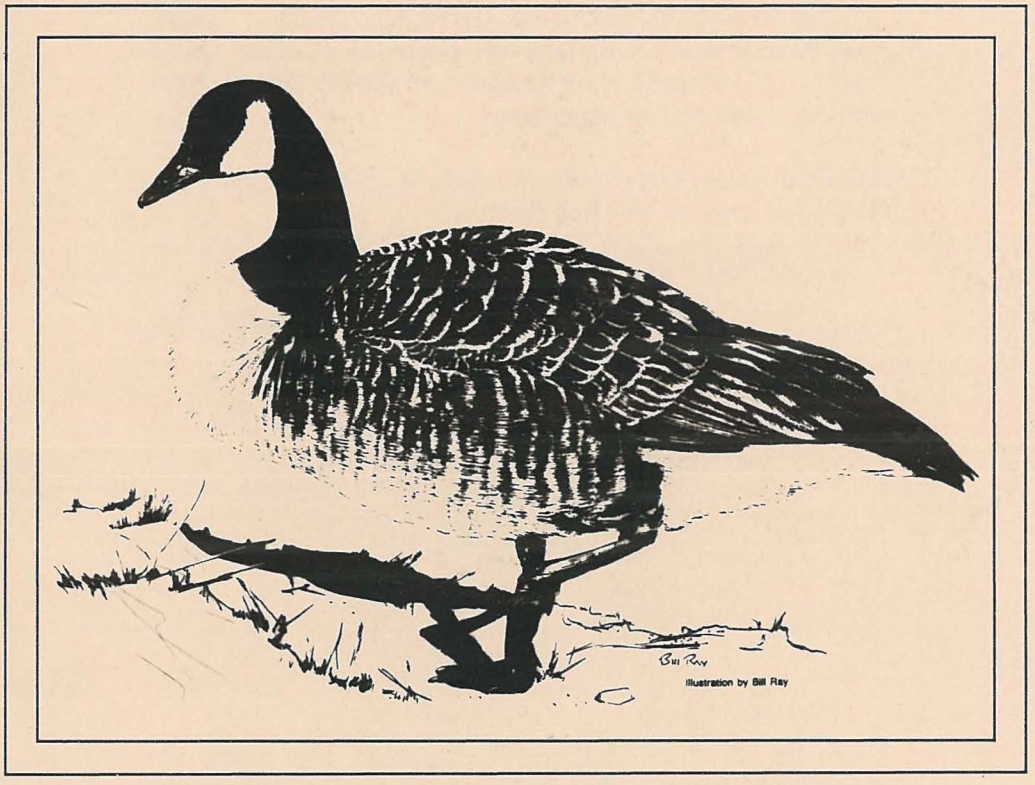
Alaska Department of Fish and Game
Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
Annual Report of Survey-Inventory Activities
1 July 1988-30 June 1989

# WATERFOWL




**by**
**Bruce H. Campbell**
**Thomas C. Rothe**
**Vol. XX, Part XIII**
**Project W-23-2, Study 11.0**
**June 1990**

STATE OF ALASKA
Steve Cowper, Governor

DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF WILDLIFE CONSERVATION
W. Lewis Pamplin, Jr., Director
W. Bruce Dinneford, Acting Planning Chief



Additional copies of this report, or reports on other species covered in this series may be obtained from:

Publications Technician
ADF&G, Wildlife Conservation
P.O. Box 3-2000
Juneau, AK 99802
(907) 465-4190

