure

which was scheduled for March 31, 2002. A similar occurrence took place in the fall of 2000 so the season was open for the first three months of the calendar year as well.

9. Fishing

With an estimated 500,000 lakes and ponds, and the two largest river systems in the state running through the refuge, sport, commercial, and subsistence fishing are very important activities for many of the region's residents. Though only a small number of non-local residents travel to the refuge for sport fishing, this contingent is expected to increase among the less used fishing waters (i.e., the Kwethluk, Kasigluk, and Kisaralik Rivers). Rainbow trout, Dolly Varden, grayling, pike, and five species of salmon are sought by sport fishers. Burbot, Alaska blackfish, herring, sheefish (*inconnu*), and sticklebacks are all harvested at various levels for subsistence. During the winter months, ice fishing for pike and whitefish occurs on many of the region's lakes and rivers to fulfill subsistence needs.

Subsistence Fishing

The population of the Yukon-Kuskokwim Delta is among the largest of any similar Native/aboriginal occupied region in Alaska. It's estimated that over 50 percent of all of the state's rural subsistence fishing activities occur within the Yukon and Kuskokwim River drainages, much of which are located within the refuge's boundary. Fish play an important part in the subsistence cash economy and account for 30-60 percent or more of the yearly food supply in most Yukon-Kuskokwim Delta villages. Approximately 1,300 families participate in the annual harvest of salmon in the Kuskokwim drainage alone. Chum, chinook, and coho salmon are the most heavily exploited salmonids, while substantial quantities of several whitefish species, northern pike, sheefish, Alaska blackfish, burbot, rainbow smelt and Pacific herring are also harvested. As evidenced by the following discussion, the majority of management effort and most available subsistence information pertains to salmon while very little is known about the other species. Over the years, questions have arisen about the population status of whitefish and northern pike for several areas within the refuge. There is a desire by the state and refuge to conduct studies for these species, but the reality is that salmon will always overshadow the so called less significant species.



Alex and Minnie Nick collecting rainbow smelt. (DC 06/99)

Because of the extremely poor returns of Kuskokwim and Yukon River chum and king salmon the past years, the State's Board of Fisheries (BOF) designated both species as stocks of concern in the fall of 2000. This designation was based on the inability of the state to maintain expected commercial and subsistence harvest yields, meet existing escapement goals, and the expected poor return predicted for 2001. Since up to 40% of the summer chum salmon incidentally harvested in the Area M/False Pass commercial fisheries may be of Y-K origin, the BOF reduced their harvest cap by 70 percent in hopes of improving Arctic-Yukon-Kuskokwim escapements. At the onset of the subsistence salmon fishing season, both the state and federal managers adopted restrictive schedules for the Yukon and Kuskokwim Rivers, intending to increase escapement and spread subsistence harvest opportunity among all users. The Federal Subsistence Board (FSB) restricted the harvest of chinook and chum salmon in federally administered waters to federally qualified users, and in effect closed commercial and sport fisheries on these waters. Throughout the year the sport fish closure resulted in a significant disagreement between the Feds and the State, and has the potential to hinder cooperation when pursuing solutions to future management issues.

For the second year in a row, salmon subsistence fishing restrictions were imposed on the Kuskokwim River to conserve chinook and chum salmon. Restrictions in 2000 were limited to a maximum mesh size that could be used. This restriction was put in place late in the run. Even with this restriction in 2000, neither escapement goals or subsistence needs of upriver fishermen were met. Going into the 2001 season, both the state and

federal managers agreed to implement a subsistence schedule that allowed salmon fishing for four consecutive days per week. For a brief period later in the season, fishing was allowed only two days per week. Subsistence harvest in the entire Kuskokwim River drainage for chinook salmon alone generally ranges between 85,000 and 90,000 fish, most of which (90%) are taken from the lower section of river within the refuge's boundary. Actual 2001 harvest numbers are not yet available, but preliminary assessment indicates that the fishing was at least better than 2000, when approximately 64,917 chinook salmon were harvested.

The original schedule for the lower Yukon going into the season was two 36-hour periods per week, but in mid July the schedule was further reduced to one 12-hour period. Besides the Federal restrictions on federally administered waters, the state closed all personal use and sport fishing in all other portions of the river. Numbers of salmon harvested in 2001 are not yet available, but preliminary reports indicate that most fishermen may have met their needs. It is likely that some fisherman who aren't federally qualified users and weren't allowed to fish federal waters may not have met their needs.



Salmon drying in smokehouse (DC 07/01)

Commercial Fishing

The commercial harvest of salmon originating from refuge rivers is of economic and nutritional importance to local residents of the Y-K Delta. Commercial salmon fisheries

within the refuge are concentrated in the mainstem rivers, and along the western coastline and Nunivak Island for Pacific herring and halibut. The commercial harvest of salmon in the Kuskokwim River began in the early 1900's and has grown dramatically from 1960 to the present. The local commercial fishery in the Kuskokwim River is directed at chum and coho salmon. Commercial salmon fishing began in the Alaska portion of the Yukon River about 1918, and presently occurs along the entire 1,200 mile length for chum and chinook salmon. In both river systems, the majority of commercial effort (approximately 75% in the Yukon and 90% in the Kuskokwim) occurs within their lower sections which lie within the refuge's external boundary.

Salmon returns in 2001 were expected to be among the lowest on record, and in fact were. For this reason, the state did not schedule any commercial fishing periods for chum or king salmon in either the Kuskokwim or Yukon River drainages. There were 10 commercial fishing periods for coho salmon in the Kuskokwim River. As would be expected, the reduced or non existent fishing opportunity has caused extreme financial hardship throughout the Delta, especially since harvests and prices have been low the past few years.

Due to the recent poor returns of chums and kings in the Kuskokwim River, the economic significance of coho salmon has steadily grown. Although the coho's importance continues to escalate, knowledge of timely escapement data from refuge rivers has not kept pace. In fact, comprehensive information on the status of individual coho stocks returning to refuge rivers is nonexistent. As noted in Section G.11, there is concern with this year's escapement of approximately 20,000 coho into the Kwethluk River, and last year's return of 25,610. Because of the lack of in-season data, there is concern that excessive commercial harvest during years of low returns may place refuge stocks in jeopardy of over exploitation.

The commercial coho catches in 2000 and 2001 were 259,703 and 192,998, respectively, well below the ten year average of 500,000. Hopefully these numbers are not indicative of things to come. The low figures coupled with the poor showing of chinook, chum, and now possibly pink salmon is cause for alarm for future generations of anadromous and resident species. Nutrients released from decaying carcasses enrich the environment of anadromous and resident juveniles by influencing the entire food chain, while adult resident species (e.g., rainbow trout, Dolly Varden, and grayling) consume rotting flesh and stray eggs. Without adequate nutrients, refuge streams may experience reduced productivity levels for many years to come.

Pacific herring are harvested in four commercial districts along the refuge coast: Cape Avinof, Cape Romanzof, Nelson and Nunivak Islands, all of which are in the state's AYK Region. Overall, most of the harvest was sold as sac roe product, except 80 tons sold as bait in the Cape Romanzof District. Due to record low values fishers received for their product, the exploitation rate of 7.9% was the lowest ever reported for the entire AYK Region, and the effort was the lowest since the fishery began in the late 1970's.

The average price paid to fishers for herring with 10% roe content was \$100-150 per ton, compared to \$200 per ton in 2000 and \$200-\$500 per ton in 1999. The total harvests in 2001 for Cape Avinof, Nelson Island and Cape Romanzof were 231, 678, and 137 tons, respectively; no fishing occurred off Nunivak Island.

Commercial fishing for whitefish is limited, but could expand in the future; just recently there was a request for a large scale permit within the refuge in the Yukon River.

Because there is little known about this fishery, and since subsistence use is quite extensive, more biological data are needed to properly manage this species.

Sportfishing

Sportfishing pressure on the refuge is currently low, but tributaries feeding the Kuskokwim and Yukon rivers provide anglers with an excellent variety of trophy fish. Some of these rivers are just now being discovered by people from outside the region. Salmon, rainbow trout, Dolly Varden, Arctic grayling, northern pike, whitefish and sheefish (inconnu) make up the list of fish accessible to anglers on many of the refuge tributaries. Favored rivers for sportfishing include the Aniak, Kwethluk, Kasigluk, Kisaralik and Andreafsky. Recently regional and national publications have featured articles which promote fishing and floating some of these waters. Proactive management will be necessary to protect resident fish populations and fulfill management obligations.

With implementation of the four day subsistence fishing schedule, the Federal Subsistence Board decided to close all federally administered waters to sport fishing for king and chum salmon. Fishing for resident species and coho, sockeye and pink was allowed however. The Aniak River receives the most sport fishing pressure of any river in the Kuskokwim drainage (excluding Kuskokwim Bay). Expecting some noncompliance of the new regulations, the refuge patrolled the Aniak River and had several undercover officers pose as out of state fishermen. Several violations were documented and charges are pending.

10. Trapping

Furbearer trapping continues to be a supplemental source of income for a number of local residents. Trappers in the region have suffered diminished income from the depressed fur prices in recent years. Trappers focus their efforts on beaver, otter, mink, fox, and muskrat. Other species such as wolf, wolverine, marten, and lynx are also highly sought. Trapping success during the past five years continues to be well below historical average harvest, mainly due to depressed fur prices.

Only five species of furbearer are required to be sealed by the State of Alaska. Many of the furbearers, especially beaver and land otter, are crafted into hats, mittens, etc. and used or sold in the local area. Harvest information provided to ADF&G based on sealing requirements are most likely under-representative of the actual harvested population.

11. Wildlife Observation

In May the refuge hosted guided bird walks that were conducted during the months of May and June. See "Section H.7"

12. Other Wildlife Oriented Recreation

Other recreational activities, such as backpacking, boating, camping, hiking, birding, photography, and river floating occur to a small extent on the refuge. Power boating and camping are generally associated with subsistence hunting and fishing. Since the refuge is so remote and costly to access, this use is low in comparison to that of many other refuges. Activities associated with rafting include camping, fishing, hiking, wildlife observation, and photography.

15. Off-road Vehicling

Transportation on the refuge is limited to aircraft, boats, and snow machines. Snowmobiles are used heavily, both for recreational and subsistence uses. Three-and four-wheeler use is common in and around villages, but is not permitted on refuge lands. This is not to say that they are not used on the refuge. We are aware of at least several instances where ORVs have been or are beginning to be a problem.

Snowmachine use in the spring, after much of the snow has melted, has caused disturbance of the surface vegetation mat on many established trails. The regulations state, in essence, that snowmachines are allowed as long as there is adequate snow cover to prevent resource damage. Snowmachine travel is a way of life in villages throughout Alaska where they provide necessary transportation between villages or for winter and spring hunting. When spring arrives it is not uncommon to have snowmachines traveling on trails or overland when there is less than fifty percent snow cover. With some 20,000 village residents living in villages surrounded by over 20,000,000 acres of refuge land, the regulation is difficult at best to enforce. Our practice has been to focus on enforcement of the gross misuse of the machines. This year we are initiating an information and education campaign aimed at highlighting the habitat destruction the machines cause.

