Yukon Delta National Wildlife Refuge
Bethel, Alaska

Annual Narrative Report

Calendar Year 1986

U. S. Department of the Interior
Fish and Wildlife Service
National Wildlife Refuge System
L-R: Prince, Comish, Wege, Clyde, Hunt, Perry, Strom, Comish, Mathlaw, Rearden, Peltola, McCaffery

Permanent and Intermittent Staff

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<tr>
<td>1. Refuge Manager</td>
<td>Ronald L. Perry</td>
</tr>
<tr>
<td>2. Deputy Refuge Manager</td>
<td>Dennis W. Strom</td>
</tr>
<tr>
<td>3. Asst. Refuge Manager/Pilot</td>
<td>Michael B. Rearden</td>
</tr>
<tr>
<td>5. Wildlife Bio/Pilot (Trans 9-86)</td>
<td>Kurt Becker</td>
</tr>
<tr>
<td>6. Interpreter</td>
<td>Charles Hunt</td>
</tr>
<tr>
<td>7. Wildlife Biologist</td>
<td>Richard Ernst</td>
</tr>
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<td>8. Wildlife Biologist (Trans.6-86)</td>
<td>John Clark</td>
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<td>9. Budget Assistant (Res. 8-86)</td>
<td>Norma Shaw</td>
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<td>10. Bio Tech (Res. 7-86)</td>
<td>Paschal Afoan</td>
</tr>
<tr>
<td>11. Wildlife Biologist (EOD 9-86)</td>
<td>Timothy Miller</td>
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<td>12. Clerk Typist (Res.9-86)</td>
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<td>13. Clerk Typist (EOD 5-86)</td>
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<td>14. Budget Assistant (EOD 8-86)</td>
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<tr>
<td>15. Maintenanceeman</td>
<td>Mildred Prince</td>
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<td>16. Laborer (Trans. 6-86)</td>
<td>Rex Mathlaw, Sr.</td>
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<td>17. Maintenanceeman (Res.9-86)</td>
<td>Palmer Olrun</td>
</tr>
<tr>
<td>18. Maintenanceeman</td>
<td>Richard Davis</td>
</tr>
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GM-13, GS-12, GS-11, GS-09, GS-07, GS-05, GS-03, GS-04, GS-07, WG-10, WG-02, WG-08
19. Tony Amos
20. Jack Paniyak
21. Jimmy Slats

Bio Tech, Mekoryuk
Maintenance, Chevak
Bio Tech, Chevak

Temporary Employees

Eugene Peltola, Jr.  Bio Tech  GS-05
Phillip Paniyak  Bio Tech  GS-05
Brian McCaffery  Bio Tech  GS-05
Elena Clyde  Clerk Typist  GS-03

Youth Conservation Corp

Nancy Peterson
Wayne Chandler

Volunteers

Dawn Comish
Clifford Kassel
Brian McCaffery

Refuge Information Technicians

Retained:  Michael Jimmy  District 1
          Alex Nick  District 2
          Harry Lincoln  District 8
          Moses Anvil, Jr.  District 4-5

Resigned:  Josephine Roczicka  District 4-5
          James Charles  District 10

Hired:  Clifford Kassel  District 6
        Stella Nash  District 9
Reviews and Approvals

Submitted By: Ronald L. Perry Date: 3/25/87
Regional Office Review: Paul L. Schmidt Date: 4/14/87
Regional Office Approval: Joseph Marzano Date: 5/7/87
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A. HIGHLIGHTS

The Comprehensive Conservation Plan is near completion (D.1)

The Refuge Headquarters and nine new residences are near completion (I.1)

The Yukon Kuskokwim Delta Goose Management Plan was signed again in 1986 (H. 8)

B. CLIMATIC CONDITIONS

The refuge is located in western Alaska on the deltas of the Yukon and Kuskokwim rivers. The refuge stretches from Nunivak Island in the Bering Sea to Aniak some 200 miles inland from the coast. The entire region is considered part of the transitional climatic zone with influences of both continental and maritime climates. The resulting climate tends to be cooler than interior Alaska during summer, due to coastal clouds and cold seas. In winter this region is warmer than interior Alaska due to the warming effects of the Bering Sea and heat retention by coastal cloudiness. Wind is an important aspect of the climate at all seasons. At Bethel wind speeds average about 12 mile per hour throughout the year. The maximum recorded high and low temperatures at Bethel are 84 degrees and -48 degrees. Freeze-up normally occurs in mid October and break-up in early to mid May.

Average monthly temperatures during 1986 remained near normal throughout the year with the exceptions of February and December which were above normal; i.e. + 10.0F and + 16.7 F respectively. Precipitation for the year was closer to normal compared to 1985 precipitation which was double that of 1986. January through July were drier than normal, however August and September as well as November proved to be much wetter than normal.

See Table 1 for Bethel climatological data.
Table 1

1986 Climatological Data for Bethel, Alaska.

<table>
<thead>
<tr>
<th>Temperature (degrees F.)</th>
<th>Days with Measureable ( .01 Inches)</th>
<th>Total Snowfall (Inches)</th>
<th>Total Precipitation (Inches)</th>
<th>Average Wind Speed (M.P.H.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
<td>Precipitation</td>
<td></td>
</tr>
<tr>
<td>Jan. 21</td>
<td>-21</td>
<td>12</td>
<td>8.7</td>
<td>.65</td>
</tr>
<tr>
<td>Feb. 45</td>
<td>-20</td>
<td>5</td>
<td>1.7</td>
<td>.57</td>
</tr>
<tr>
<td>Mar. 46</td>
<td>-10</td>
<td>0</td>
<td>Trace</td>
<td>Trace</td>
</tr>
<tr>
<td>Apr. 51</td>
<td>-9</td>
<td>6</td>
<td>2.6</td>
<td>.39</td>
</tr>
<tr>
<td>May. 64</td>
<td>23</td>
<td>7</td>
<td>4.2</td>
<td>.78</td>
</tr>
<tr>
<td>Jun. 83</td>
<td>36</td>
<td>14</td>
<td>0.0</td>
<td>1.25</td>
</tr>
<tr>
<td>Jul. 80</td>
<td>39</td>
<td>17</td>
<td>0.0</td>
<td>1.97</td>
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<tr>
<td>Aug. 67</td>
<td>35</td>
<td>25</td>
<td>0.0</td>
<td>4.40</td>
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<tr>
<td>Sep. 68</td>
<td>26</td>
<td>25</td>
<td>Trace</td>
<td>3.10</td>
</tr>
<tr>
<td>Oct. 49</td>
<td>10</td>
<td>12</td>
<td>0.3</td>
<td>1.28</td>
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<td>Nov. 45</td>
<td>-6</td>
<td>11</td>
<td>1.8</td>
<td>1.9</td>
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<td>-12</td>
<td>10</td>
<td>2.1</td>
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<td>TOTALS</td>
<td>144</td>
<td>21.4</td>
<td>16.74</td>
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</table>

* Data unavailable

C. LAND ACQUISITION

3. Other

The Yukon Delta National Wildlife Refuge is responsible for the management of Native selected lands within the refuge boundary until conveyance documents are issued to village corporations under the terms of the Alaska Native Claims Settlement Act (ANCSA). The Bureau of Land Management (BLM) is responsible for land transfer to native corporations.

The refuge's interim management responsibilities add a major workload to the staff, especially in the area of special use permit issuance and administration during the spring and summer. Even when a conveyance is issued to a village corporation, 10% of the final conveyance is withheld until the final patent is issued to deal with protests and errors.

Land of 15 villages selected from the Clarence Rhode, Hazen Bay, and Nunivak Island Refuges is subject to 22(g) provisions of ANSCA. Since regulations are not issued for these lands there is much confusion. The regional office has been working with Alaska Federation of Natives (AFN) to complete draft regulations. Other
attempts over the last 10 years have been unsuccessful. Even when regulations are issued the refuge will be responsible for administering the regulations for over 500,000 22(g) lands and dealing with 14 different villages.

The yellow coloring on this map shows the Native selected lands within the Refuge boundaries. The red squares show the individual Native allotments. Almost all of this is unsurveyed, making it difficult to determine land status on the ground.

D. PLANNING

1. Master plan (comprehensive conservation plan)

The Comprehensive Conservation planning process continued this year, with significant progress made on the final product. The year started with the completion of the subsistence resource mapping by refuge information technicians in villages.

In May and early June, Norm Olson's planning staff and refuge representative held meetings in 12 Delta villages. The purpose of these meetings was to discuss the alternatives of how the refuge could be managed. One of the main items of discussion were the wilderness proposals. Villages supported proposals ranging from those for no more wilderness to those calling for all wilderness.

On June 12, ARM Strom and Norm Olson presented a briefing to the regional directorate on the range of C.C.P. alternatives. A preferred alternative was selected by the regional director.
The week of June 16-20, RM Perry and planning team leader Norm Olson traveled to Washington to give a briefing on C.C.P. alternatives for the Yukon Delta NWR. The presentation was given to the FWS Refuge Staff and other Interior Dept. Staff.

In July, the Regional Office planning team started writing a draft version of the C.C.P.

On September 22 & 23rd, the planning team came to the refuge to go over the first draft of the C.C.P. before submitting it for public review. The two day session was intense, but very productive.

By November, the C.C.P. draft was polished enough to be put out for internal review, prior to submitting the draft for public review. In December the refuge staff submitted comments on the internal review to the planning staff.

The next phase will be the public review and more meetings on alternatives. The final C.C.P. product will hopefully be completed next year.

2. Management Plan

This year marked the third operating season under the interagency fire management efforts by the state, private owners, the BLM and the National Wildlife Refuges to accomplish land management objectives while saving money. The plan incorporates four management options for wildfire ranging from immediate suppression to no suppression. Approximately 50% of the refuge is contained in the modified category, which dictates suppression during the critical burning dates (break-up to July 15) but allows less suppression after that date. One of the 4 actual fires on the refuge in 1986 was in this category and not actively suppressed, just watched.

The remaining three fires were in full protection zones and were suppressed. These three fires totaled 17.2 acres; mostly around native allotment areas.