CONTENTS

# WATERFOWL HARVEST AND HUNTER ACTIVITY

GAME MANAGEMENT UNITS: All

GEOGRAPHIC DESCRIPTION: Statewide

PERIOD COVERED: 1 July 1988 - 30 June 1989

## Introduction

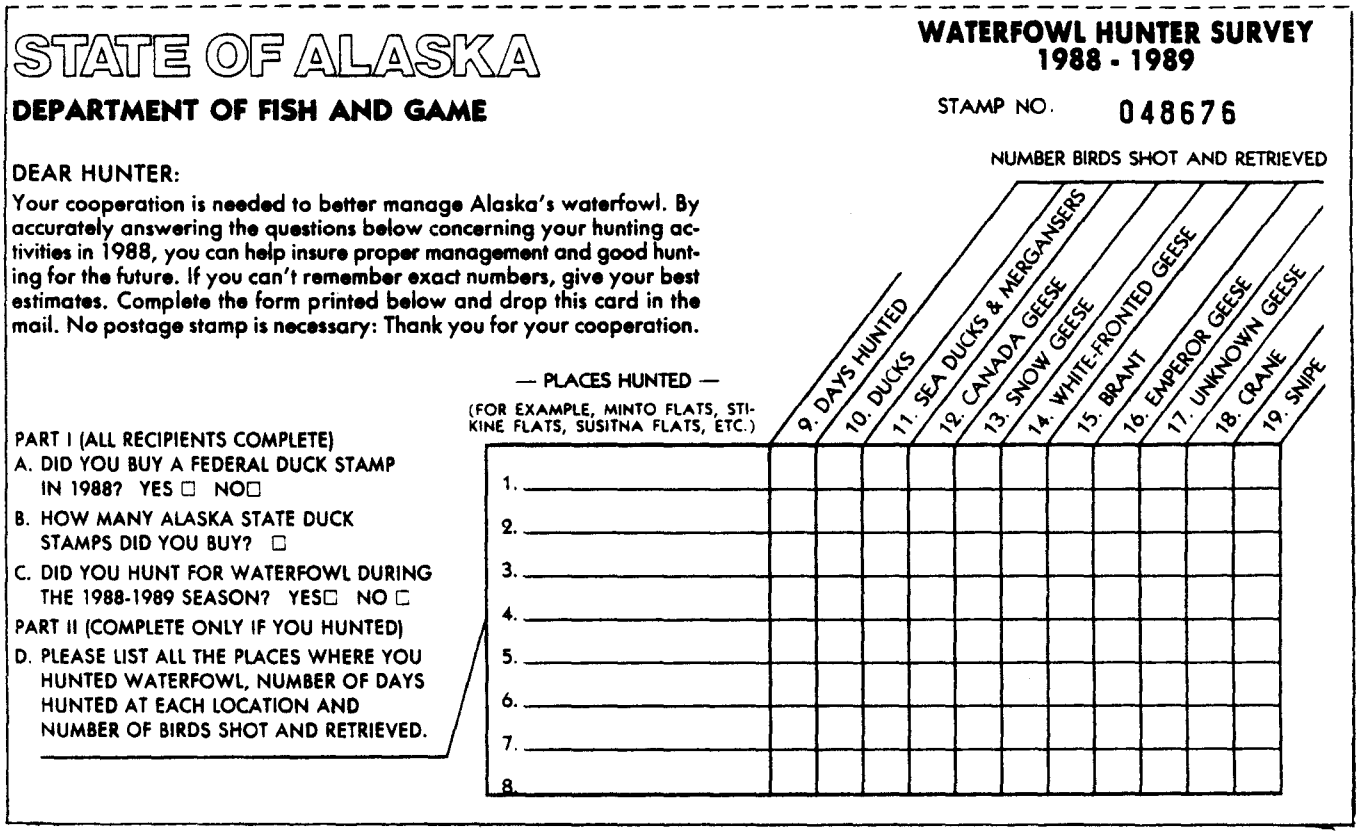
Except for the period 1977 to 1981 and 1986, the state of Alaska has surveyed waterfowl hunters to estimate annual harvest and hunter activity since 1972. This survey was redesigned in 1987 to increase efficiency and accuracy (Campbell et al. 1989). Results from both state and U.S. Fish and Wildlife Service (FWS) surveys were used to determine hunter activity and harvest for the 1988-89 waterfowl season. Because of the scheduling of this report, final FWS survey data for the reporting period were not available; however, because their third-quarter harvest data typically do not vary significantly from their final data, they will be used in this report.

## Methods

The distribution of hunter questionnaires has been incorporated into the sales of the state duck stamp. Self-addressed, preposted questionnaires (Fig. 1) were issued by license vendors to the purchasers of the first 2 stamps out of each booklet of 5 stamps (40% sample). Harvest and hunter activity data were compiled from survey cards returned by 1 May 1989. Reminder questionnaires were not sent to nonrespondents.

Harvest location information from the questionnaires were coded by a hierarchical system based on specificity of responses. Locations were coded to the lowest level or most specific location when possible. When a specific location was not reported, a general area (e.g., based on the respondent's resident ZIP code) was assigned. These were then coded according to a geographical region (Fig. 2); e.g., if a reported harvest of ducks from the Fairbanks area could not be assigned to a specific harvest location, it would be coded to the central region (005). For reporting purposes, the harvest data were combined when harvests for several locations were low and scattered throughout a local geographical area; for example, reported harvests from Kenai Lake, Summit Lake, and Anchor River were reported as the Greater Kenai Peninsula area (119). Harvest location codes are presented in Table 1. To facilitate comparison of ADF&G and FWS data, harvest locations were also categorized according to location codes used in the FWS parts collection survey.