To this end, the refuge is developing, and the Alaska Department of Transportation and Public Facilities (ADOT) is funding, the production of an educational ATV and snow machine poster as primary mitigation for wetland impacts expected from the upcoming relocation of the Alakanuk Airport in the Yukon River Delta. The poster's slogan is "Don't drive on the tundra...The land you save may be your own". It will be approximately 8 ½ " X 11", printed in full color and translated in Yup'ik and Chup'ik. The poster production is part of a larger education program on the same topic currently being developed by the refuge.

16. Other Non-wildlife Oriented Recreation

Sled dog racing remains a popular winter sport. The most popular race in the area is the "Kuskokwim 300" which occurs in January each year. The race route originates from Bethel, follows the Kuskokwim River to Aniak, then goes overland to Whitefish Lake and Tuluksak before rejoining the Kuskokwim River on its way back to Bethel. Though most of the race occurs on Native Corporation lands, it does cross refuge lands for a short distance along the trail's northern portion. A permit was issued during the year to the non-profit corporation that sponsors and directs the race.

17. Law Enforcement

This year was probably the most active ever for LE activities by refuge officers. Two collateral officers were on staff during the year - DRM Liedberg and ROS Peltola.

In the spring of 2000, an R44 helicopter was used to contact subsistence waterfowl hunters in the villages of Kwigillingok and Kongiganak. The helicopter was used because of the difficulty in contacting hunters any other way. In 2001, the village of Kongiganak decided they did not want the helicopter in the area and agreed to let an officer live in the village while conducting patrols by snowmachine. From April 30 through May 12, DRM Liedberg stayed in the village and conducted snowmachine patrols. Although cold weather and storms delayed many of the birds from arriving, a significant amount of hunting took place. He made 65 contacts with hunters and issued NOV's to two individuals for possession of lead shot. Jimmy Andrew from the village was hired as a guide. A house and snowmachine were rented from village residents. For the reader, it would be hard to put this event in perspective without being involved in the past 15 years of negotiations with south coast villages regarding subsistence waterfowl issues.

At the same time as the Kongiganak effort, ROS Peltola was working in a similar manner in the village of Kipnuk. Regional LE Coordinator Ray Portwood and SA Jill Parker provided assistance. A similar number of contacts were made and two NOV's were also issued in this village for possession of lead shot. Although the village of Kipnuk had invited us to work there in 2000, this was the first year an effort was made.



A successful hunter from a south coast village returns with whitefronts and cacklers (and more importantly, no emperors). Compliance with the goose management plan was excellent and only one citation was issued in this village for use of lead shot. (PAL 5/01)



Jimmy Andrew from Kongiganak served as a guide and assistant when conducting LE around that village. Largely because of him, the effort was successful. (PAL 5/01)

Other spring LE efforts included two Special Agents from Anchorage who worked for several days out of the village of Toksook Bay. No NOV's were issued. Special Agents from Nome and Fairbanks and a Refuge Officer from Fairbanks conducted patrols and issued several NOV's for lead shot possession in the vicinity of Bethel. Although there was a complaint or two on radio and in the newspapers, all fines were paid without significant delay.

A new effort for the refuge this year was the enforcement of subsistence fishing regulations that included the first time reduction which affected fishing opportunity on the Kuskokwim River. Special Agents agreed to cover the Yukon River which had a similar schedule and Refuge Officers covered the Kuskokwim. The Kuskokwim River schedule allowed for fishing from Wednesday through Saturday, with the remaining days closed to subsistence fishing for salmon. This schedule remained in place for June and July. Aircraft and boat patrols were begun on the Kuskokwim with the first closure from June 3-5. A number of nets were observed mainly upriver from Bethel. Because this was the first ever closure if this type, calls were placed to the traditional councils in the respective villages advising that the nets needed to be pulled. During this first closure, a total of only two nets were pulled from the river and left on the bank near the village of Tuluksak with information about the closure.

Through the course of the season, Refuge Officers conducted the majority of the patrols and contacts although there was assistance from Special Agents and State Fish and Wildlife Protection Officers at times. A total of six nets were pulled from the river. The two that were seized were returned. In one case the individual was elderly and did not speak English so there was confusion about the regulations. In a second, a family crisis prevented the net from being pulled before the closure. Special Agents seized one net though they could not identify the owner and no NOV was issued.

Overall, it was felt that the significant effort to provide information prior to the start of the fishing season assisted with compliance. With 90% of the subsistence caught salmon on the Kuskokwim River taken within the refuge boundaries, it was critical that enforcement efforts be effective and we feel that the goal was achieved.

The Yukon River patrols were the responsibility of the Special Agents although ROS Peltola did assist with some flying support later in the season. Due to a number of reasons, overt patrols on the river were minimal. At least one covert investigation took place to determine how easy it was to purchase subsistence caught salmon and the results showed that it was very easy. This practice is not illegal but the information obtained will be used in the discussion of customary trade regulations being drafted.

The Aniak River receives probably the highest concentration of sport fishers within the boundaries of the refuge. No fewer than 10 companies provide guided fishing on the river which includes a combination of lodges, rafting trips which concentrate on fishing, and daily boat transport out of the village of Aniak to fish the river. Most of the land

bordering the Aniak River is privately owned but the subsistence management regulations give us enforcement authority. The Federal Subsistence Board closed the Aniak River (within the Refuge) to sport fishing for salmon in June and July. ROS Peltola lead four patrols on the river in July with other refuge staff and a Special Agent. Although they stated that they were fishing for pike or trout, numerous anglers were contacted that were believed to be targeting salmon. Two NOV's were issued and paid. The Aniak River will receive significant attention again in 2002 if sport fishing not allowed.



Subsistence Resource Specialist Robert Sundown participated in June fisheries LE on the Kuskokwim River. This was one of two nets pulled and left on the bank during the first days of the subsistence fishing closure. Overall, compliance was excellent and no citations were issued during the season. (PAL 6/01)

In June we received a tip that several walrus had been taken without salvaging the required meat by individuals from Scammon Bay. ROS Peltola investigated and issued NOV's to three individuals. One set of tusks was confiscated.

One NOV was issued for illegal guiding on the refuge. An individual from Mekoryuk was guiding muskox hunters without the required Special Use Permit.

In June, DRM Liedberg contacted three individuals on Baird Inlet Island in possession of an estimated 250 brant and emperor eggs, lead shot, and seven emperor geese. The island contains one of the five major brant colonies on the refuge. Seventeen additional

individuals were also contacted but they had just arrived on the island and had not begun collecting eggs or birds. We were also aware that the previous day there were additional people on the island. Although most subsistence waterfowl harvest practices are allowed, the Yukon-Kuskokwim Delta Goose Management Plan specifically prohibits the harvest of emperors, the use of lead shot, and the take of most eggs - whitefront eggs being the exception.

Because of the magnitude of these violations, Special Agents worked with the Solicitor and AUSA to determine appropriate penalties. By year's end, DRM Liedberg had prepared NOV's totaling \$6,450 for each of two individuals, the third being a minor and not charged. The fines included \$6,050 for 120 eggs which is what could be actually counted in a photo, \$100 for possession of lead shot, and \$400 for take of the emperors. NOV's were issued in early 2002 and it is expected that a court appearance will be requested and take place early in the year.



Approximately 250 brant and emperor eggs were collected on Baird Inlet Island by three individuals in June. (PAL)



Along with the eggs collected, seven emperor geese were shot on Baird Inlet Island in June. This is the largest number of emperors we've caught anyone taking since active subsistence waterfowl enforcement began in the 1980's. (PAL)

After a year of trying to hire a full time Refuge Officer, Seth McMillan was selected and will report in May of 2002. He is currently working at Yosemite NP and will report for duty with the refuge shortly before attending his initial LE training at FLETC. A local hire candidate who was selected early in the year later decided he could not leave his newly acquired job of flying for an air taxi operator in Bethel. The new Refuge Officer position is funded by the subsistence fisheries program.

ROS Gene Peltola who conducted a large portion of the patrols and investigations during the year accepted the Refuge Manager position with the Selawik Refuge and departed in late December. Subsistence Resource Specialist Robert Sundown departed in November for his initial LE training at FLETC. His experience growing up on the Y-K Delta and speaking Yup'ik will make him a valuable addition to the LE staff. DRM Liedberg traveled to Washington DC for two weeks in October to participate in the security detail at the Main Interior building.

Lastly, a legal subsistence waterfowl harvest made its way closer to reality during the year. The Alaska Migratory Bird Co-Management Council met several times to discuss the regulations process. Although progress was not as expedient as was anticipated and there will not be regulations in place for 2002, it is still hoped that a legal harvest can take place in 2003.

18. Cooperating Associations

The refuge, in partnership with Alaska Natural History Association (ANHA), operates a small sales outlet in the visitor center. Gross sales for the calendar year 2001 were over \$15,000. This is a substantial increase in gross sales since calendar year 1999 per the table below:

Calendar Year	Gross Sales
1999	\$3,000
2000	\$7,300
2001	\$15,000

Sales increase is primarily due to four changes: 1) the knowledgeable and courteous presence of RIT Michael Jimmy at the front desk, 2) the additional display tables of product in the visitor center, 3) the upgrade of the bookstore to slatwall fixtures which maximizes and beautifies the display space, and 4) the increase presence of product displays at community events.



The appealing and expanded display of ANHA sales items, plus the able assistance of RIT Michael Jimmy at the main entrance desk, helped boost sales from \$3,000 to \$15,000 in the past two years. (PAL 3/02)

The increase of funds benefits both ANHA and the refuge. While ANHA profits from the increase sales, the refuge profits as well. For example, the increase funds can be used to buy refreshments for refuge hosted events, workshops, and training. The ANHA funds can be used to pay for refuge event flyers, advertising and promotional products. ANHA funds purchase books for the refuge library, buy volunteer gifts as rewards for their time and effort, and can fund the travel expenses to attend the annual ANHA training. Lastly, ANHA with its nation-wide presence as a bookstore and gift shop, has talented staff to advise and design advertising, logos, brochures, flyers, curriculum materials, videos, and books.

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

The lab of the main office building was converted into desperately needed office space during the year. What was designed as a lab was largely used for storage and work space, and not very efficiently at that. Two private offices were constructed along with one open office and counter space. The low bid for the work totaled \$58,000 and was awarded to a contractor from Anchorage. The new office space was dedicated to the fisheries staff including the refuges Fisheries Biologist, the Subsistence Resource Specialist, and a new Fisheries Biologist hired by the Kenai FRO who is being housed with the refuge staff.

New carpeting was ordered for the entire office but had not been received by year-end.

Sand and gravel were laid down at the float plane landing at Hanger Lake making the area smoother, firmer, and less susceptible to erosion. Further efforts to prevent erosion from occurring at the Hanger Lake floatplane port consisted of planting grass near the lake's edge and continually clearing a beaver dam that held the lake water at high levels.