A total of 18.2 acres were burned on the Yukon Delta NWR with an overall suppression cost of $33,280.00. By overall consensus, the Interagency Fire Management Plan was successful this year. This year was one of the easiest fire years in the last few with only 4 fires being addressed. The wet conditions this spring that continued into the fall kept the fire hazard very low. A complete list of the fires on the Yukon Delta NWR for 1986 is contained in Table 2.
Table 2: Wildfires Reported on the Yukon Delta NWR in 1986

<table>
<thead>
<tr>
<th>Fire Number</th>
<th>Acreage</th>
<th>Action taken</th>
<th>No. Personnel</th>
<th>Protection Category</th>
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<tbody>
<tr>
<td>A-066</td>
<td>0.1</td>
<td>H. suppression</td>
<td>5</td>
<td>Full</td>
</tr>
<tr>
<td>A-120</td>
<td>1.0</td>
<td>S. suppression</td>
<td>2</td>
<td>Modified</td>
</tr>
<tr>
<td>A-153</td>
<td>0.1</td>
<td>S. suppression</td>
<td>5</td>
<td>Full</td>
</tr>
<tr>
<td>A-161</td>
<td>17.0</td>
<td>S-&amp; retardant</td>
<td>6</td>
<td>Full</td>
</tr>
</tbody>
</table>

*Action taken - H.- Helitak
S.- Smoke jumpers

3. Public Participation

The Y-K Delta Goose Management Plan was renewed on March 12, 1986 at the mid-winter AVCP convention held in Kasigluk, Alaska. The basic concept of the plan remains the same. But the format has changed for easier reading and understanding.

During the spring, because of the low count of emperors (42,000), the AVCP Waterfowl Conservation Committee requested the Y-K Delta people to voluntarily refrain from taking emperors. The Alaska Department of Fish and Game during their annual Game Board meeting in March 1986 closed the sporthunting of emperor geese. Plans are underway for the closure of emperors to spring subsistence take of emperors.

The I & E Task Force traveled to 17 villages to inform them of the new and revised goose management plan. The booklet "Goose Guide" was changed to "A Pocket Guide to the Yukon-Kuskokwim Goose Management Plan" (attached in back).

Only one Incident Report was reported in the taking of cackling Canada geese in the Y-K Delta villages during the month of September 1986. Representatives from the U.S. F. W. S., Alaska Department of Fish and Game, Association of Village Council Presidents, Inc., and the AVCP Waterfowl Conservation Committee met with residents of this village and spoke to them of the goose management plan and the action was to inform all hunters in the village not to take any cackling Canada geese.

5. Research and Investigations

A. Arctic Nesting Goose Studies: During the spring of 1984 Wildlife Biologist Ron Garrett developed an Arctic Nesting Goose Population management Study. The program was initially instituted with Oregon State University under a Cooperative
Agreement, Research Work Order Number 4. Subsequently, FWS Research was given the lead and the following studies were proposed in lieu of the population monitoring effort that had been in place since 1982. The following studies were instituted in 1985 with one exception, project number 10, Foraging Ecology and Habitat Use by Emperor Geese which completed the last of a five year effort in 1986.

(1) Title:
Factors affecting the distribution and nutritional quality of vascular plants in the coastal zone of the Yukon Delta.

Problems being addressed:
1. Identification of important goose breeding and brood rearing habitat on the Yukon Delta.

Objective:
1. Determine the factors affecting the distribution and nutritional quality of plants used as food by geese on the Yukon Delta.

Justification and Background:
Populations of Pacific Flyway white-fronted geese, Pacific black brant, cackling Canada geese and emperor geese have suffered significant declines over the past 20 years. Although sport and subsistence hunting have been implicated in their decline, other factors such as predation and changes in the habitat quality should also be considered. Recent studies have identified the most important forage plants used by young cackling geese on the Yukon Delta. An unpublished report by Dr. Dennis Raveling suggests that the timing of nesting effects annual productivity. The proposed study consists of an assessment of the edaphic factors related to the nutrients and plant nutrients.

(2) Title: Arctic Geese during Brood-rearing on the Central Yukon-Kuskokwim Delta: Analysis of Patterns of Distribution.

Objectives:
1. To delineate the current distribution of brant and cackling Canada, emperor, and white-fronted geese during brood-rearing along the coastal strip of the central Yukon-Kuskokwim Delta.
2. To identify specific brood-rearing areas used by brant from the major nesting colonies at Kokechik Bay, Tutakoke River and Kigigak Island.

3. To analyze the patterns of distribution for all four species during brood-rearing in relation to (a) habitats used and available, (b) nesting distribution, (c) densities of predators and (d) proximity to areas of human use.

4. To determine whether patterns of habitat use and distribution change or remain constant during brood-rearing.

5. To develop a survey method to provide an index of the number and size of broods present in the coastal zone for interannual comparisons.

6. To determine if seasonal mortality of young can be measured from aerial surveys and, if so, to test if survival rates differ among different-sized brood flocks.

7. To determine a method to predict what areas within this coastal zone will be important for brood-rearing once the populations have recovered.

Justification and Background:

For all four species of geese nesting in the coastal zone of the central Yukon-Kuskokwim Delta, almost nothing is known about their distribution during brood-rearing, how mobile the birds are, the habitats that are most important, or the factors influencing survival. Only one study, that on the foraging ecology of cackling geese during brood-rearing had addressed any of these questions. Even for it, however, we do not know how representative the findings are because the general distribution and habitat use by cacklers during brood-rearing have never been studied. Summer harvest has been implicated as an important factor contributing to the decline of these coastal populations. It is imperative that we determine to what extent broods may be precluded from feeding in preferred habitats or in what areas they may be particularly susceptible to human disturbance. We will then be able to make management decisions to aid the populations' recovery and then protect critical areas to prevent future declines.

This study of geese during brood-rearing will be set up in several phases so that we can understand not only the broad distributional patterns but also the specific reasons geese use the areas they do. This study will also attempt to develop criteria that can be used to predict which habitats will be important once populations have recovered to former levels. Parts of this study will look at all four species of geese simultaneously but other parts will have to be set up separately
for each species because of differences in their patterns of dispersion, behavior, habitat use and geographic range.

The initial part of this study will focus on determining the seasonal distribution of brant, cacklers and emperor geese during brood-rearing in the "vegetated intertidal" zone between Kokechik Bay and north Nelson Island, an area of historic high productivity. Observations on white-fronted geese using this area will also be recorded, but, because this species is much more widely dispersed within this zone and farther inland, distributional patterns may not be totally identified. Distributional data for all species during brood-rearing will be analyzed in conjunction with other data being gathered this summer by Wildlife Assistance on breeding distribution and from the recently completed study by Special Studies on habitats.

A second, more specific study on brant was started in 1985. Brood-rearing areas used by birds from the three largest colonies will be determined by following color-marked adults. Additional studies will be conducted to examine habitat use, the nutritional value of vegetation, and patterns of movement of broods at specific sites (see proposal on foraging ecology).

(3) Title: Observations of Avian and Mammalian Predation on a Brant Colony at Kokechik Bay.

Objectives:

1. Describe and quantify the anti-predator behavior of brant and determine how behavioral responses vary according to predator distance and nesting chronology of brant.

2. Determine comparative predation rate in high and low density brant nesting areas.

3. Determine whether predator numbers and foraging intensity is greatest during laying, early incubation, late incubation, or hatch.

4. Describe and quantify fox and glaucous gull foraging behavior.

Justification: Brant have experienced particularly severe declines in recent years. Information indicates that predation by birds and fox may have contributed greatly to this decline. In 1984 fox were abundant and commonly observed near a brant nesting area. Except in years of high fox density, glaucous gulls and parasitic jaegers are probably the most important non-human waterfowl predators in western Alaska.

Few researchers have systematically observed and described predation on goose eggs and young. Consequently, the comparative importance of different mammalian and avian predators, the diel
and seasonal timing and extent of predation on goose eggs, the foraging behavior of fox, glaucous gull, and parasitic jaeger, and anti-predator behavior of geese are poorly understood on the Yukon-Kuskokwim Delta.

(4) Title: Movements, Habitat Use and Mortality Rates of Cackling Canada and White-fronted Goose Broods: a Radio Telemetry Study.

Objectives:

1. Determine the feasibility of using radio transmitters attached to nesting female geese to regularly locate and observe individual broods.

2. Determine distances moved by broods from nesting areas.

3. Examine rates and routes of dispersal of goose broods from nesting areas.

4. Estimate the sizes of areas used by broods.

5. Describe habitat in brood-rearing areas and habitat features related to the use of particular areas. Also examine the dynamics (temporal/ontogenic) of use of particular areas.

6. Determine whether broods have affinities for discrete geographic areas (i.e. are there definable brood-rearing areas for both species).

7. Determine food habits of adults and goslings during brood-rearing to better assess importance of particular areas.

8. Based on distances moved and habitat used define other potential brood-rearing areas from color IR photos.

9. Estimate "true" gosling mortality rates from repeated observation of individually identifiable broods.

10. Determine the location of post-fledging use areas on the Yukon-Kuskokwim Delta.

11. Determine the fidelity of individual white-fronted geese to particular nesting and brood-rearing areas.

Justification: Y-K Delta geese have declines precipitously since the 1960's. The FWS is presently charged with understanding and halting factors contributing to the decline, defining and protecting areas of importance to the geese and developing methods that will improve management in the future. Presently, brood-rearing areas are poorly defined on the Y-K Delta.
Preferred brood-rearing habitat has been only poorly described for any species on the Y-K Delta. We also do not know the relationship between nesting and brood-rearing areas. Radio telemetry potentially allows estimation of distance moved, habitat used and size of area utilized. Knowledge of these factors will allow us to predict which areas that are not now used might be utilized when nesting densities recover to previous levels.

A further goal of the FWS is description and understanding of population processes. Mortality during brood-rearing may be a significant factor in the dynamics of goose populations, yet estimates of gosling mortality rely solely on counts of brood sizes throughout brood-rearing. This method does not account for either interchange of goslings among broods or complete loss of broods. Failure to account for complete loss of broods may cause large underestimates of brood mortality both because of the undetected loss and because disproportionate loss of small broods (1 or 2 goslings) could actually cause the average brood size estimated from remaining broods to increase. Resighting marked geese or those carrying of goslings from known broods can be determined through repeated observations.

(5) Title: Use of Radio Telemetry to Determine Movements, Habitat Use and Mortality Rates of Cackling Canada Goose Broods on the Yukon-Kuskokwim Delta, Alaska.

Objectives:

1. Evaluate techniques for trapping and attaching radios to nesting cackling Canada geese, and use of radio-telemetry to follow brood movements.

2. Document chronology and magnitude of movements of goose families from nesting to brood-rearing areas.

3. Determine potential affinities between nesting and brood-rearing areas. Compare movements of families nesting in different habitats.