Reporting bias was corrected during data analysis (Voelzer et al. 1982). Briefly, this was done by correcting for memory and prestige response biases by multiplying the reported duck and



STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

WATERFOWL HUNTER SURVEY
1988 - 1989

STAMP NO. 048676

DEAR HUNTER:

Your cooperation is needed to better manage Alaska's waterfowl. By accurately answering the questions below concerning your hunting activities in 1988, you can help insure proper management and good hunting for the future. If you can't remember exact numbers, give your best estimates. Complete the form printed below and drop this card in the mail. No postage stamp is necessary: Thank you for your cooperation.

PART I (ALL RECIPIENTS COMPLETE)

A. DID YOU BUY A FEDERAL DUCK STAMP IN 1988? YES ☐ NO☐

B. HOW MANY ALASKA STATE DUCK STAMPS DID YOU BUY? ☐

C. DID YOU HUNT FOR WATERFOWL DURING THE 1988-1989 SEASON? YES☐ NO ☐

PART II (COMPLETE ONLY IF YOU HUNTED)

D. PLEASE LIST ALL THE PLACES WHERE YOU HUNTED WATERFOWL, NUMBER OF DAYS HUNTED AT EACH LOCATION AND NUMBER OF BIRDS SHOT AND RETRIEVED.

— PLACES HUNTED —
(FOR EXAMPLE, MINTO FLATS, STIKINE FLATS, SUSITNA FLATS, ETC.)

NUMBER BIRDS SHOT AND RETRIEVED

| — PLACES HUNTED — | 9. DAYS HUNTED | 10. DUCKS | 11. SEA DUCKS & MERGANSERS | 12. CANADA GEESE | 13. SNOW GEESE | 14. WHITE-FRONTED GEESE | 15. BRANT | 16. EMPEROR GEESE | 17. UNKNOWN GEESE | 18. CRANE | 19. SNIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | | | | | | | | | | | |
| 2. | | | | | | | | | | | |
| 3. | | | | | | | | | | | |
| 4. | | | | | | | | | | | |
| 5. | | | | | | | | | | | |
| 6. | | | | | | | | | | | |
| 7. | | | | | | | | | | | |
| 8. | | | | | | | | | | | |

Figure 1. Alaska State waterfowl hunter questionnaire.