3. Major Maintenance

Minor rehabilitation was preformed on the cabin at Paimiut. New copper line was run from the propane tank to the stove and lanterns. New rain gutters were sent out, and the floor was given a fresh coat of paint. This cabin is dedicated to Randy Kaycon, an ADF&G biologist who was killed while conducting moose surveys on the Yukon River in 1996. The cabin remains in good condition and seems to be respected by people in the area.

The headquarters driveway that was paved in 1999 was given its first coat of sealant in 2001. Another coat is expected to laid down in the summer of 2002.

4. Equipment Utilization and Replacement

A 24' Alweld was purchased in Fairbanks and driven down river to the Paimute check station where it was used during the month of September. After moose season the boat was placed in storage at Saint Mary's with the USFWS fisheries boats. It's anticipated that the boat will primarily be used for monitoring subsistence fisheries along the Yukon in the summer. It may also be useful for performing breading bird surveys in the early summer and will most likely be used annually at the Paimute moose check station in the fall.

The John Deere JD 350 dozer was sold and replaced with a Caterpillar skid steer loader. The skid steer has been more useful and versatile than the dozer. A trailer for the skid steer has been purchased and should arrive in Bethel on the first spring barge in 2002.

Funds were obligated toward the purchase of a new stake-bed truck. The Dodge stake-bed has been useful for transporting large volumes of camp supplies, equipment, and other items that no other vehicle in the fleet could hold, but has become somewhat like a dog that is loyal to only one master (in this case . . . driver). Over the past few years, the number of drivers man (or woman) enough to take on the Dodge stake-bed has dwindled. A more dependable, better handling stake-bed, with automatic transmission will get better use. Hopefully the new truck will arrive before the 2002 field season.

A military generator was transferred to the Yukon Delta to provide backup power to refuge headquarters, the bunk house, and two government family residences. A storage room for the generator will be purchased and its installation will most likely take place in summer 2002.

The disposal of human waste at the Kanaryamiut field station has been a continuing problem over the years. Permafrost prevents a conventional outhouse from working. Propane toilets have been tried but the maintenance required for large groups has made them unworkable. The approved DEC method of treating the waste with lime and depositing it on an outgoing tide may meet requirements but does little to aid our "good neighbor policy" with fish camps downriver. This year we purchased an incinerator that has been used in several construction and survey camps throughout the state. It appears to meet all our needs and we plan to require all research camps on the refuge to use the same method of waste disposal. It does use a fair amount of diesel fuel for each firing but as you can see from the photo, it doubles as a stove-top so Pilot George Walters can use it for cooking hotcakes every morning.



Hotcakes never taste better than when prepared in the out-of-doors! Pilot George Walters gets double duty out of the new human waste incinerator installed at the Kanaryamiut field camp. (MBR 7/02) (See J.4)

Several metal shipping containers were purchased to secure refuge equipment, including field gear and the skid steer loader. Available warehouse space is at a premium. We are still trying to operate with the same size warehouse that we had when the staff was one quarter the size of what exists now.



The installation of two 1,000 gallon avgas tanks a couple of years ago at the Kanaryarmiut field station greatly simplified our fueling operations and decreased the risk of spills. The tanks are filled by a Beaver on wheel-skis or floats to the tune of about \$7.00 per gallon - our cheapest alternative. (PAL)

5. Communication Systems

Four new digital Racal radios were purchased to replace the Bendix Kings. This is the initial process of phasing in the new digital radios as funding permits or in this case, as the old Bendix Kings wear out.

Several Iridium satellite phones were purchased in 2001. The phones have shown themselves to be practical tools, providing a safer environment to field personnel. It is likely that more will be ordered to equip RIT's and biological crews in the future.

8. Other

Regarding facilities, we can look back on 2001 as being the year of the fires. Along with the fires came some revelations.

On August 16 we received word that one of the remaining unoccupied BIA school buildings in the village of Niglumtoq was on fire. The refuge became the owner of these facilities because, to make a long story short, they were no longer being used for a school and they reverted to the nearest Federal land management agency. Another of the

buildings had burned in 2000. Both were suspected to be arson caused since there was no electricity or heat in the facilities.

Complicating the fire is the fact that the building was known to contain asbestos. Later in the summer, Phukan Inc. was hired to conduct a study of the facility to determine the extent of contamination and in October they traveled to the village to install a liner over the burned out structure to prevent the spread of any materials. By the end of the year we were attempting to determine the extent of our reporting requirements and obtain funding for a total cleanup of the site.

As is the case in many villages on the refuge, a cleanup of this magnitude is a formidable task. The village is 500 miles from the nearest road system and 100 miles west of Bethel. A backhoe is about the extent of the equipment located in the village that could be used for a cleanup. There are only about four months a year when a cleanup could reasonably take place and everything would have to be removed by barge or small airplane. Our position is not an enviable one.



The old BIA school buildings in the village of Nighthmute are now under the control of the refuge. A second building was burned down by arsonists in 2001. Funds are being actively sought to clean the site for eventual exchange or transfer to the village. (MBR 8/02)

Our issue at Nighthmute can only be eclipsed by the one in Bethel. In August, a 55,000 square foot building at the old BIA facilities (formerly an Air Force radar facility)

partially burned from a suspected arsonist. The site is on the Bethel road system about four miles from the center of town. Concrete fire walls prevented the entire structure from being consumed. This facility was scheduled, via legislation passed in the mid 1990's, to be transferred to the Yukon Kuskokwim Health Corporation (YKHC). Unexplained delays in the Solicitor's office caused it to still be in BIA hands, we thought, when the fire occurred.

The Bethel Fire Department responded to the blaze and were in contact with BIA who advised them to let it burn. Little did we know (until a week later) that the site was legally no longer in the possession of BIA. Instead, as with the Nightmute School site, it was now part of the refuge holdings. Besides the 55,000 square foot building that partially burned there are four radar dome bases, a water treatment building, several other structures, parking lots, fences, etc.

We immediately put in place a plan to provide some level of public safety at the site. A gate was installed, a guard shack was placed (courtesy of YKHC), signs were posted, and guards for the site were hired or utilized from existing Refuge Information Technician staff. This level of protection for the site took place until late December when snow prevented travel by vehicle for patrols. By that point we had spent nearly \$50,000 on the project and decided that we needed to weigh the cost versus the need for that level of public protection.

As of this writing the site is unguarded but well signed and a locked gate prevents access from the main road. Of course, YKHC no longer wants the facility unless the torched building is cleaned up. That estimate is going to be somewhere in the two million dollar range. All the parties are supportive of trying to secure a special appropriation for this purpose.



The newest addition to the real property holdings of the refuge! This 55,000 square foot building was days away from being transferred from BIA to the Y-K Health Corporation when it was set on fire. Understandably, the corporation now wants it cleaned up before they take control of the site. (MBR 8/02)



Remnants of the arson caused fire that destroyed part of a building belonging to the refuge. The radar dome base in the background is one of four on the site. (MBR 8/02)

J. OTHER ITEMS

1. Cooperative Programs

The Kuskokwim River Salmon Management Working Group is comprised of various groups that have an interest in the management of salmon on the river. This group was established in the mid 1980's as a means of initiating a dialogue with the Alaska Department of Fish and Game and provide input in setting the commercial fishing periods. Since it was initiated, and now with the reduced commercial fishing on the river, the group has developed to represent subsistence fishers and sport fishers as well. With the involvement of the FWS in subsistence fisheries management, and with the Yukon Delta Refuge Manager delegated as the in-season management authority, we have become a regular attendee at the meetings. The Working Group meetings all took place in the refuge conference room except for one held in Aniak on July 27. Although there were no commercial openers for chinook or summer chums in June and July as directed by the Board of Fish in an effort to rebuild the stock, a number of openings took place for coho in August. The Working Group met throughout the summer to review information on run strength, subsistence harvest, and later, commercial harvest.

A port development project has been in the works for several years in the village of Mekoryuk. Although they have received some less than stellar economic feasibility conclusions related to the project, it continues to faintly pulse. On August 20 a village group working on the project briefed the Refuge Manager on the project and obtained input on how to proceed.

3. Items of Interest

Section H.9 discussed a major change in the way subsistence fishing took place on the Kuskokwim River this year necessitated by several years of poor salmon runs. Instead of the normal 24/7, fishers were restricted to catching their subsistence fish in just four days per week. Both State and Federal managers recognized that compliance with the reduced fishing time would require that people be informed and educated, not only about the rebuilding plan established for the river, but also basic salmon biology. This relay of information was launched in April through a series of articles and ads placed in one of the local newspapers. The information aided in increasing the dialogue up and down the river before the fish arrived and we feel it was a major factor in the excellent compliance with this new regulation. The series of articles is included in the back of this report.

4. Credits

The biological staff of SWB Broerman, WB's Wege, McCaffery, and Kovach, FB Cannon, and BT Harwood wrote sections D.5, F.1-7, and all of Section G., and H.9. ROS Snow wrote sections E.1, 3, 5, and 6, F.9, and Section I. ES Hanley wrote sections E.4, H.1-7, 11-16, and 18. DRM Liedberg wrote sections B., C, D. 2-4, and 6, H. 8-10

and 11, Section J., collected the Feedback section, and compiled, edited, and finalized the report.

RM Rearden is responsible for the photos on pages 29 and 81. No, we do not have a PT Cruiser as part of the station vehicle fleet though I bet we could get one in white, and no, we do not use the human waste incinerator for cooking our hotcakes at camp in the morning.

K. FEEDBACK

We thought it might be interesting this year to provide some excerpts from past Annual Narratives.

From the 1951 Nunivak National Wildlife Refuge report there is a discussion about the reindeer population on the island. Penned by Dave Spencer, the Refuge Supervisor, it says: *"Our tally this year was about 5,000 (reindeer), with an estimated population of 5000-5500 including calves. Our brief checks of the range indicate that although widespread remnants of lichen growth remain, it has been so damaged by over use by high populations in the past that little is available as winter feed for the deer. There seems slight chance of lichen recovery even with the present herd. The herd should not be allowed to increase above the present size, in fact a reduction in this size would provide for greater chance of range recovery."*

For the years 1956 through 1964 the herd averaged about 10,000 animals. For the past several years we have been meeting with a series of managers for Nuniwarmiut Reindeer and Seafood Products to encourage that the herd be reduced from its present 4,500 to the 2,000 animals authorized in the management plan. It makes you wonder where 50 years have gone.

The following note is from the 1953 report written by Paul Adams, the first Refuge Manager for the Nunivak and Hazen Bay NWR's, having been appointed in December, 1951. He states: *"Beaver from the Chuilinuk River area are steadily moving toward the Yukon River. Five new houses were discovered this winter, three on Hungry Creek where there had been none and three on Wilson Creek where two had existed last fall. This makes a total of seven houses in an area which reportedly had no beaver three years ago."*

If Paul Adams could see the Yukon-Kuskokwim Delta today he would see beaver everywhere. Their range has extended near enough to the coast that one wonders exactly how they survive without even willows for feed. As in 1953, the price of beaver today is discouraging trappers from pursuing the critters.