4. Measure home ranges of individual families through fledging.

5. Determine gosling survivorship.

Justification: The cackling Canada goose (Branta canadensis minima) population has declined precipitously in the last 20 years. To assist recovery of the population, nesting and brood-rearing habitat must be identified and protected. Adult and gosling behavior and foraging ecology have been well studied in a localized area. However, the relationship of nesting to brood-rearing areas and family mobility during brood-rearing are not well understood.
Mortality during brood-rearing may significantly reduce annual productivity of cackling Canada geese, but accurate estimates of gosling mortality prior to fledging are difficult to obtain. Loss of entire broods cannot be detected except by following known broods. Radio-telemetry permits tracking specific families and can provide information on distances traveled, home ranges, and gosling mortality.

(6) Title: Annual production and population size of Cackling Canada, Emperor, White-fronted Geese and Pacific Black Brant on the Yukon-Kuskokwim Delta.

Objectives:

1. To evaluate the influence of nesting density, breakup chronology, weather conditions, and population size of predator and alternate prey species on the annual production of young by geese.

2. To estimate the magnitude of detrimental influence on nesting success caused by visitation to nests by biologists.

3. To design an efficient sampling method to provide an annual index to the production of young.

4. To provide ground calibration data for an aerial survey designed to estimate the total breeding population sizes and distribution of geese on the coastal fringe of the YDNWR.

Justification and Background:

Annual estimates of the production of young by geese on the Yukon-Kuskokwim Delta are useful in setting hunting regulations by the Pacific Flyway Council. Of immediate concern is the identification of a means to return these populations to their former abundance and then to manage them to produce sustainable yields for both subsistence and sport hunters. Identification of factors limiting production may lead to management actions that would speed recovery in these species.

In recent years field projects have been conducted by YDNWR to provide goose production estimates. Data have been collected for 1-2 years on intensively studied plots at 6 permanent field camps located in areas of high goose nesting density (Garrett and Wege 1983). Data are also available for 3 years on approximately 40 plots of 150-250 acres located in areas typical of cackling Canada goose habitat (Garrett and Wege 1984). Analysis has included summary tabulations, between year comparisons of nest density, percentage of nests that hatch, information on clutch size, and timing of nest initiation. Because the sampling procedures used were not intended to provide other than between year comparisons, valid estimates cannot be made of total
breeding population size, variation between geographic areas, relationship of nesting density to habitat characteristics, visitor-induced bias, or optimization of sampling effort. Although the intensity of nesting success data collected for between year comparisons will be reduced, additional data and the ability to address other objectives should be useful for refuge and flyway management concerns.

(7) Title: Foraging Ecology and Habitat Use by Pacific Black Brant During Brood-rearing.

Objectives:

1. Describe the location of areas used by brant from the Tutakoke River colony during brood-rearing.

2. Characterize habitats used by brant for brood-rearing (i.e. physical attributes, vegetation structure, plant species composition).

3. Evaluate nutritional causes of observed habitat use.

4. Evaluate the role of human disturbance in determining habitat use.

Justification: Pacific Black Brant colonies on the Yukon-Kuskokwim Delta have declined during the last 20 years with particularly dramatic reductions since 1980 (Garrett et al. 1983, Garrett and Wege 1984). It is believed that brant use habitats along river corridors or the coastal mudflat-vegetation interface for foraging during brood-rearing. However, few observations have been made of brant in undisturbed circumstances where unbiased assessments of habitat use can be made. For this reason, the habitats used by brant for brood-rearing because of the large creches they form and the accessibility of their brood-rearing habitats. Hunting of brant (and other disturbance) may impact the population by precluding the use of habitats in which goslings achieve optimal growth in addition to direct mortality due to hunting. At present, we cannot assess the nutritional importance of particular habitats, nor do we know how much displacement from preferred habitats occurs because of human disturbance.

(8) Title: Breeding Biology of Pacific Black Brant: Estimation of Nesting Density and Success and Determination of Factors Influencing these Parameters.

Objectives:
1. Estimate the number of pairs of geese (primarily brant) nesting in the Tutakoke-Lower Kashunuk River (hereafter called Tutakoke) brant colony and map the location of these nests.

2. Determine the importance of factors responsible for annual variation in nesting density and success, including weather, timing of nestling, predation, total colony size and local nesting density.

3. Develop simple indices for predicting the number of fledging young (i.e. from factors measured in objective 2).

4. Develop photographic aerial survey techniques for censusing numbers of brant nesting in major colonies on the Yukon-Kuskokwim Delta.

Justification: The Y-K Delta historically contained most of the nesting pairs of Pacific black brant (Branta bernicla nigricans). Brant census plots sampled between 1966 and 1984 indicated a reduction in numbers of brant nesting in the Tutakoke colony. The declining trend in brant nesting in this colony has accelerated with a reduction in numbers of nesting pairs from 14,000 in 1981 to about 2,000 in 1984 (Garrett and Wege 1984). While reliable estimates of total numbers of nesting brant on the Y-K Delta are not available, it's believed declines elsewhere on the Y-K Delta are similar to those in the Tutakoke colony. The dramatic declines in brant nesting on the Y-K Delta have occurred despite nearly stable winter population counts in Mexico during the last 20 years (Bartonek 1984). Lack of catastrophic declines in winter counts have tended to reduce concern for the population even though the segment of the population under the jurisdiction of the U.S. Fish and Wildlife Service has declined precipitously.

Presently, we have a poor understanding of factors influencing brant nesting success. Declines in brant numbers have paralleled those in other goose species nesting on the Y-K Delta and have occurred at a time when Yupik people have rapidly increased both their population and technological hunting ability (Raveling 1984).

(9) Title: Demography and Population Biology of Pacific Black Brant.

Objectives:

1. Estimate basic population parameters (age-specific annual survival rate, age-specific annual fecundity, recruitment rate).
2. Examine factors responsible for variation in population parameters (e.g. predation, weather, size of cohort, nesting density, hunting pressure, social status, location in colony, individual fitness).

3. Develop functions that predict fall flight based on easily measured indices (e.g. previous fall age ratios, spring and summer weather, predator density, number of nesting pairs).

4. Develop population models that can be used to examine management decisions and predict population dynamics.

**Justification:** Pacific Black Brant nesting on the Yukon-Kuskokwim Delta have undergone precipitous declines since 1980 (Garrett et al. 1983 and Garrett and Wege 1984). Subsistence harvest by Yupik people has been implicated as a major cause of the decline (Raveling 1984) because the Y-K delta segment of the population has declined faster than the entire population. Additionally, sport harvest, while poorly monitored and occurring primarily in Mexico, is believed to be small (Kramer et al. 1979) However, adequate data are not presently available to adequately address this point.

Management of the population has been hampered by a lack of knowledge about (1) harvest, (2) population size, (3) population structure and (4) population production rate. Studies are beginning that address the first two points. Proper management of the population, however, requires adequate prediction of production so harvest can be adjusted to sustainable levels and so the consequences of particular management actions can be assessed. Furthermore, knowledge of the basic demographic parameters (and factors affecting them) is nearly completely lacking for geese. Knowledge of demographic parameters, besides being necessary for the construction of population models, would represent a major advance in our understanding of the structure of goose populations.

(10) **Title:** Foraging Ecology and Habitat Use by Emperor Geese.

**Objectives:**

1. Locate and describe areas used by emperor geese in spring and during brood-rearing.

2. Characterize habitats used by emperor geese.

3. Determine food selection, and evaluate nutritional benefits of observed diet of emperor geese.
4. Evaluate the role of disturbance by predators and humans in determining habitat use and behavior.

5. Assist in collection of aerial survey information by ground-truthing and documenting disturbance by survey aircraft.

**Study Area:** Kokechik Bay is a shallow estuary 1.6 km wide, bounded on the north by the Askink Mountains, and separated from the Bering Sea by Panowat Spit and Aniktun Island. A narrow band of low tundra lining the shore of the bay and the Kokechik River mouth, provides important goose brood-rearing habitat (Eisenhouer and Kirkpatrick 1977). The area has the highest known nesting population of emperor geese (Petersen 1982), and contains the habitat types used by emperor geese in other breeding areas (Eisenhauer and Kirkpatrick 1977).

**Justification:** Previous observations suggest that incubating emperor females spend less time off nests than other species of geese (M> Petersen, pers. comm.), and consequently consume little food prior to nest-initiation. As a result, the period when geese are on the nesting grounds prior to nest-initiation may be important for females building up energy reserves.

(11) **Title:** Investigation of Arctic Fox Predation on Geese of the Yukon-Kuskokwim Delta -- Problem Definition, Fox Ecology, and Control Feasibility.

**Objectives:**

The ultimate goal of this study is to determine the feasibility of improving nesting success of brant and cackling Canada geese by localized control of arctic fox. Specific objective of the study are:

1. To determine food habits and foraging behavior of fox denning near nesting geese.

2. To define home ranges and territories of breeding and non-breeding fox foraging in nesting areas of geese.

3. To monitor fluctuations in population of fox and prey species from year to year.

4. To evaluate the efficacy of reducing fox populations for improving nesting success of geese.

5. To define parameters under which control would be considered.
Recent studies of geese nesting in select areas of the Yukon-Kuskokwim Delta indicate significant reductions in production of brant, cackling Canada geese, emperor geese, and white-fronted geese. Brant and cackling Canada geese have experienced particularly severe declines in areas under study (Garrett and Wege 1984). Reasons for this rapid decline in information on the nesting success are unknown. More complete information on the nesting ecology of this population is being collected, but egg gathering and subsistence hunting by natives on the Y-K Delta (Raveling 1984), and predation by birds and fox (Garrett et al. 1983 and Garrett and Wege 1984) have been identified as contributing factors. Of the aforementioned mortality factors, fox predation is considered the most manageable factor in curbing the decline of brant and cackling geese.

Although considerable information has been collected on the arctic fox in other areas of its range, little is known about its ecology on the Y-K Delta or its predation on brant and cackling geese in general. Without this information efforts to control fox predation would be ineffective or, at best, inefficient. Critical to developing an effective control strategy are (1) problem definition -- determining the importance of geese in the diet of fox, (2) control parameters -- determining the spatial and temporal characteristics of a successful control effort, (3) risk assessment -- identifying conditions under which control is warranted and applicable, and (4) control methodology -- developing an efficient method of removing offending fox with minimal effect on nontarget animals. The objectives of the proposed 5-year study would produce much of this information and provide a solid basis for managing fox in critical habitat of nesting geese.

B. Subsistence Waterfowl Survey - a research and development effort.

Under guidelines established within our Research Work Order with Oregon State University, Dr. John Copp had developed a rigorous sampling program which is designed to determine the level of waterfowl harvest on the delta.