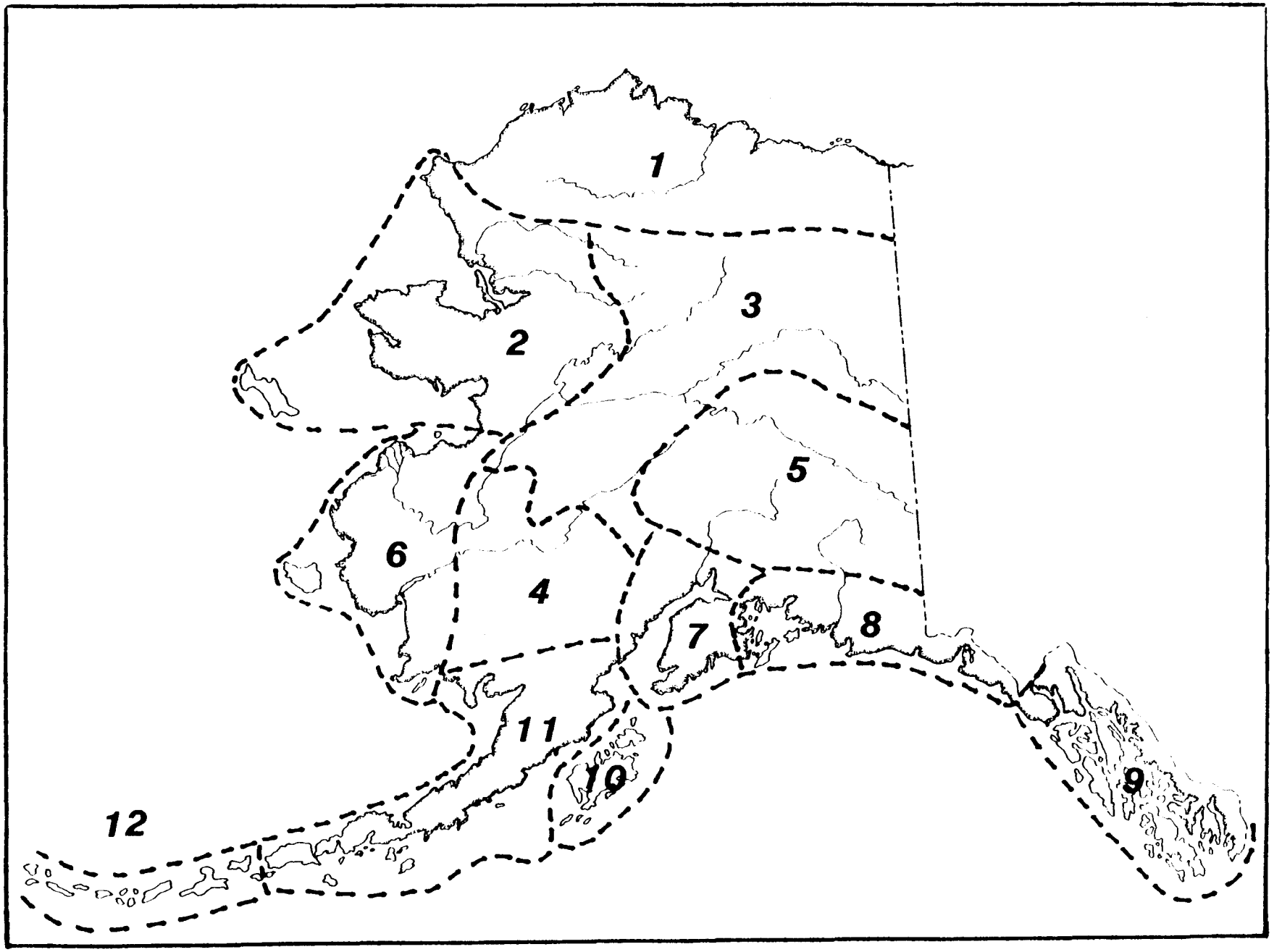



Figure 2. State waterfowl and crane harvest survey regions.

Table 1. Summary of codes used to assign harvest locations in Alaska.

| ADF&G Code | FWS Code | ADF&G geographical region (R)and harvest location names | Original FWS "county" name | FWS harvest zone |
|---|---|---|---|---|
| 000 | 0000 | Unknown | Unknown | Unknown |
| 001 | 0101 | North Slope (R) | Arctic Slope | Northwest |
| 002 | 0301 | Seward Peninsula (R) | Seward Peninsula | NW |
| 020 | ---- | Shishmaref | Seward Peninsula | NW |
| 021 | ---- | Norton Sound | Seward Peninsula | NW |
| 022 | ---- | Nome area | Seward Peninsula | NW |
| 023 | ---- | Safety Lagoon | Seward Peninsula | NW |
| 024 | ---- | Serpentine River | Seward Peninsula | NW |
| 003 | 0502 | Upper Yukon Valley | Upper Yukon-Kuskokwim | Central |
| 004 | 0502 | Lower yukon Valley | Upper Yukon-Kuskokwim | C |
| 005 | 0702 | Central (R) | Fairbanks-Minto | C |
| 070 | 0752 | Delta area | Fairbanks-Minto | C |
| 071 | ---- | Denali Highway | Fairbanks-Minto | C |
| 079 | 0722 | Eielson AFB | Fairbanks-Minto | C |
| 080 | ---- | Fort Wainwright | Fairbanks-Minto | C |
| 081 | 0742 | Healy Lake area | Fairbanks-Minto | C |
| 082 | 0712 | Minto Flats | Fairbanks-Minto | C |
| 083 | ---- | Salcha River | Fairbanks-Minto | C |
| 084 | 0732 | Salchaket Slough | Fairbanks-Minto | C |
| 085 | ---- | Tanana Flats | Fairbanks-Minto | C |
| 086 | ---- | Tetlin Flats | Fairbanks-Minto | C |
| 087 | 0762 | Tok-Northway | Fairbanks-Minto | C |
| 088 | ---- | Fort Greely | Fairbanks-Minto | C |
| 089 | ---- | Chena River | Fairbanks-Minto | C |
| 090 | ---- | Creamer's Field | Fairbanks-Minto | C |
| 006 | 0901 | Yukon Delta (R) | Yukon-Kuskokwim Delta | NW |
| 007 | 1103 | Cook Inlet (R) | Anchorage-Kenai | Southcentral |
| 115 | 1153 | Chickaloon Flats | Anchorage-Kenai | SC |
| 116 | ---- | Eagle River | Anchorage-Kenai | SC |
| 117 | 1133 | Goose Bay | Anchorage-Kenai | SC |
| 118 | 1193 | Kachemak Bay | Anchorage-Kenai | SC |
| 119 | ---- | Greater Kenai Pen. Area | Anchorage-Kenai | SC |
| 120 | ---- | Jim-Swan Lakes area | Anchorage-Kenai | SC |
| 121 | 1123 | Palmer Hay Flats | Anchorage-Kenai | SC |
| 122 | 1163 | Portage | Anchorage-Kenai | SC |
| 123 | 1143 | Potter's Marsh | Anchorage-Kenai | SC |
| 124 | 1183 | Redoubt Bay | Anchorage-Kenai | SC |
| 125 | 1113 | Susitna Flats | Anchorage-Kenai | SC |
| 126 | 1173 | Trading Bay | Anchorage-Kenai | SC |
| 127 | ---- | Kenai River Flats | Anchorage-Kenai | SC |
| 128 | ---- | Kasilof River | Anchorage-Kenai | SC |
| 129 | ---- | Knik River | Anchorage-Kenai | SC |
| 130 | ---- | Skilak Lake | Anchorage-Kenai | SC |
| 131 | ---- | Tuxedni Bay | Anchorage-Kenai | SC |
| 132 | ---- | China Poot Bay | Anchorage-Kenai | SC |