Jim King was the Refuge Manager in 1963 when he wrote: *A year ago when this station was activated we were hampered by an almost complete lack of reference material. Since then we have acquired a reference library of about 50 bound books and a like number of unbound reports, journals, etc., dealing with biology and other matters pertaining to this area. We now have the bulk of the reference material we need here and acquisition of additional material will be slower.*" Information exchange has come a long ways since 1963 and to Jim's credit, we know that he has kept up with it.

Back in the 60's, the refuge narrative reports were done three times per year. (I suspect the transition from three per year to an annual report was a result of the work associated with it but one has to wonder if the next step is from "annual" to "none".) In his January-April, 1963 report Jim King under the section titled "Illegal Waterfowl Harvest" he reports: *In the spring of 1961 a number of Eskimos were apprehended in the Bethel area. In one case, agents were shot at and in another case were attacked by a mob but these incidents were well handled by the agents involved and the result was a real glimmer of respect.* He goes on to discuss the next two years where the respect gained in 1961 quickly diminished. He concludes by stating: *So, the people of the Clarence Rhode Refuge are still enjoying unrestricted waterfowl hunting. It appears that it may be a long process closing the "season".* As we all now know, it was a long process though it wasn't to close the season but rather to open it. Jim played a large role for many years after leaving his position on the Clarence Rhode Refuge in collecting waterfowl population data. Jim's work as well as that of many others over the past 40 years helped document not only waterfowl populations, but also the harvest levels by residents on the Y-K Delta and the need for this harvest to continue. As of this writing, it looks like we will finally have a legal subsistence waterfowl harvest taking place in 2003.

Not too early to talk about rebuilding our fish stocks

by Paul Salamone

Today's the first day of spring, which means most people will be starting to think about summer activities, like fishing. I wrote a column right before Thanksgiving and at that time we were preparing for the Board of Fisheries meeting held in Anchorage during January. The meeting is over and there are some important changes people need to know about. This is the first in a series of articles of that will detail the Board's actions.

Everyone should be aware of the problems we've had the past several years with poor returns of salmon in the Kuskokwim River. Because of the low runs there has been little commercial fishing, and still too few salmon have been getting to the spawning grounds. The problem has been most critical for kings and chums. The exact reasons aren't clear, but one thing is clear: we do not have as many salmon as we did a few years ago.

Salmon populations are cyclic, the 80s and mid 90s may have been a peak of the cycle, but now, we may be entering into a part of the cycle where the abundance of salmon is not as high as we have become accustomed to. The 2001 outlook for king and chum



salmon is poor, so management will be very conservative for all salmon fisheries on the Kuskokwim River.

The Board of Fisheries made several changes to the Kuskokwim River Salmon Management Plan. The biggest being the intent of the plan, which is to rebuild stocks of king and chum salmon in the Kuskokwim River by improving escapements.

The Department has been directed to manage these salmon stocks for "escapement and subsistence uses" during June and July,

which means commercial fishing will be unlikely unless these priorities have CLEARLY been satisfied. Note that escapement is THE FIRST priority. This is extremely important for the future.

Within the Kuskokwim River, people can have the most impact by reducing fishing mortality. Since commercial fishing in the river has already been reduced, the next logical place to reduce fishing mortality is the next largest user group — the subsistence fishery. In order to increase the amount of fish that make it to the spawning grounds the Board has set up a subsistence fishing schedule that will allow four consecutive days of subsistence fishing for salmon and then three consecutive days when it will be

closed. This schedule will apply to salmon gillnets and fishwheels. The schedule will start June 1st but exactly which days will be open and which closed is still being discussed. Tagging studies have shown that salmon take three to four days to travel through

The bottom line in all this is that every person who uses salmon on the Kuskokwim River has the responsibility to make sure we continue to have fish for the future.

District W-1: the area where a large part of the subsistence harvest occurs. This schedule will provide the fish with periods ("windows") of time where no nets or fishwheels would be operating, thus giving them a chance to make it past the "gauntlet of gill-nets" in the lower river, while still allowing subsistence users a reasonable opportunity to fish.

In a "normal" year when commercial fishing is open two days a week, subsistence fishing for salmon is closed 16 hours before, during, and 6 hours after a commercial opener. This is about 112 hours per week of subsistence salmon fishing time. The proposed schedule will allow 96 hours of subsistence salmon fishing per week, or a reduction of 16 hours from a "normal" schedule. This is a compromise and it is important to note it's a starting

point. If the run is worse or better than expected, the schedule may be changed.

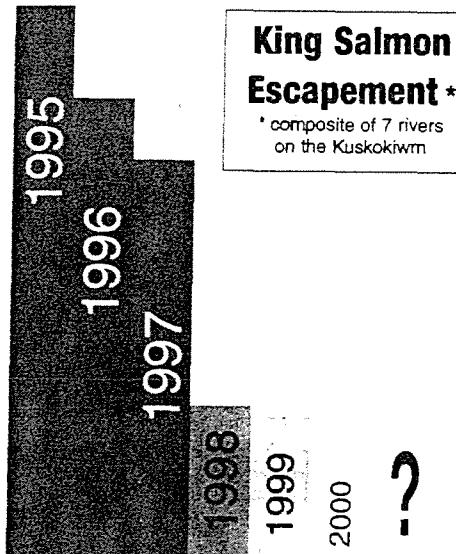
It is also important to understand that no one wants to deny people the opportunity to meet their subsistence needs. What we are experiencing is a low point in the salmon cycle. What we cannot do is to continue to catch fish as if we were still at the high point of the cycle. This means everyone will have to consider how they use salmon and what their actual needs are. Some people have already done some soul searching about how they will approach fishing in 2001 and I am encouraged.

One prominent person said he is going to catch only half as many kings as last year. Another will not send fish to relatives that live outside the area. These two people have put some thought into how many fish they really need and have decided that they can do some things differently. This is what every person and family needs to do. By working together, we can still have salmon for the future and salmon for subsistence today. The last thing anyone wants is harsher restrictions on subsistence, which will happen if spawning escapements don't improve.

The objective is to take immediate action that will keep the situation from becoming worse. If we do nothing the consequences could be severe. How would you respond to the question "what was it like to have salmon in the river?" from a grandchild? I've been places where this has happened and we

continued on page 13

It takes a King Salmon to make a King Salmon



King Salmon Escapement *

* composite of 7 rivers
on the Kuskokwim

Since 1995, the number of returning kings reaching their spawning grounds on the Kuskokwim has been reduced dramatically resulting in less fish in our rivers.

**6 times fewer kings arrived
in 2000 than in 1995.**

**Saving this magnificent resource is
your business, everyone's business.**

**Join responsible fishermen practicing
voluntary conservation**

Take only what you need

Help us rebuild the salmon stocks so there is something left for our future generations



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



Another fishing season ahead for the Yukon River

by Monty Millard

Fishers are being told that another below average year is being predicted. Hopefully we will be surprised, but we must enter the season being even more conservative than we did last year. On both the Kuskokwim and the Yukon Rivers we are asking for voluntary reductions even on the

restrictions that may take place. We must protect escapements. It is a legal responsibility for managers and a moral responsibility for all of us — managers and fishers alike.

During the past several weeks, state, federal biologists and subsistence coordinators have met with fishers at Holy Cross, Kotlik and Fairbanks. This presented the opportunity to discuss the disaster in 2000 and what might be expected this summer. The news is not good. The year 2000 saw the first restrictions on the subsistence harvest of Chinook salmon. It was also the lowest commercial har-



vest on record.

Although 2000 was expected to be a below normal run, it came back even worse — for all species. Few escapements were met and the important Canadian Chinook and fall chum numbers were miserable. Although escapement into Canada was poor, it was better than in 1999. The importance of the Canadian stocks

cannot be over-emphasized. They provide about 50% of the Chinooks harvested in the United States on the Yukon River. They will provide for most of your fishing rights in the future.

Fishers on the Yukon River attending these meetings have been informed that there is little to no likelihood of a commercial fishing season. I believe this was expected given the past three years. Every attempt is being made to provide for an equitable sharing of subsistence needs. Many fishers have provided information to help the managers reach these difficult

decisions. The State Board of Fisheries recently developed a subsistence fishing schedule. If the runs are even worse than expected, reductions to this schedule may be required. On federal lands, to avoid confusion, I anticipate that the state schedule will be adhered to. These are:

Districts 1, 2, 3 will have a maximum of two 36 hour periods for subsistence fishing. This provides for three days per week.

Districts 4, and Subdistricts 5B & C will receive a maximum of two 48 hours per week for subsistence fishing. This provides for four days of fishing.

District 5D, the Koyukuk River, and the Coastal District will receive 7 days per week for subsistence fishing.

Subdistrict 5A and District 6 will receive two 42 hour periods per week for subsistence fishing.

Although 1999 was a below average year we cannot forget 1998, the year of the salmon with the "big heads". The average weight of Chinook salmon in 1998 caught in the

commercial fishery was the lowest on record. This was followed by the second lowest weight in 1999. It appears that this weight reduction was continued in 2000. To me this is an obvious recent result of high seas productivity — fewer and smaller fish. Even the pink salmon numbers collapsed in 2000 and this species is not targeted by fishermen in western Alaska. What does this tell us about the future, and in particular, the 2001 fishing season?

In 1999, in the lower Yukon, the average weight of chinook in the commercial fishery was the fifth lowest, and the second lowest for the upper Yukon. There are many variables that affect the average weight in the commercial catch, poor ocean productivity is only one of them and may only be a small factor compared to the other variables (such as mesh size).

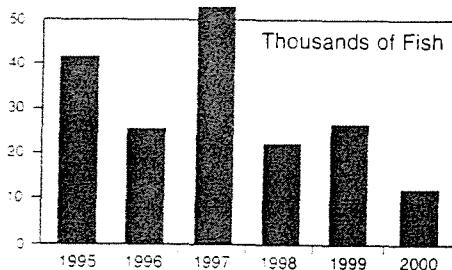
To conclude, this next season is going to be difficult for all of us. The next fisheries meeting on the Yukon will be at Mountain Village on April 17th. I look forward to seeing old and meeting new friends.

Keep the faith...the fish will return. With your help!

(Monty Millard is a federal fisheries manager for the Yukon River.)

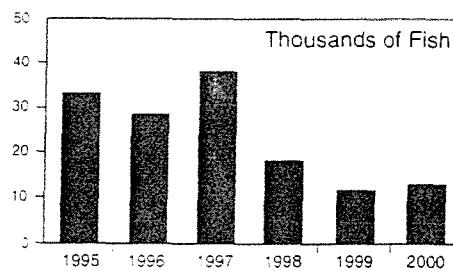
Yukon River King Salmon Need Your Support

U.S. Escapement *



*U.S. escapements are derived from aerial surveys and escapement monitoring estimates.

Canadian Escapement **



**Canadian escapements are based on mark recapture estimates.

Historic low returns of Yukon River King Salmon demand your attention and compassion as the 2001 fishing season approaches.

The pre-season outlook is poor, based on the best available information.

Please conserve for the future!

A public service message by

The U.S. Fish and Wildlife Service

and

The Alaska Department of Fish and Game



The importance of salmon escapement

by Dave Cannon

The term "escapement" simply means the number of adult salmon that make it back to spawn in the streams in which they were born several years earlier. We call it "escapement" because these fish have escaped from predators in the ocean, commercial fishermen on the high seas, and commercial and subsistence fishermen.