The new hunter survey methodology implemented in the spring of 1985 was continued in 1986. This effort is the most ambitious and technically complex survey effort attempted thus far on the Delta; it is based upon a multi-staged stratified random sampling design. In order to generate statistically reliable estimates of total take of waterfowl and their eggs, the survey encompasses the entire refuge and extends throughout the entire time waterfowl are on the Delta. Accordingly, the Delta was divided into six strata (north coast, mid-coast, south coast, Kuskokwim...
River, Yukon River, and Bethel) and the survey period was divided into five seasons (spring, early summer, mid-summer, late summer, and fall). Although the primary interest in the survey is assessing hunting and egging activities directed toward four declining goose species (cacklers, whitefronts, emperors, and brant), data are being collected on forty additional kinds of waterbirds, including ducks, swans, cranes, loons, gulls, and others. This is to ensure a more balanced and comprehensive investigation, since much remains unknown about basic waterfowl harvest on the Delta. Currently, data are being gathered from 16 villages and from the city of Bethel. (See H.8 Hunting for Birds Harvested).

C. A management study; proposal entitled "Populations, Movements and Potential Range of Caribou in the Kilbuck Mountains" was prepared and submitted to the Regional Office during the year. The study has been approved pending funding and should commence in 1987. During the interim, a less intensive caribou inventory is being conducted (see G. 8, Game Mammals).

D. A coastal survey of the entire refuge coastline was conducted in 1985 and 1986 to determine what groups/species of birds utilize the littoral habitat, where do they congregate, in what numbers and at what times. The survey provided important baseline data on bird use of the refuge coast. Three areas were found to be important concentration areas for birds: the area between the middle and north mouths of the Yukon River, Angyoyaravak Bay and Tern Mountain.

Peak bird use occurs in late August. Many birds using the coastal zone for feeding, to build energy reserves necessary for fall migrations. Shorebirds are virtually absent from the littoral habitats until after breeding (mid-July), while gulls are common throughout the summer and dispersed along the entire 660 mile coastline. In contrast to gulls, dabbling ducks (particularly pintails) concentrate along the middle and north mouths of the Yukon River. They are absent from this area in mid-July due to molt.

Future surveys hope to include some on the ground verification of species, especially in the prime concentration areas.
E. ADMINISTRATION

1. Personnel

Again, as during most years at Yukon Delta National Wildlife Refuge, we had a lot of turnover of staff....

Ronald L Garrett, Wildlife Biologist, transferred to the Regional Office in Anchorage to work with the Habitat Evaluation program on 12-86.

Kurt Becker, Wildlife Biologist/Pilot transferred to an identical position at Kodiak NWR on 9-86.

John Clark, Wildlife Biologist, transferred to Kern NWR on 6-86.

Norma Shaw, Budget Assistant, resigned 8-86.

Timothy Miller, Bio Tech, resigned 7-86.

Janice Larson, clerk typist, resigned 9-86.

Dawn Comish was hired as a Clerk Typist on 5-86, after serving as a volunteer.

Mildred Prince was hired as a Budget Assistant on 8-86 after transferring from BIA.

Palmer Olrun, Laborer, transferred to the Ak. National Guard on 6-86.

Richard Davis, Maintenance man, Mekoryuk, resigned on 9-86.

Phillip Paniyak was hired 5-86 and terminated on 8-86 after serving as a biological technician.

Brian McCaffery was hired 10-86 as a biological technician.

Elena Clyde was hired 11-86 as a clerk typist.

Two Refuge Information Technicians resigned: Josephine Roczicka and James Charles. Two RIT's were hired: Clifford Kassel and Stella Nash.

2. Youth Programs

The refuge employed two people under the YCC program in 1986--both from Bethel. Brenda Petersen and Wayne Chandler worked on repairing banding nets, general cleanup, office work and helped the maintenance men on various projects.
4. Volunteer Program

Dawn Comish volunteered prior to being hired on permanently. She constructed 200 miniature geese for I & E efforts (See Photo) and helped in office work. Brian McCaffery worked on Curlew studies during the early summer.

Dawn Comish, while working as a volunteer constructed these miniature geese to be used in interpretive programs explaining how geese are counted, surveyed etc. (see H. 7)
A close up of a miniature emperor

### Table 3

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The base O & M budget actually increased from FY86 to FY87, although it still doesn't meet fixed expenses and we have to rely on ARMM, RPRP, and congressional add-ons. There were no new monies in FY86 for construction. Construction finally got underway for 9 new residences, bunkhouse, and office-shop building. There were 5.4 Million dollars available for these projects from FY 84&85 monies.
6. **Safety**

Considering the size and remoteness of the refuge and the harsh climatic conditions in which field work is conducted, 1986 was a safe year on the YDNWR. No major injuries or accidents occurred, and only two lost time accidents occurred.

On 9-04-86 Rex Mathlaw, maintenance man, injured his back while working on a garage door. He was off work 14 days while his back healed.

On 9-18-86 Rex Mathlaw lacerated his hand on the table saw. After stitches Rex was off for an additional 12 days.

A major aircraft accident was averted on June 17 when the engine on the Cessna 185 died while WB/Pilot Becker and three others were conducting a low level caribou inventory in the Kilbuck Mountains. Fortunately, Becker was able to restart the engine using the emergency fuel boost pump but not before the plane had glided to within 50 feet of the ground. Becker elected to make a precautionary landing on Icebox Lake and determined the cause of the engine stoppage to be failure of the engine driven fuel pump. Two OAS mechanics were flown out to the scene where field repairs were made. Even after the pump was replaced, the plane continued to give the refuge problems. Fuel contamination was suspected and analysis of a fuel sample confirmed this suspicion. The plane's entire fuel system was subsequently purged and cleansed, and an extra Aquacon filter was installed on the pump at Hangar Lake as a precautionary measure.

During first aid training, RIT Clifford Kassel applies a bandage to Chuck Hunt's head.
8. **Other Items**

During 1986 the following Special Use Permits were issued on the Yukon Delta NWR:

- Guiding (Hunting) 3 (2 Nunivak)
- Transporters 7 (Nunivak)
- Military 1
- K-300 Dog Sled Race 1
- BIA 1
- Gravel Removal 2
- BLM 1
- Reindeer Grazing 1
- Research 2
- Floatplane Tiedown 5

We had no serious problems with adherence to conditions other than with BIA, unfortunately. They left piles of trash and areas covered with flagstone rocks on the tundra on Nunivak Island. A letter was written to them to tell them to clean it up prior to spring breakup with the ultimatum that if it isn't done properly that no further permits will be issued to them for their archeological reconnaissance work.
F. HABITAT MANAGEMENT

1. General

The Yukon Delta NWR encompasses approximately 26.3 million acres. Six major habitat types, moist tundra, wet tundra, alpine tundra, closed spruce-hardwood forest, riparian woodland, and shrub thickets have been identified on the delta. All habitats remain essentially untouched by man. No habitat management as practiced in the lower 48 states occurs. Management activities involve monitoring wildlife populations, regulating activities, and generally developing guidelines that adequately protect the landscape from the increasing demands for mining, construction, sand and gravel operations, reindeer grazing proposals, and oil and gas exploration and development.

2. Wetlands

Most of the refuge consists of the broad, flat delta formed by the Yukon and Kuskokwim Rivers. The delta is covered with thousands of lakes interspersed throughout the tundra habitat types. Many of these habitats are wetlands. Some of the most critical wetland habitat on the refuge is the coastal region along the Bering Sea. This area is the most productive waterfowl nesting habitat on the refuge. It contains much of the most important goose nesting habitat in Alaska.

Inventories of wetland and other habitats in coastal zone goose nesting areas near Hazen Bay were completed in 1985 and the final report has recently been delivered to the refuge. An excellent job of field work and documentation was done and the information will be useful in future management decisions regarding arctic nesting geese.

3. Forests

There is very little forested land on the Yukon Delta NWR. Narrow bands of riparian woodland, black spruce-hardwood, mixed black spruce-balsam and blåsm, popular and blåsm popular habitats extend onto the delta along the Yukon and Kuskokwim Rivers. Riparian woodlands also extend out onto the delta along the Tuluksak, Kisarlik, Kwethluk, and Eek Rivers which drain into the Kuskokwim River from the Kilbuck Mountains. These forest habitats also occur along rivers and streams in the Andreafsky Wilderness and in the Kilbuck Mountains east of Bethel.
A forested area of the Refuge near the Kisaralik River, east of Bethel.

6. Other Habitats

The refuge is primarily composed of wet tundra, moist tundra and boreal forest ecosystems but also has large areas of alpine tundra and intertidal mudflats. The mudflats are extremely important habitat for many shorebirds, water birds and waterfowl. Coastal cliffs also provide important nesting habitat for seabirds on Nunivak Island, Nelson Island and Cape Romanzof.

7. Grazing

Currently the only grazing by reindeer on the Yukon Delta is on Nunivak Island. The herd fluctuates with periodic heavy harvest but averages 2,000-2,500 animals. The refuge does not charge grazing fees.

The Soil Conservation Service completed a refuge funded range survey of Nunivak Island. A four person crew surveyed during the summers of 1984 and 1985. During 1986 the final report was printed and the Refuge is currently dealing with SCS, the Alaska Dept. of Fish and Game and the Bering Sea Reindeer Products to develop a management system for the Nunivak reindeer that will allow rehabilitation of the range which is now in very poor shape.
F.9 Fire Management

A total of 4 fire occurred on the Yukon Delta NWR in 1986 all of which were caused by lighting. Of these, one was in modified and three in full suppression category. A total of 18.2 acres were burned and no resource values were deemed to have been lost or diminished due to fire. Last year there were a total of 32 fires and 1944 acres were burned.

11. Water Rights

Instream Flow Study Priority Input Forms were completed to identify 46 characteristics of 61 major refuge rivers. This project was requested by the Division of Habitat Resources in order to prioritize refuge rivers for the purpose of reserving Federal water rights.

12. Wilderness and Special Areas

Two wilderness areas currently exist on the refuge, the Andreafsky and Nunivak Wildernesses. The Andreafsky Wilderness is quite remote and receives little public use. A major reason for the low public use is limited aircraft access, due to a lack of adequate ridge tops and suitable sand bars in the two forks of the Andreafsky River.

Interest in the area continues to increase, however. In 1986, a handout on the Andreafsky River was written to help in responding to written requests for information. Their are presently no commercial fishing guides operating in the area.

The use of motorized equipment other than boats, aircraft, and snowmachines in Alaska wilderness areas became an issue this year after a court ruling resulting from an incident that occurred at Togiak Refuge. For several months, it was thought that the use of chain saws and other such motorized equipment could no longer be used in Wilderness areas, even for subsistence uses. This ruling was especially significant to the people of Nunivak Island, who have used chain saws for years within the Nunivak Wilderness.