Table 1. (Cont).

| ADF&G Code | FWS Code | ADF&G geographical region (R)and harvest location names | Original FWS "county" name | FWS harvest zone |
|---|---|---|---|---|
| 008 | 1303 | Gulf Coast (R) | Cordova-Copper River | SC |
| 150 | 1313 | Copper River Delta | Cordova-Copper River | SC |
| 151 | 1333 | Prince William Sound | Cordova-Copper River | SC |
| 152 | 1323 | Yakutat area | Cordova-Copper River | SC |
| 153 | ---- | Montague, Hawkins, Hinchenbrook Islands | Cordova-Copper River | SC |
| 154 | ---- | Valdez area | Cordova-Copper River | SC |
| 009 | 1503 | Southeast Coast (R) | Juneau-Sitka | Southeast |
| 170 | 1523 | Blind Slough | Juneau-Sitka | SE |
| 171 | 1513 | Chilkat River | Juneau-Sitka | SE |
| 172 | 1543 | Duncan Canal | Juneau-Sitka | SE |
| 173 | 1573 | Farragut Bay | Juneau-Sitka | SE |
| 174 | ---- | Icy Strait | Juneau-Sitka | SE |
| 175 | ---- | Ketchikan area | Juneau-Sitka | SE |
| 176 | 1563 | Mendenhall Flats | Juneau-Sitka | SE |
| 177 | ---- | Petersburg area | Juneau-Sitka | SE |
| 178 | ---- | Prince of Wales Is. | Juneau-Sitka | SE |
| 179 | 1533 | Rocky Pass | Juneau-Sitka | SE |
| 180 | ---- | Seymour Canal | Juneau-Sitka | SE |
| 181 | ---- | Sitka area | Juneau-Sitka | SE |
| 182 | 1553 | St. James Bay | Juneau-Sitka | SE |
| 183 | 1583 | Stikine River Delta | Juneau-Sitka | SE |
| 194 | ---- | Thorne Bay | Juneau-Sitka | SE |
| 195 | ---- | Lynn Canal | Juneau-Sitka | SE |
| 196 | ---- | Pybus Bay | Juneau-Sitka | SE |
| 197 | ---- | Tenakee Inlet | Juneau-Sitka | SE |
| 198 | ---- | Admirality Cove | Juneau-Sitka | SE |
| 199 | ---- | Eagle River | Juneau-Sitka | SE |
| 010 | 1704 | Kodiak (R) | Kodiak Island | Southwest |
| 200 | 1714 | Kalsin Bay | Kodiak Island | SW |
| 201 | ---- | Middle Bay | Kodiak Island | SW |
| 202 | ---- | Old Harbor | Kodiak Island | SW |
| 203 | ---- | Ouzinkie | Kodiak Island | SW |
| 204 | ---- | Raspberry Straits | Kodiak Island | SW |
| 205 | ---- | Women's Bay | Kodiak Island | SW |
| 206 | ---- | Port Lion's | Kodiak island | SW |
| 207 | ---- | Pasagshak | Kodiak Island | SW |
| 208 | ---- | Afognak | Kodiak Island | SW |
| 011 | 1904 | Alaska Peninsula (R) | Cold Bay-Ak Peninsula | SW |
| 220 | ---- | Cinder River | Cold Bay-Ak Peninsula | SW |
| 221 | 1914 | Cold Bay | Cold Bay-Ak Peninsula | SW |
| 222 | ---- | Naknek River | Cold Bay-Ak Peninsula | SW |
| 223 | 1924 | Pilot Point | Cold Bay-Ak Peninsula | SW |
| 224 | 1934 | Port Moller | Cold Bay-Ak Peninsula | SW |
| 225 | 1944 | Port Heiden | Cold Bay-Ak Peninsula | SW |

Table 1. (Cont).