The most accurate way to determine how many salmon have returned is with weirs. Weirs are used to count each fish as they pass upstream. Unfortunately weirs are expensive to build and operate, so it's not possible to put one in every stream. Weirs that are strategically placed throughout the Yukon and Kuskokwim Rivers help give managers an indication of the status of the entire run. Currently there are weirs on the Kukpuk River in the lower Kuskokwim and the East Fork of the Andreanuk River in the lower Yukon. A new weir on the Takuuk River is planned for this summer in the lower Kuskokwim. Other weirs are located in the middle Kuskokwim (George, Kogruklik, Tatlawitsuk, and Takotna), and further up the Yukon. But not all fish that make it past a weir spawn; some are eaten by bears, eagles, otters, or a number of other animals.

Escapement numbers alone don't tell the whole story. Just because enough fish seem to return doesn't necessarily mean that future runs will be strong. Sometimes many more males than females come back. Female chinook are larger than males of the same age, and a big female chinook may hold over 10,000 eggs. Females often

build several nests, depositing some of their eggs in each, and may mate with more than one male, so the more females in the escapement the better it is for future salmon runs. This is why net size restrictions have been in place in the Kuskokwim commercial fishery since 1984, and why they may be used under Emergency Order in the Yukon: To allow more larger females to escape to the spawning grounds. Similarly, a female chum may produce between 2,000 and 4,000 eggs, a coho about 4,000, a pink about 2,000, and a sockeye 2,200. In short, regardless of the salmon species, it's better to have 100 females and 50 males reach the spawning grounds than 50 females and 100 males.

Adequate escapement is not only important for getting enough eggs deposited in the spawning areas to guarantee that enough young will return in the future to continue this cycle of life and death. As part of this salmon cycle, all Alaskan salmon die shortly after spawning. The dead salmon carcasses decompose, and although these rotting carcasses may stink, they are very important to the survival of many other fish, wildlife, and even plants. So as you will see, the death of adult salmon results in sustaining many other forms of life.

As adult salmon grow in the ocean they eat other fishes, small squid, and very small crab-like animals. Since these food items are only found in the oceans the salmon take in ocean derived nutrients into their flesh and bones as they grow. When they return to our rivers and die, they pass

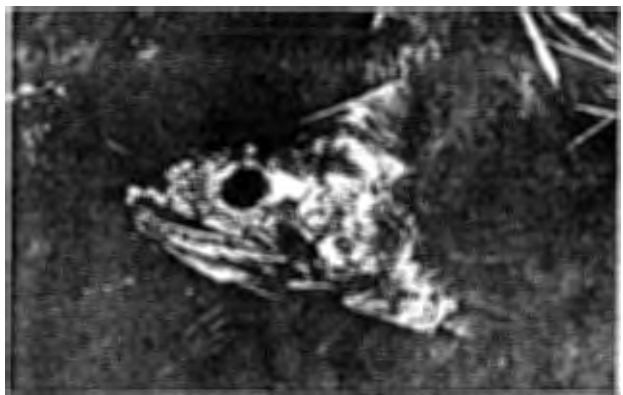


photo by Dave Cannon

Spawned out salmon decompose and offer valuable nutrients to other fish, wildlife and even plants. Salmon allowed to escape help to support a complex ecosystem in rivers and streams.

along these nutrients. Adult rainbow trout, Dolly Varden and grayling eat the larger pieces of rotting flesh, while the juvenile rainbow, Dolly Varden, grayling, chinook, coho, and sockeye salmon eat the smaller pieces. Some young salmon may ultimately thrive on the remains of their parents. Stream insects eat the smallest of pieces, and young and old fish eat the insects. Studies have shown plants that are several hundred feet from the edge of the stream have these ocean derived nutrients in their

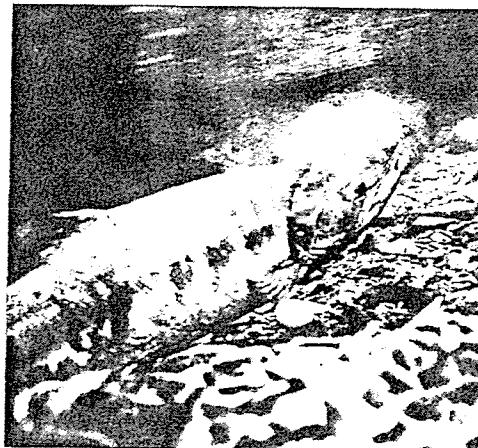
leaves, roots, and stems. Often bears and other animals will carry carcasses far back from the rivers edge.

Salmon escapement is important for several other reasons. As females release their eggs into the nest, some are washed out of the nest and are eaten by adult rainbow trout, Dolly Varden, grayling, and juvenile salmon. They're also eaten by small birds, harlequin ducks, and in-

continued on next page

Help us conserve our King Salmon

Kuskokwim and Yukon king and chum salmon runs are expected to be very weak this year. All users of salmon need to do what they can to conserve king and chum salmon for the future.



Here are some ideas how each of us can help:

- Respect the fish. Take care of what you catch and don't waste.
- Use all of the salmon you may have from last year's harvest. Avoid feeding good salmon to dogs or throwing it away.
- Carefully consider how many king and chum salmon you need and harvest only that amount. Each of us reducing our harvests a little can make a BIG difference.
- Consider sending less salmon to family or friends this year, or none at all.
- Using a 6" mesh or smaller gillnet when subsistence fishing will help you avoid catching large female king salmon.
- Consider releasing large live king salmon from your gillnet so they can continue to the spawning areas.
- Don't use salmon eggs when fishing with rod and reel for salmon during June and July. Release large king salmon so they can spawn.
- Keep your boat away from salmon in spawning areas. Give the salmon a chance to spawn and the eggs a chance to survive.



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



Subsistence Salmon Fishing

Closed 7 Days a Week

by Robert Sundown

This could very well be the headlines in summers yet to come. Your decision to "fish as usual" or "conserve for the future" this summer will determine your future fishing schedules 4 to 6 years from now. Area M has been restricted by approximately 70%, the high seas trawl fleet has been restricted of its take of king salmon, sport fishing will be severely restricted or perhaps closed this summer. This summer there will be no one else to blame for future disasters, except you.

What will your decision be this summer?

Last year most streams in the Kuskokwim made only a fraction of their escapement for king and chum salmon. Subsistence fishers caught about 20 percent fewer king salmon than average last summer due to the weak return. If this large harvest on a weak run continues, your children will not be able to continue a subsistence lifestyle in the future with salmon. Everyone agrees that a subsistence way of life is most important to the people of the Yukon Kuskokwim Delta. Legally, subsistence fishing has priority over commercial and sport fishing because it reflects our values in our society. In our society we also have a priority for protecting the salmon resource. Protecting the

salmon resources through escapement goals are the first priority because it allows you to practice your subsistence lifestyle in the future.

This summer a weekly subsistence fishing schedule will begin June 3. The schedule allows for subsistence fishing 4 days each week followed by 3 days of closure. The Open days are Wednesday, Thursday, Friday, and Saturday. The Closed days will be Sunday, Monday, and Tuesday. This schedule is a compromise between two needs. The first need is for salmon to make it home to their streams and make more salmon (which will allow you to feed your family 4 to 6 years from now). The second need is your ability to feed your family.

It is time to ask yourself and your family what your needs are for salmon this summer, and then ask what your future needs are for salmon 4 to 6 years from now. The savings and sacrifices we make now will help us reverse the declining escapements we had witnessed these past few years. Shortages in the future may be a direct result of your efforts.

Please make every effort to take only what you need and even reduce your family's harvest, if possible. What will your decision be this summer?

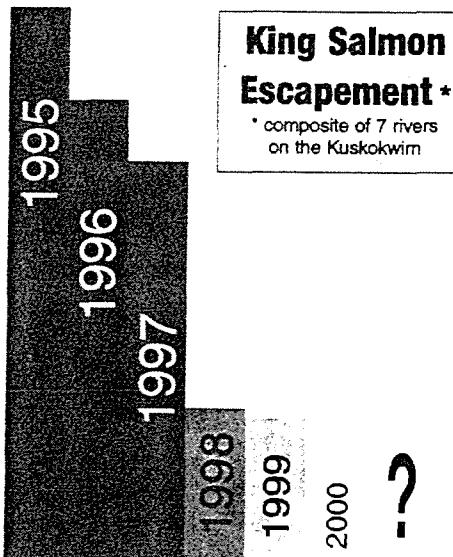


Fish Faxts

King Salmon or Chinook Salmon

- King salmon are anadromous- they hatch in freshwater, spend part of their life in the ocean, and return to freshwater to spawn. After spawning all king salmon die.
- King salmon mature at ages 2 through 7 years, thus causing varying sizes during their spawning return.
- Female king salmon tend to be older and larger than male king salmon. In the 2, 3, and 4 year age classes there are more males than females. But in the 5, 6 and 7 year age classes there are more females than males.
- 2 year old king salmon that spend one year in the freshwater and one year in the ocean are often called jacks. Jacks are young male king salmon.
- Jack king salmon can not compete with larger older male king salmon to spawn, so jacks have a difficult time contributing to the spawning escapement.
- King salmon are long distant travelers in the ocean and freshwater. In the Yukon River, king salmon will swim more than 2,000 miles into Yukon headwaters in less than 60 days.
- During the spawning migration king salmon do not feed and their body gradually deteriorates as they use stored body materials for energy and for development of reproductive products.

It takes a King Salmon to make a King Salmon



Since 1995, the number of returning kings reaching their spawning grounds on the Kuskokwim has been reduced dramatically resulting in less fish in our rivers.

6 times fewer kings arrived in 2000 than in 1995.

Saving this magnificent resource is your business, everyone's business.

Join responsible fishermen practicing voluntary conservation

Take only what you need

Help us rebuild the salmon stocks so there is something left for our future generations



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



Salmon: Much more than food

by Michael Coffing

I once heard someone say that salmon swimming upstream in the Kuskokwim River each summer is like the blood flowing in our veins. Each year the river provides the salmon that nourishes communities and families throughout the Kuskokwim drainage. Thoughts of salmon fishing in June immediately bring to mind visions of cut fish hanging on drying racks and the soft blue smoke floating out of the smokehouse. Many of the customs and traditions our families enjoy during summer are linked closely to the return of salmon. It is our responsibility to pass on these customs and traditions and to make sure that there are salmon available long after we are gone.

When we stop to think about salmon and consider how important they are to us, we realize how difficult it is to imagine life without them. Many families in this region focus their summer activities around harvesting and preserving salmon. Fish camps provide us a place to escape and live a more basic life style, away from the telephone, television and noise. Fish camp activities bring us closer to the things that matter such as visiting with friends, playing with our kids and teaching them how to work and share in family responsibilities, how to take care of one another, and how to have fun.

Catching whitefish on a string with salmon eggs and making a toy boat from cottonwood bark is always better at fish camp.