Letters were written to the Alaska congressional delegation by residents of Mekoryuk. The result was that a policy decision was made at the Regional level which once again allowed chain saw use in Alaska Wilderness for subsistence purposes.

Additional refuge wilderness was proposed as part of the Comprehensive Conservation Plan. Lands were proposed for wilderness designation if they are adjacent to existing wilderness boundaries and logically belong in the wilderness area but have not been designated as wilderness. Lands were also proposed if they have outstanding resource values that were overlooked by Congress in the ANILCA wilderness designation.
Under the Service's preferred CCP management alternative, approximately 1.9 million acres on the coastal plain of the Yukon-Kuskokwim Delta would be added to the National Wilderness Preservation System. This area of the refuge is considered the best goose-brant nesting area in North America. Most of the geese of concern nest within this area.

Two additional wilderness areas are being proposed in the CCP, and will appear in the management alternatives. The Andreafsky Addition (900,000 acres) includes the area south and east of the present Andreafsky Wilderness, and the Kilbuck Mountains Unit (1.9 million acres) includes the extreme southeast portion of the refuge.

Under the terms of ANILCA, the Andreafsky River from its source, including all headwaters, and the East Fork within the boundary of the Yukon Delta Refuge was designated as a Wild River. No other rivers on the refuge have been so designated, although the Kisaralik was studied by the National Park Service. Their report was issued in September, 1984. Although the Kisaralik was deemed eligible for inclusion in the National Wild and Scenic River system, the river was found to be unsuitable for inclusion because the State of Alaska, as well as local residents, did not support such a designation.

The land within the former boundaries of the old Clarence Rhode Refuge is in National Natural Landmark Status. This is the only "Special Area" presently designated within the Yukon Delta NWR.

G. WILDLIFE

1. Wildlife Diversity

Migratory birds that utilize the Yukon-Kuskokwim Delta as a nesting place or molting area or even as a spring or fall staging area migrate through all flyways of North America. Of the 68 species of shorebirds known in Alaska, 52 occur in this region. Some 15 of these are Asiatic in origin and "straggle" to Alaska in small numbers swell into the millions over littoral and supralittoral habitats of western Alaska.

Shorebirds utilize the delta for breeding and foraging; additionally, large numbers of seabirds and other water birds including gulls, jaegers, cranes, and waterfowl use the delta.

In past years the refuge has hosted over half of the continental population of Pacific black brant, ranging between 50 and 75%. Today, however, fewer than 20,000 brant, nest on the refuge. Additionally, at one time the number of cackling Canada geese numbered in the hundreds of thousands. Today there are approximately 58,000. Similar reductions in abundance are observed for Pacific white-fronted geese and emperor geese.
Yukon-Kuskokwim geese are in deep trouble as viable wildlife populations. Without a doubt these avian forms have been a significant factor in the shaping of the coastal ecosystem.

Despite the sharp reduction in geese the refuge still supports large numbers of ducks. Approximately 1.3 million ducks utilize the delta for nesting. The principle species are pintail, greater scaup and oldsquaw. Common and spectacled eider populations seem down from previous years although they are regularly observed. Mallards, wigeon, green-winged teal, shoveler and common scoters also are an important part of the delta's duck population.

Large mammals are not abundant on the refuge. Muskox are found on Nunivak and Nelson Islands. Caribou exist in the Nulato Hills and the Kilbuck Mountains in very small numbers. The population of caribou in the Kilbuck area seems to be of caribou was closed for the area in 1985 and 1986. Moose, grizzly bear, black bear, wolves, wolverine, marten, beaver and many small mammals occur on the refuge. One curious observation over the past few years has been the range extension of beaver. Ten years ago, beaver were not known to the coastal areas; today their numbers have increased substantially and are found in the coastal area well beyond the tree zone. Fox populations appear to be on the upswing and a few incidences of rabies have been reported.

The delta sustains a large fishery resource. Five species of salmon (chinook, chum, pink, sockeye and coho) migrate through the refuge and also utilize many refuge streams for spawning. Other common species are smelt, northern pike, blackfish, stickleback, sheefish, burbot, five species of whitefish, rainbow trout, Arctic char and grayling. The Nunivak Island waters include many marine species such as halibut, truecod and herring.

2. Endangered and/or Threatened Species

Four listed species occur or could occur on the refuge. The Arctic peregrine falcon occurs on the refuge and is listed as threatened. The American peregrine falcon is endangered and also occurs on the refuge. Both subspecies are primary targets of a raptor inventory designed to locate and identify cliff nesting sites and stick nests on the Kisaralik and Andreafsky drainages. The study began in 1985 but only one peregrine nest was located. The Eskimo curlew and the short-tailed albatross may once have occurred on the refuge, but it is unlikely they still remain.

3. Waterfowl

The refuge is responsible for inventorying and monitoring perhaps the largest waterfowl production area in the system. The Y-K delta is the exclusive nesting area for cackling Canada geese, and a primary nesting area for emperor geese, Pacific black brant, and Pacific Flyway greater white-fronted geese. While the
populations of two other Canada goose subspecies (lesser and Taverner's) are healthy, the above four species have declined drastically in number during the past 15 years. Cackling geese have declined 93%, whitefronts 50%, and emperor geese 44%. Based on total population figures, brant have declined 23% flyway-wide; however, on the delta we have witnessed minimally an 85% decline in number nesting between 1981 and 1985. The factors responsible for these declines are many, complex and not completely understood; but certainly include such things as sport and subsistence hunting, predation, loss and degradation of winter, and disease. While the refuge participated in monitoring goose nesting and production, this is the second year in which FWS Research and Wildlife Assistance Divisions conducted most goose surveys, inventories, and management studies. The following statements were abstracted from a variety of research reports.

Breeding Bird Surveys: This was the second field season of a 3-4 year study by the Wildlife Assistance Division to develop an aerial breeding pair index for geese and swans utilizing the coastal zone of the refuge. While the number of indicated pairs of cacklers increased 9.7%, those for emperors, whitefronts and tundra swans decreased 20.5%, 17.1% and 2.6%, respectively. The change for cacklers is consistent with the population increase documented on the California wintering grounds. The decrease for emperors also parallels the 28% drop in the spring population index which was determined prior to birds arriving on the breeding grounds. The declines for whitefronts and swans are less readily supported and await the accumulation of additional information.

The colonial aspect of brant nesting prevents determining an index for this species with the procedures employed in the current aerial survey. Despite this lack of a wide-ranging aerial survey, observation of personnel at various field locations indicated that the number of brant nesting at the three major colonies on the Y-K delta remained about 20,000 birds.

An Overview of 1986: Despite a cool and prolonged spring, average environmental conditions in part resulted in increased goose nesting success on the Y-K delta in 1986 over 1984 and 1985. Success averaged 47% for brant (n=1400), 66% for cacklers (n=833), 72% for emperors (n=432) and 77% for whitefronts (n=205). These levels are approximately the same as in 1981 and 1983, in contrast to poor success in 1982, 1984 and 1985. Nest success varies greatly across the delta and is positively correlated with goose density.

Although glaucous gulls, parasitic jaegers and mink contributed to nest loss, predation by arctic fox continued to be the major source of nest depredation. To determine whether nest success could be enhanced at specific locations, fox populations were reduced under an experimental study by leg-hold trapping and shooting in the vicinity of the Tutakoke River brant colony and
Kigigak Island in 1986. After the removal of 30 and seven animals, respectively, from these locations primarily during May, new animals did not continually move into these areas during nesting. Nevertheless, two foxes remained untrapped at Kigigak Island and a few foxes were observed at Tutakoke. This reduction markedly increased brant nest success at Tutakoke to 83% compared to 2% and 6% in 1984 and 1985, respectively. The effect at Kigigak Island was unclear since nest success was essentially the same as in 1983 when no reduction was made to a presumably similar fox population. In addition, nest success was equally high at some other delta locations where fox were known to be present and no reduction was attempted. Thus, despite the apparent ability to enhance nest success for colonial brant, understanding the relationship between fox populations and goose nesting success requires additional information and any attempt to initiate a delta-wide predator control program would be ill-advised at the present time.

This was the last year of the five year nesting ecology of emperors and cacklers at Kokechik Bay. Hopefully some useful management information will be forthcoming in the final report. However, it is certain that all personnel engaged in logistic support for this camp have breathed a sigh of relief over not having to again move the massive amount of gear!

Between late September and mid October a portion of the Wrangel Island lesser snow goose population utilizes the refuge as a migration staging area. An aerial photographic survey is conducted to determine the percent of young in these flocks. In 1986, ten flocks totalling 7,699 birds were located during three flights. The age status of 4,941 birds was determined from photos and indicated 31% young in this segment of the population.
In 1986 the portion of the Wrangel Island snow goose population that staged on the refuge had approximately 31% young birds.

4. Marsh and Water Birds
Sandhill cranes. Loons and grebes are widely distributed on the wetland areas of the refuge. Sandhill cranes are particularly abundant and constitute an important component of the delta ecosystem. Refuge populations of these species appear stable. Cranes congregate on the muddy shores of several large shallow lakes west of Bethel in August. The possibility of obtaining ratios of young to adult cranes on these lakes through aerial counts or photography needs to be addressed.

5. Shorebirds, Gulls, Terns and Allied Species
Shore and water birds visiting the refuge each year number in the millions. Many come to breed on the tundra, shorelines and mountain tops of the refuge. By August, shorebirds flock to coastal and riverline mudflats to build lipid reserves for long migrations, while terns have already departed south. Highest densities of shorebirds along the coast occurs at Tern Mountain and Angoyaravak Bay. Gulls are common along the entire refuge coastline from spring through autumn.

During the 1986 field season, breeding bristle-thighed curlews were found just north of Saint Mary's. This represents the third confirmed breeding site on the Yukon Delta NWR for this rare species. Densities were approximately .75 pairs/km², the highest yet recorded for bristle-thighed curlews. However, this breeding density is still far lower than the reported breeding densities
of other North American curlews. Observations of bristle-thighed curlews in 1986 indicate that they are much more catholic in their habitat use patterns than previously suspected. Curlews were found regularly in a wide range of habitats from riparian marshes to cottongrass tussock tundra to alpine lichen fields. Two bristle-thighed curlew chicks were captured on 5 July, banded with USFWS bands, and immediately released.