| ADF&G Code | FWS Code | ADF&G geographical region (R)and harvest location names | Original FWS "county" name | FWS harvest zone |
|---|---|---|---|---|
| 226 | ---- | Egegik River | Cold Bay-Ak Peninsula | SW |
| 227 | ---- | Dillingham/Nushegak River and Bay | Cold Bay-Ak Peninsula | SW |
| 228 | ---- | Ugashik | Cold Bay-Ak Peninsula | SW |
| 012 | 2104 | Aleutian Chain (R) | Aleutian-Pribilofs | |
| 240 | ---- | Unimak | Aleutian-Pribilofs | |
| 241 | ---- | Adak | Aleutian-Pribilofs | |

goose bags by 0.7895 and 0.8516, respectively. Adjustments for junior hunter activity were made by multiplying the estimated ducks and geese bagged by 1.0451 and 1.0871, respectively. Reported crane and snipe harvest data were not corrected for memory bias or junior harvest.

Because of nonreporting by hunters without duck stamps and these hunting outside legal seasons, the assessment of waterfowl hunting and harvest is complicated. Analysis did not include data from 29 respondents who reported hunting without a federal duck stamp or did not respond to the relevant questions. Estimates of hunters, harvest, etc. in this report are based solely on duck stamp sales and, therefore, reflect only the reported fall harvest.

## Results

### Number of Hunters:

Based on licensing reports, 4,074 questionnaires were distributed to state duck stamp buyers; of these, 1,201 were returned (i.e., response rate of 29.5%); 1,168 (97.3%) of the returned questionnaires contained sufficient information to be used in the survey. Of the 1,168 hunters who reported purchasing a state duck stamp, 823 (70.5%) reported hunting in 1988 (Table 2), compared with a FWS estimate of 70.3%, a 12-year state survey average of 68.8%, and a 20-year FWS average of 69.7% active hunters (Fig. 3). Based on the sales of 15,017 federal duck stamps (up 6% from 1987, 10.5% below the 20-year average, Fig. 3) and a state estimate of a minimum of 14.3% sales to stamp collectors, there were 12,870 potential waterfowl hunters in Alaska during the 1988-89 season (Table 2), compared with a FWS estimate of 13,768 potential hunters and a correction factor of 8.3% for philatelic sales (Martin et al. 1989). The 1988 state estimate of potential hunters is above the 12-year state survey average of 10,282, while the FWS estimate is 6% above that for 1987 and over 16% above the 20-year average (Fig. 3). After adjustment for inactive and nonhunters, an estimated 9,068 adults hunted waterfowl in 1988 (Table 2), compared with a federal estimate of 9,679 adult hunters.

### Hunting Activity:

Hunters reported hunting an average of 4.9 days during the 1988-89 season, representing a total of 44,625 waterfowl hunter days (Table 2), considerably lower than the federal estimate of 56,009 days. The state estimate was down about 24% from the 12-year average, and the FWS estimate was down 22% from the 20-year average (Fig. 4). The distribution of hunter days and resulting harvest are summarized by region in Table 3 and by specific hunting locations in the following sections.

Table 2. Summary of Alaska waterfowl hunter activity and harvest from the state survey, 1988-89.

| | |
|---|---|
| Number of survey cards issued: | 4,074 |
| Number of survey cards returned: | 1,201 (29.5%) |
| Number of survey cards usable for data analysis: | 1,168 (97.3%) |
| Projected number of fall sport hunters: | |
| Total federal duck stamps sold[a]: | 15,017 |
| Federal duck stamps sold to potential hunters in Alaska: | 12,870 |
| Number of active hunters: | 9,068 (70.5%) |
| Calculated statewide fall sport harvest: | |
| Ducks: Dabblers/divers: 78,065; Sea ducks: 6,364; Total: 84,429 | |
| Geese: Canada: 7,064; white-fronted: 910; brant: 610 snow: 124; emperor: 10; unknown species: 62 Total: 8,781 | |
| Cranes: | 1,443 |
| Snipe: | 1,807 |
| Calculated hunter days: | 44,625 |