We can all appreciate the benefits and the opportunities that an abundant salmon resource provides us. Cultural values, customs and traditions are taught and learned in association with many of our subsistence activities. Teaching our children how to mend a gillnet, how to cut fish or make king salmon strips, how to drift a net, and where to fish are all important elements in feeding our families. Just as important though are those things that are difficult to measure, such as providing our kids avenues to develop self esteem, confidence, and teaching them that determination, cooperation, and hard work are necessary to accomplish difficult tasks. Salmon nourishes not only our body, but also our soul and our spirit.

Many of us have children that have already been taught how to catch salmon and put them up for subsistence. Securing those same opportunities for our grandchildren will depend on having healthy salmon populations when it is their turn to fish. No one can be sure how many salmon will return this summer. Biologists use the best information they have to forecast the strength of salmon returns. They are telling us that the king salmon return may be as poor or



Fish Faxts

- ☛ All pink salmon juveniles live only a few months in fresh water before going out to the estuary or ocean.
- ☛ All chum salmon juveniles live in their home stream only a few months in fresh water before going out to the estuary or ocean.
- ☛ Coho salmon juveniles live in their home stream one, two, or three years before going out to the ocean to live.
- ☛ Sockeye salmon juveniles live in their home stream one or two years before going out to the estuary or ocean to live.
- ☛ Most king salmon juveniles live in their home stream one year before going out to the estuary or ocean to live.

worse than last year. This information can help us prepare. We need to have our boats and fishing gear ready, but we also need to be prepared to do whatever we can to help make sure enough salmon get upriver to spawn so that our families and our children's families will have salmon in the future. If we don't, we are not just catching "our fish", we are also catching "their fish".

Sacrifices we make now can help make sure that many of the cultural values, customs and traditions that we treasure will continue. Although there may be other ways that these customs and traditions can be sustained, it is difficult to imagine how they can all remain

intact without salmon fishing. Your efforts to conserve salmon this summer will make a difference in five or six years from now. Will our grandchildren have the same opportunities to teach their kids how to fish, how to cut salmon strips, how to smoke salmon, and how to catch whitefish on string with salmon eggs?

If we are careful to make good choices now, if we respect the resource and take care of it, our children will have the same opportunities to harvest and use salmon that we have enjoyed.

(Mike Coffing is a Subsistence Resource Specialist with the Subsistence Division of the Alaska Dept. of Fish and Game.)

Protect salmon for our grandchildren



"I grew up eating salmon, so did my father, my children, my grandchildren."

"I would like my grandchildren and children to utilize salmon for their primary diet."

"It is my main diet."

Robert Nick
Subsistence Fisherman
Nunapitchuk



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



Just how many salmon are there?

by Charles Burkey

I'm sure most people are aware that the number of salmon returning to the Kuskokwim River changes from year to year. A period of years with strong salmon returns will be followed by a time of low salmon numbers. In the late 1980s and early 1990s, salmon were generally more abundant than they have been since 1997. How can we measure the number of salmon that reach their spawning grounds in the Kuskokwim River drainage?

Three main methods are being used to count spawning salmon in Kuskokwim River tributaries: weirs, sonars and airplane surveys. Of the three methods, weirs are the most accurate and cost effective. Sonar is used when a stream is too deep or muddy to count the fish using a weir. Counting fish using an airplane is the least accurate method.

Our ability to determine the number of salmon on the spawning grounds (escapement) in the Kuskokwim River tributaries has increased substantially in the last five years. In 1995, the Kogrukuk River located at the upper end of the Holitna River, and the Aniak



River, were the only tributaries of the Kuskokwim River where salmon were being counted using a weir or sonar.

In 2001, along with the Aniak River sonar, weirs will be used to count salmon on the Kwethluk, Tulusak, George, Kogrukuk, Tatlawiksuk, and Takotna Rivers. In the near future there may be weirs on other tributaries such as the Kisaralik, Kasigluk, Holokuk, and Telaguana Rivers. In addition to escapement counts, important data such as age, sex, and size of the salmon are also being collected at these projects.

Having a good number of escapement projects, such as weirs, distributed throughout the Kuskokwim River drainage provides a good indication of salmon abundance. If the number of salmon counted at weirs and sonars is good, we believe that the number of salmon reaching the other spawning tributaries is probably also good. In other words, the weirs and sonars that are used in some tributaries give us an idea of what is happening throughout the drainage. The information provided by these weirs, sonar and aerial surveys is useful, however, knowing the total number of salmon returning to all Kuskokwim River

drainage spawning areas would be even better. Fisheries projects that are planned in the future will help determine the total number of salmon returning to the Kuskokwim.

Beginning this summer, the Alaska Department of Fish and Game will carefully capture and tag chinook, chum, and coho salmon at the mouth of the Holitna River. A small radio transmitter will be attached to each fish. These radio transmitters will allow us to locate tagged fish and determine which areas are important for spawning. Knowing the number of tagged and untagged fish that pass through the Kogrukuk River weir will allow us to estimate the total number of chinook, chum, and coho salmon spawning in the Holitna River drainage. In addition, we will also be able to estimate the number of spawners in the Holitna River's major tributaries, which include the Hoholitna, and Chukowan (Swift) Rivers. In the future, radio-tagging projects could be used to estimate the total number and spawning distribution of salmon returning to the Aniak, Swift, and Stony River drainages.

In order to help determine the total number of coho salmon that return to the entire Kuskokwim River drainage, the Department of Fish and Game and the Kuskokwim Native Association plan to operate another mark/recapture program in the middle Kuskokwim area. Salmon will be caught with fish wheels in the Kuskokwim River

between Tuluksak and Lower Kalskag and tagged. Other fish wheels located further upriver of Upper Kalskag will be used to catch these salmon again. The number of tagged and untagged salmon caught in the upriver fish wheels will be used to estimate the total number of salmon that spawn above Tuluksak. Weirs on the Kwethluk, Tulusak, and possibly the Kisaralik and/or Kasigluk Rivers will provide an estimate of salmon that spawn below Tuluksak. If all goes well with the coho tagging project, plans are being made to expand the mark/recapture program to king, chum and sockeye salmon in future years.

Knowing the total number of salmon that spawn in the Kuskokwim River drainage along with the age and sex information collected at weirs will greatly increase our ability to ensure adequate escapement by avoiding overharvest and to forecast returns in future years.

Within the last five years great improvements have been made in our ability to determine the strength of Kuskokwim River salmon returns. In the near future the mark/recapture program, the Holitna River radio-tagging project, and weirs and sonars in the tributaries will allow us to answer the most important question; "How many salmon spawn in the Kuskokwim River drainage?"

Charles Burkey is the Kuskokwim Area Management Biologist for Commercial Fisheries Division, Alaska Dept. of Fish and Game.

We must work together to save the salmon



"Our elders tell us not to bicker or fight over resources and game."

"If we fight over them, they will start to disappear."

"The only way for the salmon rebuilding plan to work is for everyone to work together."

Robert Nick
Subsistence Fisherman
Nunapitchuk



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



Salmon for your future

by Robert Sundown

The general public and management agencies don't always agree on how to manage fish and game resources. The obvious reason is that we are in the business of making sure that there is a balance between the needs of people and the health of our resources. Maintaining this balance is what allows the continued future harvest of salmon.

Most everyone would be surprised to know that since the beginning of time, 99.9% of all life (species) that has ever existed on earth, are now extinct. This is not to say that Kuskokwim salmon stocks are in immediate danger of becoming extinct. It, however, does point out that continuity of species is relatively fragile, and all species including salmon deserve monitoring and balanced harvest.

King and chum salmon on the Kuskokwim River are in desperate need of your help. The Alaska Department of Fish & Game and the U.S. Fish & Wildlife Service cooperatively monitor spawning tributaries with local tribes. Escapement goals have been established that we feel will provide adequate numbers of fish to satisfy the subsistence needs and sufficient brood stock to repeat the cycle. In the last several years we have not come remotely close to achieving the escapement goals. In fact, the return in 2000 may have been so weak, that if NO king salmon were harvested last year (65,000 kings), we may still not have achieved our escapement goals for king salmon.

The end result of not reaching escape-

ment goals is simple. The commercial fishery is closed, subsistence fisheries are limited or closed, and the salmon resources suffer. You, the user have seen the result of salmon shortages in the last three years. The headlines have read "Governor Declares Disaster" and numerous meetings are held over what to do about the salmon resources.

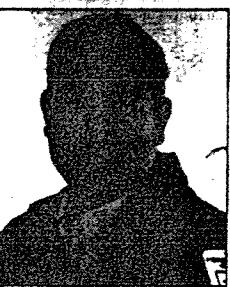
These are public meetings. Village leaders are gathered through the State of Alaska Fish & Game Advisory Committee's and the Federal Regional Advisory Councils. The

problems are discussed and proposals are forwarded to the Alaska Board of Fisheries and the Federal Subsistence Board. Through the participation of village and community leaders, regulations are proposed and created to address the issue.

You, the public, recognize that a problem exists on the Kuskokwim River with king and chum salmon. With your help, a solution has been created to rebuild the salmon stocks in need of help. Our solution to this problem includes a sincere effort on your part to conserve king and chum salmon. This sincere effort by everyone will be the form of a Subsistence Fishing Schedule to be implemented on June 3, 2001.

This schedule allows for subsistence fishing to occur on Wednesday, Thursday, Friday, and Saturday. The closed days on Sunday, Monday, and Tuesday are your solution to rebuild the salmon stocks. It is a balance of your needs now and your needs in the future.

(Robert Sundown is a subsistence specialist with the U.S. Fish & Wildlife Service.



Fish Faxts

All pink and chum juveniles spend less than one year in freshwater before traveling downstream to an estuary or ocean environment.

Adult salmon use their sense of smell to find their way back to the same stream they were born in, then spawn and die.

All pacific salmon (king, coho, chum, pink, and sockeye) found in Alaska die shortly after spawning, but Atlantic salmon don't.

Some Kuskokwim and Yukon king salmon spend four years in the ocean before they return to spawn, while others spend either three, two, or a few may even spend five years. The older they are, the bigger they are.

Some Kuskokwim and Yukon chum salmon spend five years in the ocean before they return to spawn, while others spend either four, three, or two years.

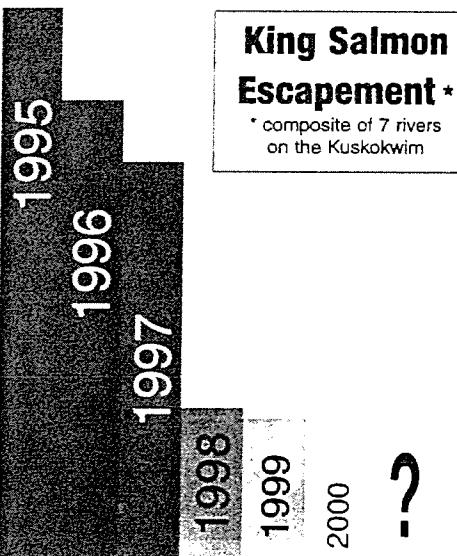
Most Kuskokwim and Yukon coho salmon spend one year in the ocean before they return to spawn.