Cliffs on the southwest side of Nunivak Island are nesting sites for an estimated 500,000 seabirds, mainly common murres and black-legged kittiwakes. This colony is one of the largest in the Alaska Coastal Waters Oceanographic Regime. Monitoring population dynamics of this colony provides information on the health of the marine ecosystem. The current procedure for estimating population trends of these birds has been difficult to accomplish. Rough seas and bad weather make counts from boats impossible. Land based plots need to be expanded and permanently marked so the same plots can be censused in the future.

6. Raptors

Seventeen species of raptors have been recorded on the refuge, including 3 natural resource species: Golden and bald eagles and peregrine falcon.

In 1986, the refuge reviewed the historical information concerning the distribution and abundance of breeding raptors on the refuge. We now realize that our understanding of the cliff-nesting raptor density and distribution in the Kisaralik River drainage is less complete than formerly realized, and it appears that those populations have declined in the last decade. Also our understanding of riparian raptor density and distribution elsewhere on the delta is fragmentary.

The cliff-nesters of the Kisaralik and the riparian nesting species of the Kuskokwim watershed will be the foci of the 1987 raptor field work. This work will entail rafting down the Kisaralik River and observing cliff nesters and conducting aerial transects along the Kuskokwim River and some of its tributaries to find riparian nesters during the spring prior to leaf emergence.

7. Game Mammals

Muskox are probably the refuge's most important game mammal, at least in considering public use. Muskox were introduced to Nunivak Island in 1935 from Greenland. In 1967 muskox were transplanted to Nelson Island, where the herd presently numbers approximately 280 animals. Nelson Island Muskox continue to radiate onto the delta mainland, and have been reported near Kongiganak, the mud volcanos and the Askinuk Mountains. The ADF&G is attempting to promote the growth and expansion of the
mainland muskox population on the refuge and is working with local villages to obtain their support.

The annual Nunivak Island muskox census was conducted in March. Participants included refuge biologist John Clark, Maintenance man Richard Davis, Bio tech Amos and ADF&G biologist Sam Patten. A total of 487 muskox were observed, of which 43% were cows and 57% bulls. Ninety one yearlings were also counted.

Moose inhabit much of the range on the periphery of the refuge on the eastern boundary and along the Yukon and Kuskokwim rivers. Healthy moose populations adjacent to the refuge provide a continuous reservoir of animals that move onto the refuge. We perceive poaching as the limiting factor for herd expansion on the refuge.

A small herd of caribou inhabit the Kilbuck Mountains approximately 70 miles east of Bethel. The fate of the herd is on the line as it only numbers a bit over 200 animals. Out of season hunting inflicts significant mortality on the herd. Plans are afoot in 1987 to put collars on 10-15 of the animal to make it easier to keep track of the animals. A small herd also lives in the Andreafsky Mountains north of the Yukon River. These animals may be reindeer or they may be remnants of the Andreafsky herd of caribou. Again, winter hunters keep the population trimmed down substantially.
Brown bears in the Andreafsky drainage are harvested only by a guide that operates in the area and by the occasional moose hunter traveling up the river systems. Some bears in the Kilbuck mountains are killed by subsistence hunters in the spring. The total harvest on the refuge is highly variable and very dependent upon snow conditions and availability of alternative meat sources. Very little is known about populations size or composition, however, examination of sealing records from ADF&G indicate a fairly old, healthy population.

Black bears are abundant along the mid Yukon areas of the refuge and in the foothills of the Andreafsky and Kilbuck mountains.

9. Marine Mammals

Marine mammals of the Bering Sea comprise an interesting subset of refuge wildlife and a vital subsistence resource for coastal villages. Walrus, spotted seals, ringed seals and bearded seals are hunted on the ice in spring and some seal hunting continues throughout summer in bays and estuaries. Other marine mammals include beluga, gray, killer and minke whales.

Polar bears rarely range as far south as the refuge, but were reported in spring of 1984 near tutakoke field camp and Hooper Bay. State and federal regulations permit the taking of polar bears by Alaska natives. The marine mammal program is handled through Ecological Services in Anchorage.

10. Other Resident Wildlife

Willow ptarmigan are present on the refuge in fairly large numbers. These populations are unique in that they migrate long distances from the delta to the Kilbuck Mountains to winter and back again in the spring. Migrations have reportedly occurred from as far away as Nunivak Island, a distance of nearly 200 miles. The migration is apparently in search of exposed winter browse.

A herd of several thousand reindeer owned by the Bureau of Indian Affairs are present on Nunivak Island. Management of the herd is currently under the direction of Bering Sea Reindeer Products. The Soil Conservation Service recently completed a range evaluation of the island and found that overall range condition was poor.

11. Fisheries Resources

All five species of Pacific salmon spawn on the refuge. Harvest of salmon from the Yukon and Kuskokwim Rivers constitutes the most important commercial activity on the delta. Chum salmon, king salmon and coho salmon are the most numerous and
economically important. Small commercial fisheries also exist for herring in Kokechik Bay and halibut in waters off Nunivak and Nelson Islands.

Fisheries resources also are the primary source of subsistence food for the people of the delta. Salmon, herring, Pacific cod, whitefish, blackfish, burbot, northern pike and halibut constitute important traditional, dietary and economic contributions to the dinner table for delta residents.

Sport fishing is not viewed as a traditional activity by most refuge residents and sport fishing pressure is very light. Salmon, rainbow trout, Dolly Varden, grayling and northern pike are taken by small numbers of sport fishermen in streams draining the Kilbuck Mountains and the Andreafsky Wilderness. Several of these rivers provide excellent wilderness fisheries for trophy-class grayling and rainbow trout.

Coho salmon are an important commercial fish on the Y-K delta.

14. Scientific Collections

Two special use permits were issued to collect white-fronted geese on the Delta. Both projects involved obtaining information on this declining arctic nester.

Ecological service of Western Alaska collected 19 greater white-fronts. These samples were part of a contaminant study on Arctic geese. Wayne Crayton was the principal investigator on the project. He arranged two field trips on the Delta to do the collecting for the study.
The research camp at old Chevak received a permit to collect up to twenty adult greater white-fronted geese. The collecting was part of a nesting study of white-fronts to determine food habits and body reserve composition prior to nesting. The main investigator on this project was Craig Ely.

15. Animal Control

This year in conjunction with the research efforts on Arctic Nesting Geese, some limited fox control was conducted at the camps of Kigigak Island, Tutakoke river and Old Chevak. Each of these areas has had significant nest losses the last couple of years.

Seven Arctic foxes were trapped or shot at Kigigak Island. At Tutakoke (a large brant colony), twenty eight Arctic foxes were removed and two Arctic foxes were removed from Old Chevak.

The Tutakoke brant colony experienced one of the best nest success years in the last few years. Over 80% of the nests had eggs that hatched as apposed to less than 2% in 1985.

16. Marking and Banding

The annual cackler banding/collaring project began on August 6, 1986 after 6 days of inclement weather at the Kanagyak field station. The banding crew consisted of Rod King (pilot), Bill Butler (Pilot), Bill Eldridge and Karen Bollinger from Migratory Bird Management and Mike Rearden (pilot), Jack Paniyak, Jimmy Slats, Phillip Paniyak, and Gene Peltola, Jr. of the Yukon Delta NWR. Due to the delay in banding from weather no molting flocks of cacklers were banded. All birds captured were from breeding flocks of adults with young. During the period from August 6 to August 11 we made 9 water drives using aircraft and 2 land drives coordinated with Migratory Bird Research--Anchorage organized by Craig Ely and personnel at the Old Chevak field camp. The willingness of all banders involved and the excellent cooperative attitude enabled us to be successful despite many days of inclement weather. Following is a summary of the age/sex distribution of birds neck collared and banded.

<table>
<thead>
<tr>
<th>Age/sex</th>
<th>Count</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASY-F</td>
<td>60</td>
<td>(87% exhibited brood patches)</td>
</tr>
<tr>
<td>ASY-M</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>SY-M</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>L-M</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>L-F</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>U-U</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>332</td>
<td>(214 young)</td>
</tr>
</tbody>
</table>

ASY=after second year  L=local flightless young  M=male  SY=second year  UU=Unknown age and sex  F=female
52% of all ASY birds were females and 49.5% of all local young were females.

H. PUBLIC USE

1. General

Considerably more than 90 percent of refuge public use involves subsistence activities (hunting, fishing, trapping, and the collection of vegetative materials). The remaining major public use activities include sport hunting and fishing, river floating, and wildlife/wildlands observation.

The refuge is generally isolated from the common tourist travel routes in Alaska. Once people arrive in Bethel, they still must travel considerable distances to get to the mountains, coast, or river systems other than the Kuskokwim. The large expense associated with travel to the more scenic areas of the refuge keeps the number of nonlocal refuge visitors small.

The major refuge public relations activity in 1986 continued to be the information and education effort associated with the four declining goose species. The Yukon-Kuskokwim Delta Goose Management Plan was renegotiated in March, with only minor changes. A pocket guide to the Goose Management Plan was printed which summarized the plan and the reasons for it. This pocket guide has been widely distributed on the Yukon-Kuskokwim Delta. A copy of the guide is inserted in the pocket on the Narrative back cover.

Considerable effort was devoted again this year to publicizing the Goose Management Plan. Meetings were held in nearly all Y-K Delta villages, either by members of the Information and Education Task Force, or by Refuge Information Technicians. Resolutions were signed in support of the Goose Management Plan in 19 villages by the end of the year. Because the Goose Management Plan is expected to continue in force in 1987, the effort to get resolutions signed in support of the plan will continue in 1987.
Meetings were held in many villages on the delta to explain the Goose Management Plan and the plight of the declining geese.

2. **Outdoor Classrooms--Students**

School programs continue to be an important part of visits to outlying villages by refuge staff. Most such programs are conducted by Refuge Information Technicians, although many other staff members have assisted in this effort. Now that an Outdoor Recreation Planner is back on the refuge staff, we have attempted to upgrade the materials available for RIT's and other staff members to use during school visits. Education of students continues to be a very important part of the refuge information and education program.

3. **Outdoor Classrooms--Teachers**

This year, excellent progress was made in educating teachers on the declining goose issue. Through the combined efforts of Janet Ady (RO), ORP Tom Comish, other staff members, and a dedicated cadre of volunteers, teacher workshops were held in Toksook Bay, Emmonak, Scammon Bay, Hooper Bay, Russian Mission, and Bethel.
Although some workshops were sparsely-attended, all who did attend reported them to be worthwhile. The refuge staff feels that school teachers are critical allies in the effort to educate students about wildlife issues on the Yukon-Kuskokwim Delta.