[a] Martin et al. 1989

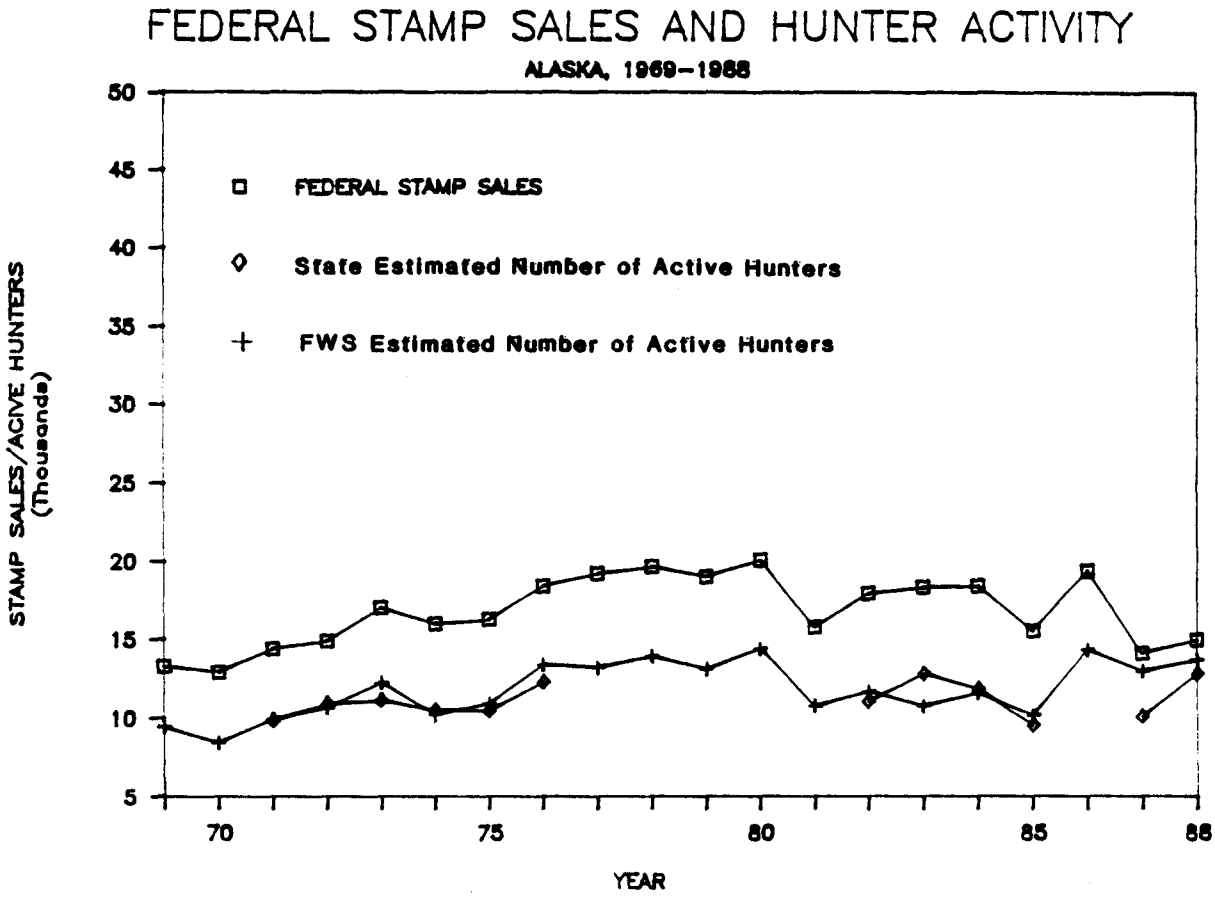



Figure 3. Twenty year trend in duck stamp sales and potential hunters in Alaska as estimated by the State and U.S. Fish and Wildlife Service (FWS).