Some Kuskokwim and Yukon sockeye salmon spend three years in the ocean before they return to spawn, while others spend two years.

All Kuskokwim and Yukon pink salmon spend 1 1/2 years in the ocean before they return to spawn and less than one year in freshwater before they go to the ocean. This is why all pink salmon are similar in size.

All juvenile salmon live within the gravel for the first several weeks (up to 1 month), until they absorb the yolk sac which provides food for them, when that's gone they begin feeding with their mouths. When this happens, they emerge from the gravel and feed on small insects and other very small food particles.

It takes a King Salmon to make a King Salmon



King Salmon Escapement *

* composite of 7 rivers
on the Kuskokwim

Since 1995, the number of returning kings reaching their spawning grounds on the Kuskokwim has been reduced dramatically resulting in less fish in our rivers.

**6 times fewer kings arrived
in 2000 than in 1995.**

**Saving this magnificent resource is
your business, everyone's business.**

**Join responsible fishermen practicing
voluntary conservation**

Take only what you need

Help us rebuild the salmon stocks so there is something left for our future generations

A public service message by

**The U.S. Fish and Wildlife Service
and**

The Alaska Department of Fish and Game



Kuskokwim River of salmon

by Jerry Berg

The Kuskokwim is not only a river of salmon, but it is also a river of people, caribou, blackfish, moose and many other animals. The Kuskokwim and Yukon Rivers are the lifeblood of the YK Delta and salmon are a main food source for most everyone and everything out here. Everyone anxiously awaits that first fresh king salmon which should be arriving in a few weeks. Spending time in fish camp with friends and family, and taking a steam after a day on the river, are among the best parts of life on the Delta.

When it is time to load the net in the boat and start fishing for this year's supply of salmon, let's not forget the people upriver who have not yet had the opportunity to fish. Your family should take ONLY as many salmon as you absolutely NEED to make it through the year. During these years of weaker salmon runs it is everyone's duty to do all you can to make a difference. The graph below tells the story of declining king salmon runs while subsistence has continued at stable levels.

Reductions in your salmon harvest are not what anyone wants but it is sometimes necessary to take less now, to help ensure salmon runs for future

years. The alternative is continued poor salmon returns for years to come. This will not only affect you but could also lead to reduced populations of many other animals that also rely on salmon to survive.

Fishery managers and many village leaders are asking for your support, and hope you will voluntarily reduce your salmon harvest to help make sure there are fish for your children. It is a difficult situation for everyone and it has not been an easy process but we

have reached the point of asking you for Voluntary Reductions of Salmon Harvests. Many meetings have been held to try to figure out the best way to approach a solution. The Board of Fisheries and Federal Subsistence Board did not want to set a subsistence salmon fishing schedule but basically had few other viable alternatives.

Subsistence salmon fishing will be Open Wednesday through Saturday and Closed Sunday through Tuesday. This solution did not come easily. The fishing schedule is the result of many hours of meetings and discussions with many people to help ensure we have salmon for the future.

Your support is key to any success. Please support these efforts to save your salmon.

(Jerry Berg is the Kuskokwim Area Fishery Biologist at the Federal Subsistence Office.)



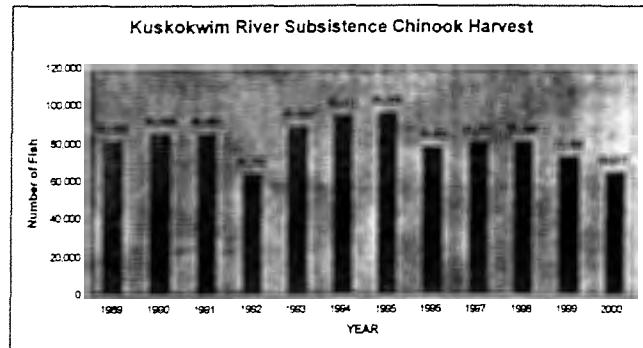
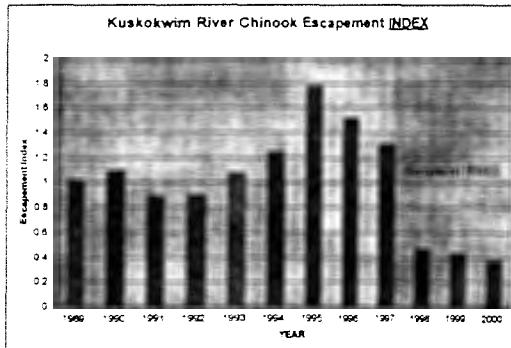
GRADUATION

Congratulations
and Well Done
to the Graduating
Classes of 2001.

Wishing the best
of future success!

Alaska Airlines

Kuskokwim River King Salmon Need Your Help



Historic low returns of Kuskokwim River King Salmon demand your attention and compassion as the 2001 fishing season approaches. The pre-season outlook is poor, based on the best available information.

Please conserve for the future!



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game





Alternatives for the subsistence harvest of king salmon

by Doug Molyneaux

According to both the federal and state fisheries biologists, the king salmon run in the Kuskokwim River is expected to be poor again this summer. We heard this message all winter, but why should folks believe it? The gloomy outlook is based on two lines of evidence. The first is the abundance trend we have seen the past few years - low numbers of kings have been harvested, yet we still have had low numbers of kings arriving to the spawning streams. The second line of evidence is that few younger aged king salmon were seen last summer - a low number of younger aged kings in one year usually means a low number of their older aged siblings the next year. For similar reasons, chum salmon returns are expected to be poor this summer, but the focus of this article will be on kings.

Can we do anything to reverse this downward trend in king salmon abundance? Our options are limited. One approach is to reduce harvest so more kings get to the spawning streams. Both the Alaska Board of Fisheries and the Federal Subsistence Board have taken measures to reduce king harvest in the Kuskokwim River. No commercial fishing is expected to occur in the Kuskokwim River during June and July this summer and subsistence fisherman will be put on a fishing schedule beginning June 1 in the lower Kuskokwim River. Subsistence fishers all along the Kuskokwim River are also being asked to voluntarily reduce their

king salmon catch. These measures are all intended to get more kings up into the spawning streams.

However, all kings are not created equal. What would be best is to get more female king salmon up into the spawning streams. One male can spawn with several females, so it is better if the extra spawning fish provided by efforts to reduce harvest were mostly females. Some folks have suggested that this can be done if subsistence fisherman use gillnets with smaller mesh sizes like 6 or 5 1/2 inch mesh, instead of 8 or 8 1/2 inch mesh. The idea behind using small mesh web is that it catches fewer female king salmon than the large mesh web. Is this really true?

To see if this was true or not, I compared the sex composition of 689 king salmon caught in gillnets of 8-inch mesh and larger to the sex composition of 789 kings caught in gillnets 6-inch mesh and smaller during the same three years. In the large mesh nets, 44% of the kings were females. In contrast, only 22% of the kings were females in the small mesh nets. Based on this comparison, the king salmon catch from small mesh gillnets has half the number of females as would a large mesh gillnet. And that means more females would be available for spawning.

While this solution has promise for kings, it is a less than perfect. Small mesh gillnets would result in an increased catch of chum salmon, and as mentioned earlier, the chum salmon run to the Kuskokwim River is also expected to be weak this summer.

I have heard some folks voice concern

that the use of small mesh nets result in more fish dropping out of the net, and that the dropouts die. Some of the dropouts may indeed die, but the number is probably very low. Death is most likely caused by damage to the gills. Female king salmon, which are large, typically cannot get their heads all the way through small mesh web, so they are less likely to get their gills damaged. Some fish may also die from the exhaustion of freeing themselves from the net, but again, this is probably not common.

Every year about 14% of the female

king salmon observed at the Holnua River weir have gillnet marks on their heads. That means these fish survived an encounter with a gillnet. Each of those surviving females brings with it 5,000 to 12,000 eggs to be deposited in the gravel of the spawning stream. And each surviving egg is one more step towards reversing the trend of diminishing king salmon runs in the Kuskokwim River.

Doug Molyneaux is a Kuskokwim Area Fishery biologist who has worked in the Kuskokwim Area since 1989.

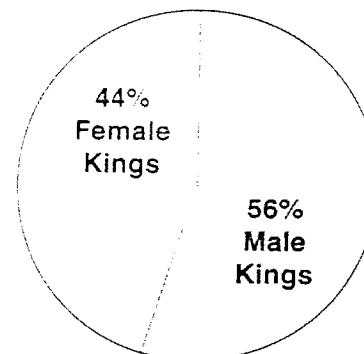


Fish Faxts

- King salmon are very particular where they spawn, often they spawn in the middle of a stream or in areas where water is flowing through the gravel.
- Depending on their size, female king salmon have 5,000 to 14,000 eggs to deposit in the gravel during spawning.
- A female king salmon will spawn 6-12 times with different males, releasing 300 to 700 eggs during each spawning.
- Depending on timing of spawning and water temperature, salmon eggs hatch in late winter or early spring. The newly hatch salmon are called alevin and live in the gravel for several weeks as they gradually absorb food in the attached yolk sac. Once the yolk sac is absorbed, the juveniles, called fry, emerge from the gravel and begin feeding on freshwater plankton and insects. Most juvenile king salmon stay in freshwater for one to two years to growing slowly. When juvenile king salmon begin migrating to the ocean, their scales become bright silvery in color, this stage of life is called smolt. Many internal biological changes are occurring that allows smolt to adapt to the ocean environment. Once in the ocean, salmon grow fast, often they double their weight during the first summer.

Help large female Kings with small mesh nets

Large Mesh
Gillnets
(8 and 8 1/2
inch mesh)



22%
Female
Kings

78%
Male
Kings

Small Mesh
Gillnets
(5 1/2 to 6
inch mesh)

To help the return of large female King Salmon, fishermen are urged to use 5 1/2 to 6 inch mesh nets when subsistence fishing this summer.

Please conserve for the future!



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



Wanted: Subsistence salmon information

by Mike Coffing

June is just a couple of days away and fishers are already out on the river trying to catch a fresh salmon for the dinner table. Words can hardly describe just how good that first salmon of the year tastes. During the past couple of months, this section of the Delta Discovery has focused on the status of the chinook and chum salmon runs on the Kuskokwim River and the need for all of us to do whatever we can to help ensure that enough salmon make it to the spawning grounds this summer. Their future and ours depends on it.

Fishing this summer will be different for all of us. We are all hopeful that the chinook and chum salmon decline will improve in the next few years (yes, it will probably take several years) and return to levels that we have enjoyed in the past. Your efforts this season, ...all of our efforts combined, can make a real difference.

This summer there will be several weir projects operating in the Kuskokwim River drainage, a sonar project on the Aniak River and a test fishery near Bethel. These projects, and aerial surveys during the summer, will help us to evaluate the relative strength of the salmon run and tell us how many salmon are reaching the spawning grounds. Subsistence fishers throughout the Kuskokwim drainage will also be asked to share their knowledge about the salmon run this summer through the combined efforts of the Orutsararmiut Native Council, the Kuskokwim Native Association, the McGrath Native Village Council, the U.S. Fish and Wildlife Service and the Department of Fish and Game; subsistence fishers will be surveyed weekly to learn

how their subsistence salmon fishing is going. We need your help to evaluate the strength or weakness of the king salmon return this summer.