6. Interpretive Exhibits/Demonstrations

Construction of the new office/visitor center in Bethel began in 1986, and was largely complete by year end. In conjunction with this effort, ORP Tom Comish spent considerable time locating needed photographs for the exhibit area. The photo work will be largely complete this year, but exhibit installation and the locating of 49 mounted specimens is a task still to be faced.

Another high priority effort in 1986 has been the development of audiovisual programs which will help in refuge management. A necessary part of developing such programs was accomplished by culling, organizing, and upgrading the refuge slide file. Although this is a task which is never really finished, the refuge now has approximately 1,600 high quality master slides with several duplicates of each, which can be pulled for a variety of program and exhibit uses whenever they are needed.

The first of the audiovisual programs, a refuge orientation program, was installed at the Alaska Airlines terminal in Bethel. This program is installed in a Videodetics unit, which can play up to 62 separate videotape programs.

The second audiovisual program, discussing the Yukon-Kuskokwim Delta Goose Management Plan and the declining geese issue, was completed in early November. Both this program and the refuge orientation program are being used extensively by the Refuge Information Technicians at village meetings and school programs.

A third program, a videotape on the goose biological research, is well underway. A script was written and some footage shot this year. The script is currently being revised, but we hope to have this program completed by March, 1987.
7. Other Interpretive Programs

In May, ORP Tom Comish presented a paper entitled Working Together for Alaska's Wildlife: Interpretation and Education on the Yukon-Kuskokwim Delta to the Pacific Northwest Regional Workshop of the Association of Interpretive Naturalists in Anchorage.

ARM Mike Rearden had an article about the Goose Issue on the Delta published in the June issue of Alaska Magazine.

In July, Comish submitted a paper entitled "Interpretation's Role in Alaskan Wildlife Management" to The Interpreter. It is scheduled to be published in the Winter, 1987 issue.

In October, Tom and Dawn Comish collaborated on a pair of articles on "The Use of Goose Models to Explain Biological Sampling to Alaska Natives," which were submitted to the national newsletter of the Association of Interpretive Naturalists. These articles were a followup to the project in which Dawn Comish made 200 models of the four species of Arctic Nesting Geese for use in I & E efforts on the Delta. The model making, completed while Dawn was working in a volunteer status, resulted in a Special Achievement Award for her (See photo under section E. 4).
A final project begun in 1986 was an effort to photographically document the refuge from 10 widely-scattered vantage points. The Ingakslugwat Hills (Mud Volcanos) east of Chevak were documented in 1986, as were many of the common flowering plants of the refuge.

Arctic Poppy

The Mud Volcanoes rise above the tundra to provide unique habitat for a variety of passerines and upland game.
8. **Hunting**

The refuge is open to both sport and subsistence hunting, subject to state and federal regulations. Only limited information is available on hunter effort and harvest in the area, however. Residents of villages within and adjacent to the refuge rely on all manner of resident and migratory wildlife for food. A small number of nonlocal hunters travel to the refuge to hunt bear, musk ox, and moose. Two hunting guides on Nunivak Island assist an average of six hunters per year. Two other guides operate in the Andreafsky area and in the Kilbuck Mountains, and concentrate primarily on bear hunting. Each year, a few unguided, nonlocal hunters travel to the refuge to hunt bear, moose, and other game.

The subsistence harvest survey, which concentrates primarily on bird species taken by local residents for food, continued this year. The results of this survey will be very valuable in determining what is a "fair" harvest allocation for the Y-K Delta when the spring waterfowl season is regulated. The Executive Summary and the "Total Take" table of the 1986 Survey Report (Copp 1986) appears below.

**EXECUTIVE SUMMARY**

The Delta-wide village subsistence waterfowl harvest survey is in its second year. Data were collected for the spring, early summer, mid summer, late summer and early fall periods. More than 500 households participated in the survey during each period—541, 543, 544, 543, 542, respectively. Altogether, 23 Delta communities were approached to participate in the survey. Four (all in the south coast) refused, and one (on the Kuskokwim River) dropped out after the spring survey. Eighteen communities, including Bethel, participated through the remaining four sampling periods. This was higher than in 1985 and virtually eliminated non-response bias within the participating communities.

As a result of improved compliance with the Yukon_Kuskokwim Delta Goose Management (GMP), the overall harvest of the four threatened species of arctic-nesting geese was down by 18%. The estimated bird take for the four GMP species was 2806, 2067, 3091, and 1483 for whitefronts, cacklers, emperors, and brant, respectively. A 39% increase in cackler take, however, offset a large average decline (26%) in take of the other three species. Although bird take decline for GMP species, it increased 47% for all other species and moved upward 35% overall. Twenty-six of the 33 surveyed species (79%) showed an increase relative to 1985.

The estimated egg take for the four GMP species was 100, 48, 14, and 89 for whitefronts, cacklers, emperors, and brant, respectively. While this represents a 66% upswing for GMP species, their representation in the overall egg take is minor.
Egging for non-GMP species increased 34%. The bulk of the egging occurred during early summer, when eggs were taken from a total of 19 species. Overall, the most important egg sources were lesser Canada, mallard, greater scaup and glaucous gull, which together accounted for 50% of all eggs taken.

An analysis of the 1985-1986 duck harvest on the Yukon-Kuskokwim Delta indicates that subsistence hunters are only harvesting a very small fraction of the total breeding duck population. Pintails and mallards are by far the most important duck species. They rank one and two, respectively, in both numbers harvested and harvested biomass. Mallards are harvested more frequently than expected given their relatively low population on the Delta. Migrant king eiders appear to play a very important role in the spring nutritional budget of coastal subsistence hunters. The effect of hunting on breeding eiders cannot be determined because of conflicting population estimates. This question warrants further examination.

It appears that cooperation with the GMP coincides with a more intense hunting of other species. Some of this upswing may be more apparent than real, consequent to elimination of non-response bias within the survey villages. That which is not may reflect changes in social and economic realities. With a shortage of cash and jobs, along with a young and growing population, escalating pressure on wildfoods resources may be an unescapable fact-of-life in contemporary rural Alaska.
**ESTIMATED ANNUAL BIRD AND EGG TAKE TOTALS**
*(1986)*

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<thead>
<tr>
<th>Estimated Total Birds</th>
<th>Estimated Total Eggs</th>
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<td>White-fronted</td>
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</tr>
<tr>
<td>Lesser Canada</td>
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<tr>
<td>Cackling Canada</td>
<td>2067</td>
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<td>Lesser snow</td>
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<td>Common murre</td>
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<td>Small shorebirds</td>
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<td>193</td>
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</tr>
</tbody>
</table>

9. **Fishing**

Fish continue to be the most important commercial and subsistence resource on the refuge. The most important species are Salmon, Whitefish, and Pike. During the summer months, most major rivers are lined with fish camps, where local residents prepare fish for the winter months. Fish camp is important both nutritionally and
culturally to Native Alaskans.

Only a small number of nonlocal residents travel to the refuge for sport fishing. The primary rivers used for sport fishing are the Andreafsky, Aniak, Eek, Kisaralik, Kasigluk, and Kwethluk. To date, the refuge has not issued any special use permits to fishing guides.

In 1986, the Kenai Fisheries Assistance Office made four float trips on the Kisaralik River to obtain baseline fisheries data. The results of this effort will help the refuge staff manage future sport fishing along this popular and scenic river. Next year, additional surveys of the same type will be conducted on other refuge rivers.

A happy sportfisherman hefts a sea-fresh king salmon

10. Trapping

Furbearer trapping continues to be a major source of income for many local residents. Trappers of Beaver, Lynx, Otter, Wolf, and Wolverine have mandatory sealing requirements. The most recent data available for these species is for the 1984-1985 trapping
season. This is the only reliable trapping data available.

<table>
<thead>
<tr>
<th>Species</th>
<th>1984-85 take</th>
<th>1983-84 take</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaver</td>
<td>1508</td>
<td>981</td>
<td>+ 54</td>
</tr>
<tr>
<td>Lynx</td>
<td>23</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>Otter</td>
<td>431</td>
<td>618</td>
<td>- 30</td>
</tr>
<tr>
<td>Wolf</td>
<td>3</td>
<td>0</td>
<td>____</td>
</tr>
<tr>
<td>Wolverine</td>
<td>7</td>
<td>3</td>
<td>+233</td>
</tr>
</tbody>
</table>

In 1986, most fur prices were depressed, except for Martin and Lynx. Beaver prices showed some recovery, but are still low.

11. **Wildlife Observation**

Because of the large numbers of birds of all types which occur along the coastal portions of the refuge, some bird watchers travel to the area each year. Most bird watching activities take place on Native Corporation lands, where local communities can provide support services.

12. **Other Wildlife-Oriented Recreation**

Other recreational activities, such as backpacking, boating, camping, hiking, and river floating occur in small numbers on the refuge. Boating and camping are generally associated with subsistence hunting and fishing.

Exploring Bering Sea tide pools near Mekoryuk
14. **Picnicking**

Picnicking is an incidental use which occurs in low numbers, mostly near population centers on the refuge.

15. **Off-Road Vehicling**

Transportation on the Yukon-Kuskokwim Delta is limited to aircraft, boats, and off-road vehicles, except in the immediate vicinity of local villages. Snow machines are used heavily, both for recreational and subsistence uses. Most snow machine use is not a problem, although some residents insist on using these vehicles when there is insufficient or no snow cover. An incident was discovered in September, 1986, north of Akiachak, where residents were using snowmachines for transportation to subsistence berry picking sites when there was absolutely no snow cover. Significant tundra damage resulted. Discussions were held with local residents to inform them that this activity is damaging to refuge resources and will not be permitted.

Damage to the tundra caused by snowmachine use during the fall
Three- and four-wheeler use is common in and around villages, but is not permitted on refuge lands. The issue of refuge access is slowly becoming a concern, and has been identified as a topic of future information and education efforts.

16. Other NonWildlife-Oriented Recreation

Sled dog racing continues to grow as a popular winter activity. The most visible dog racing activity is the "Kuskokwim 300," a race which originates in Bethel, follows the Kuskokwim River to Aniak, and then goes overland to Whitefish Lake and Tuluksak before rejoining the Kuskokwim on the way back to Bethel. Most of this race occurs on Native corporation lands, although some of it occurs on refuge lands.

17. Law Enforcement

No law enforcement cases were made in 1986. The individuals responsible for the tundra damage by snowmachines north of Akaia-chak were warned by letter that this activity was illegal and that citations may result from such activity in the future.

18. Cooperating Associations

The first step involving the refuge in Cooperating Associations took place on December 11, when ORP Tom Comish made a presentation to the Board of Directors of the Alaska Natural History Association in Anchorage regarding the establishment of an ANHA outlet at the new refuge visitor center in Bethel. The refuge staff feels there is good potential for such a sales outlet due to the new building's location across from the Native Hospital. Association sales are expected to be an important part of the exhibit area when it is completed.

The reaction of the ANHA board was favorable, and we will plan to initiate cooperating association sales by approximately 10/1/87.
I. Equipment and facilities

1. New Construction

This was the year things finally happened at the Yukon Delta NWR Headquarters in Bethel. After 20+ years of working out of small cramped, hard to maintain office space, a contract was let to construct a new headquarters complex.

A bid of $2,420,932.00 was received from H2 W contractors Anchorage to contract a two-story office building of 8,500 Sq. ft. with and an attached vehicle maintenance facility of 3500 Sq. ft. The bid also included the construction of a 2,200 Sq. ft. single story bunkhouse.
Construction of this facility started in mid August with the support beams being driven into the perma-frost. The buildings were rapidly framed and by year's end were about a month from completion.

First, a sand pad was laid over the tundra...
then steel I-beams were driven deep into the permafrost...

the floor was laid, and the building framed...
and eventually we had a new headquarters.

The office building has office space for at least 25 people with a general work space that can be expanded for more office space if necessary. It also includes a wet lab, library and a visitor display area of about 900 square feet on the ground floor. Quite a change from a small crowded office and two converted trailers for offices.

This year was also the year residences took on a new meaning in Bethel. Two contracts for $1,740,257.00 total were awarded to Straub construction of Anchorage. The nine houses were designed as a two-story dwelling with, a garage on the first floor and two large storage rooms. The second floor is a three-bedroom, 1300 square foot living area, with a fireplace for emergency heat.

Construction started in late August with the driving of pilings. Framing of the houses took 4-5 days each, and with two crews working all houses were enclosed by the end of September.

By the end of the year, the houses were about 6 weeks from being completed. The trailer house and drafty house era is a thing of the past. These new super-insulated houses will make living in Bethel much more enjoyable for refuge families.
The old...

and the new.
Unfortunately, it appears that the new sod house constructed as an administrative cabin at Cagawagamiut on Nunivak Island appears to be on or as least very near a 14 (h)l site (archeological or historical site). This was an oversight by both the regional and refuge staff. It has not yet been determined how to rectify the problem but it may involve moving the entire structure.

2. Rehabilitation

No rehabilitation work was accomplished this year. The year was spent trying to keep things held together as the new office-shop and residences were constructed.

3. Major Maintenance

The YCC crew rebuilt all of the goose banding nets and replaced all of the steel poles with light weight fiberglas poles. We now have banding nets that roll to half the diameter for the same length of net. This helps a lot as all of the transporting is done via small aircraft.

We did not put much effort into major maintenance on buildings and facilities in Bethel because they were all due to be replaced this coming winter. We made repairs and did a thorough cleanup at the Old Chevak field station.

6. Energy Conservation

The building of the new shop-office complex and the modern super-insulated housing units will go a long way toward saving energy and reducing heating costs. We eagerly look forward to moving into new facilities. The cost of operating the present system is staggering.

Maintence staff performed routine tune-ups of vehicles.

J. OTHER ITEMS

1. Cooperative Programs

In 1985 we saw the completion of the Range Survey of Nunivak Island, Alaska done cooperatively with the USDA and the State of Alaska. The report delineates the history of reindeer population dynamics and their impact on lichen winter range on Nunivak in addition to delineating lichen winter range, quantity of lichen winter range, and recovery time for overgrazed lichen range.

In summary it is obvious that the range on Nunivak Island is in very poor condition. Work is in progress to establish a range management plan on Nunivak to allow recovery of the range.
2. **Items of Interest**

In February, 1986 RM Perry was on a commercial flight to Mekoryuk for a meeting with several other federal and state employees and residents of Mekoryuk. A thick ground fog obscured the runway as the pilot made his approach. Too late, the pilot realized he was not lined up with the centerline and while attempting to do so banked sharply, hitting his wing tip and then landed hard heading across the runway. He applied full reverse to the props but knocked the nose gear and the nose section of the Dehavilland Twin Otter off before coming to a stop. Nobody was injured.

This Dehavilland Twin Otter with RM Perry aboard crash landed at Mekoryuk. No injuries were incurred.

3. **Credits**

Hinkes: Climatic Conditions  
Perry: C.3,  
Strom: D.1, 2, I.6.  
McCaffery: G.8  
T. Comish: F.11, 12, H., and the majority of the photos.  
Wege: D.5, F.1, 2, 3, 6, G.3  
Becker: E.6, G.8, D.5,  
Garrett: D. 5, J.1,  
Ernst: G.1, 2, 4, 5, 9, 10, 11  
Hunt: D.3  
Rearden: E.1, 8, F.7, G.16, I.3, J.2, J.3 and editing.  
D. Comish, M. Prince, M. Perry and E. Clyde put it together and inserted the photos.
K. Feedback

If you can't think of something positive to say don't say anything at all.
a Pocket Guide to the

Yukon-Kuskokwim Delta Goose Management Plan
YOU can help save four kinds of geese for future generations to use and enjoy. The Yukon-Kuskokwim Delta Goose Management Plan tells you how. This booklet explains the Plan and why these geese need your help.
Geese of the Yukon-Kuskokwim

Cackling Canada Geese (Tuutangayiit, Tuutaalqucit, ’Lagit, ’Lakcakcaraat)

Canada geese have white cheek patches. On the Yukon-Kuskokwim Delta, there are two kinds of Canada geese, the cackler and the lesser. The cackler’s bill is shorter than the lesser’s, but the best way to tell the cackler is by its fast high-sounding call.

Delta Goose Management Plan

White-fronted Geese (Neqleret, ’Legleret, ’Lagilugpiat)

White-fronted geese have a speckled belly and a white band at the base of the bill. In Alaska only Yukon-Kuskokwim Delta white-fronts are in trouble.
Pacific Black Brant (Neqlernat, 'Leqlernat)

Brant are small stocky geese with black heads and necks, with white stripes on both sides of the upper neck.

Emperor Geese (Nacaullget)

Emperor geese have a white head and back of the neck. The chin and throat are black but the body is flecked with silver-gray. The face is often stained rusty-colored in the summer.
Each Spring these geese fly to the Yukon-Kuskokwim Delta to nest and raise their young. Most of the cacklers, white-fronts, and brants spend the winter in California and Mexico, while emperor geese winter in the Aleutian Islands of Alaska.
The Populations of These Geese Have Seriously Declined.

Estimated Numbers of Geese*

<table>
<thead>
<tr>
<th>Species</th>
<th>Historic High</th>
<th>Current Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cacklers</td>
<td>384,000 (1965)</td>
<td>40,000</td>
</tr>
<tr>
<td>White-fronts</td>
<td>496,000 (1967)</td>
<td>94,000</td>
</tr>
<tr>
<td>Brant</td>
<td>194,000 (1981)</td>
<td>129,000</td>
</tr>
<tr>
<td>Emperors</td>
<td>139,000 (1964)</td>
<td>59,000</td>
</tr>
</tbody>
</table>

*Source: U.S. Fish & Wildlife Service
Although there are several causes for the decline in geese, hunting throughout their range has been a major cause. If hunting continues as in the past, it could cause further declines and possibly extinction of these birds, especially the cacklers.

- Egg gathering
- Fox predation
- Habitat Loss in wintering grounds
- Hunting
To save these birds for future generations, Native leaders from the Yukon-Kuskokwim Delta, sport hunters, conservation groups, and wildlife agencies have developed and agreed to the Yukon-Kuskokwim Delta Goose Management Plan.
The Yukon-Kuskokwim Delta Goose Management Plan asks everyone to:

- Stop hunting cackling Canada geese.
- Stop taking eggs from all four of these species of geese.
- Reduce hunting of white-fronts, black brant, and emperor geese.
- Reduce disturbance to these birds while they are nesting, molting, and rearing their young.
- Help protect wetlands in the goose wintering areas.
These geese are hunted all along their migration paths. Therefore, **all goose hunters** from the Yukon-Kuskokwim Delta in Alaska to Washington, Oregon, California, and Mexico are asked to follow this plan.

If you are a goose hunter, you can help these geese by following the rules of the Yukon-Kuskokwim Delta Goose Management Plan.
On the Yukon-Kuskokwim Delta, there are two kinds of Canada geese, cacklers and lessers which are very hard to tell apart. Hunters should be very careful about mistaking the two. It is best to shoot only if you are sure it is not a cackler.

Rules for Cackling Canada Geese

Sport Hunters
1. No hunting until harvestable populations are achieved.

Subsistence Hunters
1. No hunting until harvestable populations are achieved. No hunting means no hunting during spring, nesting, rearing, molting or fall.
2. No egg gathering.

Cacklers—Closed to All Hunting
Yukon-Kuskokwim Delta Goose Management Plan

Rules for Sport Hunting of White-fronts, Brant, and Emperor Geese

1. Reduce brant and white-front harvest in the entire Pacific Flyway. Refer to local hunting regulations.

2. Maintain the reduced harvest of emperor geese at 2 birds per day.

(see local regulations)
Yukon-Kuskokwim Delta Goose Management Plan

Rules for Subsistence Hunting of White-fronts, Brant, and Emperors.

1. Subsistence hunt in spring until nesting.
2. No hunting when nesting, rearing, and molting.
3. No egg gathering.
4. Subsistence hunt in fall when the birds are on the wing.

Closed to Emperors in 1986
If we all support the Yukon-Kuskokwim Delta Goose Management Plan, the goose populations will increase.

The goal is to increase the cackler population to 250,000. Harvesting may be possible when cacklers rise above 110,000.

The white-front population goal is 300,000, for brant it is 185,000, and 150,000 for emperors.
The status of the goose populations must be carefully monitored.

Taking care to minimize their disturbance, biologists will measure goose population levels, nesting success, and possible influences that might harm the geese.

Waterfowl harvest along the entire flyway is monitored through surveys and check stations.
All parties to the Yukon-Kuskokwim Delta Goose Management Plan have agreed that continued cooperation is essential to bring back the populations of cackling Canada geese, white-fronted geese, brant, and emperor geese.

For more information or a copy of the Goose Management Plan, contact: Association of Village Council Presidents, 543-3521; Alaska Dept. of Fish & Game, 543-2433; Nunam Kitlutsisti, 543-2956; or the U.S. Fish & Wildlife Service, 543-3151
The land and the wildlife of the Yukon-Kuskokwim Delta are our heritage and also our future. Please support the Yukon-Kuskokwim Delta Goose Management Plan.