Each week during the summer, technicians from the Orutsararmiut Native Council, Kuskokwim Native Association and the McGrath Native Village Council will contact subsistence fishers in their area and ask how subsistence fishing is going. Is fishing good, average, or poor? Are you having to fish harder to catch salmon? Do the salmon you catch appear healthy? Are many of the king salmon small? Are there things different about the salmon or fishing conditions this season than you want us to know? Does it look like you are going to be successful catching enough salmon for your family? These are examples of the questions you may be asked. In addition to talking to you about how your salmon fishing is going this summer, the survey staff that contact you this summer can also tell you about an opportunity for you to help collect biological information from the king salmon you catch, ...and get paid for it.

Soon you will be receiving the familiar subsistence salmon harvest calendar in your mail. We encourage you to use it to record your salmon harvests this summer and return it to us when you are through fishing. The calendars provide us with important information. Please use it. Enclosed with the calendar will be some information about the subsistence fishing schedule. If you don't receive a harvest calendar, we will have some available at the State Subsistence office in Bethel. Please contact us with ANY questions you may have at 543-3100 or 543-2423.

Fish Tails



The one that didn't get away

We hope readers will send us their fish tales and stories to publish in our Fishin' Edition this summer. We'll start it off with one of our own. Ed.

For us, it began as a major journey upriver from Bethel in a 19 foot aluminum canoe powered by a 9.9 horsepower Johnson. We were quite the sight, the three of us - Carle and I and our pet pig Gertrude, buzzing up the Kuskokwim.

It was our first year in Bethel and we were determined to go camping up the Kwethluk River at the "Y". For most, it was an hour and a half trip. We took 5 grueling hours.

We were blessed with beautiful weather that afternoon in late June and when we finally arrived there were many other day fishermen. Most were having luck catching kings.

I caught my first king salmon that day from the banks of the Kwethluk and then another. We finally made camp and spent the night at the fork of the "Y".

First thing the next morning while Gertrude was searching for leftovers from our dinner meal and Carle was cooking up pancakes, I decided to get a little fishing in before breakfast. I had noticed a spot 50 feet across the river I wanted to try. I took the canoe across and no sooner had I cast my pixie into the water when I got a huge



hit by a fish. It felt like a monster.

Having this fishing line on my reel I was worried it would break so I was extra careful giving him lots of line.

After battling for the better part of an hour, I was ready to bring the fish in, but with no one to help me with a net I had to work him to a tiny spot of beach.

Once I pulled the fish up to the water's edge I pounced on it and triumphantly held up a big king salmon for my cheerleaders - Carle and Gertrude who were watching from across the narrow river.

That was the last king that I had taken with rod and reel and one we will never

SUBSISTENCE FISHING SCHEDULE, SUMMER 2001 KUSKOKWIM RIVER DRAINAGE ONLY

CLOSED: SUNDAY, MONDAY, TUESDAY

1. Closures are from 12:01AM Sunday morning until 11:59PM Tuesday night.
2. All fish wheels and gillnets greater than 4-inch mesh (both drift and set) must be out of the water Sunday through Tuesday.
3. Only gillnets with 4-inch or smaller mesh no longer than 60 feet in length are allowed Sunday, Monday and Tuesday for harvesting other fish such as whitefish and sheefish.
4. Subsistence fishing with hook and line (rod and reel) is allowed 7 days /week.

OPEN: WEDNESDAY, THURSDAY, FRIDAY, SATURDAY

1. Openings are from 12:01AM Wednesday morning until 11:59PM Saturday night.
2. Gillnets of any mesh size and fishwheels may be used Wednesday through Saturday.
 - From Bogus Creek downstream to mouth of Kuskokwim River the first 3 day closure begins Sunday June 3. These Sunday, Monday and Tuesday closures continue each week for the remainder of June and July unless changed by Emergency Order.
 - From Chuathbaluk downstream to Bogus Creek the first 3 day closure begins Sunday June 10. These Sunday, Monday and Tuesday closures continue each week for the remainder of June and July unless changed by Emergency Order.
 - Upstream of Chuathbaluk the first 3 day closure begins Sunday June 17. These Sunday, Monday and Tuesday closures continue each week for the remainder of June and July unless changed by Emergency Order.

THIS WEEKLY FISHING SCHEDULE WILL BEGIN IN JUNE AND CONTINUE THROUGH JULY.

This schedule is subject to change depending on the strength of the king and chum salmon returns.



A public service message by
The U.S. Fish and Wildlife Service
and
The Alaska Department of Fish and Game



2001 Kuskokwim Fisheries Regulations

Frequently Asked Questions - FAQs

Subsistence fishing schedule:

Open Wednesday to Saturday
Closed Sunday to Tuesday

Starts June 3rd in District 1.

Starts June 10th in Districts 1 & 2.

Starts June 17th in all river areas.

SUBSISTENCE FAQs:

Q. I live in Anchorage but I am originally from the Kuskokwim Area. Can I go subsistence fishing in the Kuskokwim River drainage for king and chum salmon?

Q. Is there a limit to how many king and chum salmon I can catch during the open days?

Q. Can I go fishing for other species during the closed period, like whitefish?

Q. Will there be enforcement officers patrolling the river?

Q. I am from a Kuskokwim River village. Can I go fishing with a rod and reel for king and chum salmon? Do I need a fishing license?

Q. What should I do if I catch a king or chum in my whitefish net during the closed days?

Q. I am a resident of a Yukon Area within the Yukon Delta National Wildlife Refuge. Can I go fishing in the Kuskokwim River drainage for king or chum salmon?

Q. Do I have to pull my set net during the closed days?

Q. I am a Kuskokwim River Resident. I have relatives who come to visit from outside the Kuskokwim Area. If we go subsistence fishing, can they help me fish for kings or chums on Federal waters?

SUBSISTENCE ANSWERS:

A. Not likely, unless living within the Kuskokwim Management Area and the village is in subsistence fishing for king and chum salmon or the Yukon Delta National Wildlife Refuge for subsistence of the Yukon Delta National Wildlife Refuge. King and chum salmon are the only species allowed to be harvested off shore from King and Chum Salmon. King and Chum Salmon are harvested under subsistence regulations.

A. No, you must be a local, permanent user in a region for subsistence consumption of king and chum salmon.

A. You can target other species of fish during the closed days, provided you are using a mesh size of 4 inches or less and no longer than 40 feet.

A. The State Fish & Wildlife Department (State) and U.S. Fish & Wildlife Service (Federal) Agents will enforce the subsistence closed days.

A. King and chum generally a legal subsistence gear for subsistence in the Kuskokwim Management Area. Subsistence from the Kuskokwim Area do NOT need a license for rod and net fishing. Any personnel reader from the Kuskokwim River Management Area is allowed to fish 7 days per week for king and chum salmon with rod and net equipment.

A. This would be considered non-targeted bycatch, which you are allowed to keep.

A. No. You must be a resident of a Kuskokwim Area village to fish in the Kuskokwim River drainage downstream of Aniak (including the Aniak River appx. 5 miles upstream of the Buckstock) for king and chum salmon.

A. Yes, all nets with mesh size greater than 4" must be removed from the water.

A. No. Only Federally qualified subsistence users, those who live permanently in the Kuskokwim Area, may subsistence fish for kings or chums on Federal waters.

ROD AND REEL FISHING ON FEDERAL WATERS

Q. I am a resident of Bethel. Can my parents who live outside the Kuskokwim Management Area rod and reel fish for king and chum salmon with me? What about other species like rainbow trout?

Q. What are the areas closed to sport fishing for king and chum salmon?

Federal waters primarily include the Kuskokwim River and its tributaries from its mouth upstream to and including the lower portion of the Aniak River. Federal waters extend up the Aniak River approximately 5 miles upstream of the Buckstock River.



If you have questions, contact:

Robert Sundown
 Yukon Delta National Wildlife Refuge
 P.O. Box 346
 Bethel, AK 99559
 (800) 621-5804
 (907) 543-3151
robert_sundown@fws.gov

Jerry Berg
 Office of Subsistence Management
 3601 C Street, Suite 1030
 Anchorage, AK 99503
 (800)478-1456
 (907)786-3888
jerry_berg@fws.gov

Russian biologist comes home to study endangered eiders on the Yukon Delta



Photo by Ted Horner

Above, Russian biologist Diana Solovieva uncovers a goose nest during survey work for Spectacled Eiders on Kigigak Island. She brings years of experience from the Lena Delta Refuge in Northern Siberia.



Photo by Ted Horner

Right, student-intern Caleb Wiseman, from Ohio, consults with Solovieva from their Kigigak Island research camp before departing on nesting surveys. The 16 square mile land is divided into 1/4 mile plots which are surveyed for deer nests.

Right, Wiseman discovers a common eider nest which he will mark for later study by the research team.

by Ted Horner

Though born and educated in St. Petersburg, Russian scientist Diana Solovieva feels like she is coming home this summer to Western Alaska as part of a research team to study the endangered Spectacle Eider ducks.

"Even though Alaska was sold by Russia so long ago, it still feels like the land is ours," said Solovieva.

She is the lead research scientist at the Lena Delta National Wildlife Refuge in northern Siberia and deals with many of the same bird species that breed in Alaska. She hopes to develop a "sister relationship" with the Yukon Delta Refuge.

However, practicing wildlife research and management in modern-day Russia is a challenge to her dedication.

"I started as a biologist during the Soviet time," she said. "Things started getting worse and worse after the collapse."

Funding from the Russian government is scarce and she is paid a

mere \$300/month during her summer time at camp and \$100/month during the winters.

"Now we are depending on support from organizations in Germany, Norway, and England and the U.S.," she said. Once depending on comfortable and stable government funding, she now has to submit grant proposals to organizations around the world in order to keep her research projects going.

Solovieva says she has loved the study of birds since she was a child but her practical parents required that she get an education in a specialty that would assure a good job. After training through a Master's degree in Audio Engineering, she went back to school to pursue her real love - the biology of birds - where she earned her doctorate degree studying Steller's Eiders in Siberia.

Despite the economic hardships in Russia, she loves her work.

"There isn't anything else I could do or would want to do," she said.





A Message to the Villages and Residents of the Kuskokwim River

from the U.S. Fish and Wildlife Service, the Alaska Department of Fish and Game and the Kuskokwim River Salmon Management Working Group.



Congratulations to all Kuskokwim River fishers on your efforts to conserve salmon and your support of the Kuskokwim River Salmon Rebuilding Plan.

Through your commitment and sacrifice this past season toward rebuilding the salmon resource, the escapement goals were met in many of the tributaries of the Kuskokwim River. This team effort by all Kuskokwim fishers will help to ensure the vitality of future salmon runs and of the people who depend on them.

For more information on the 2001 Kuskokwim River salmon runs or the rebuilding plan, contact:

**Alaska Department of
Fish and Game
Commercial Fisheries
(907) 543-2433**

**U.S. Fish and Wildlife
Yukon Delta NWR
(907) 543-3151, or
1-800-621-5804**