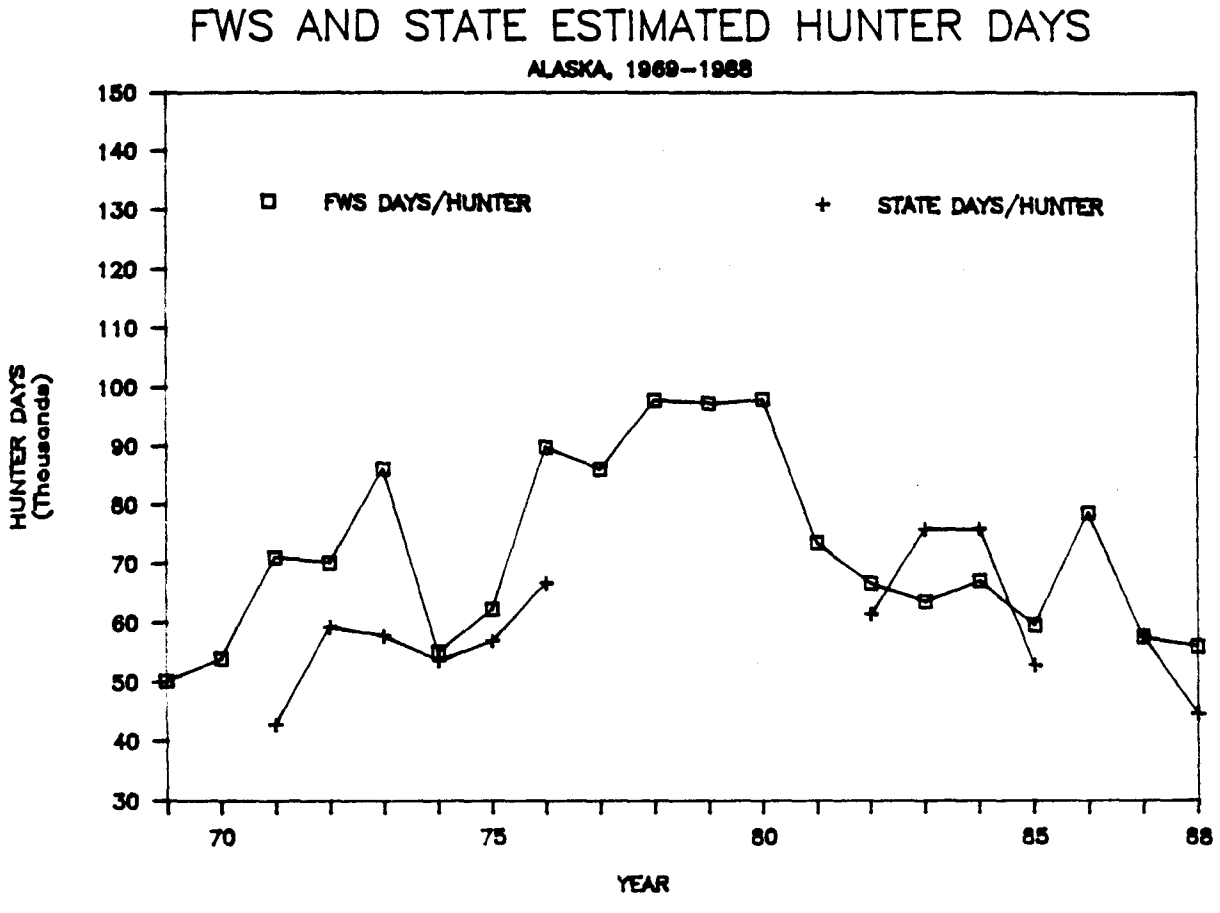



Figure 4. Twenty year trend in hunter days for Alaska as estimated by the State and U.S. Fish and Wildlife Service (FWS).

Table 3. Calculated hunting activity and duck harvest for specific locations in Alaska where more that 0.2% of the harvest occurred in 1988-89.

| Location | Ducks | | Hunter days | |
|---|---|---|---|---|
| | Calculated harvest | % of state total | Calculated days | % of state total |
| Susitna Flats | 10,925 | 12.9 | 4,264 | 9.6 |
| Minto Flats | 7,559 | 9.0 | 2,149 | 4.8 |
| Palmer hay Flats | 5,885 | 7.0 | 2,865 | 6.4 |
| Kenai River/Flats | 2,989 | 3.5 | 1,983 | 4.4 |
| Copper River Delta | 2,915 | 3.5 | 1,961 | 4.4 |
| Redoubt Bay | 2,869 | 3.4 | 584 | 1.3 |
| Portage | 2,115 | 2.5 | 1,521 | 3.4 |
| Tok-Northway | 2,051 | 2.4 | 595 | 1.3 |
| China Poot Bay | 1,848 | 2.2 | 595 | 1.3 |
| Chickaloon Flats | 1,738 | 2.1 | 716 | 1.6 |
| Kachemak Bay | 1,618 | 1.9 | 628 | 1.4 |
| Mendenhall | 1,554 | 1.8 | 1,091 | 2.4 |
| Prince William Sound | 1,499 | 1.8 | 804 | 1.8 |
| Trading Bay | 1,490 | 1.8 | 386 | 0.9 |
| Healy Lake | 1,343 | 1.6 | 628 | 1.4 |
| Cold Bay | 1,085 | 1.3 | 1,223 | 2.7 |
| Stikine River Flat | 1,076 | 1.3 | 463 | 1.0 |
| Denali Highway | 1,048 | 1.2 | 419 | 0.9 |
| Potter's Marsh | 947 | 1.1 | 1,025 | 2.3 |
| Pilot Point | 920 | 1.1 | 176 | 0.4 |
| Jim Creek/Swan Lake | 828 | 1.0 | 375 | 0.8 |
| Duncan Canal | 800 | 0.9 | 562 | 1.3 |
| Sitka Area | 607 | 0.7 | 364 | 0.8 |
| Delta Area | 589 | 0.7 | 1,576 | 3.5 |
| Greater Kenai Pen. | 589 | 0.7 | 518 | 1.2 |
| Naknek River | 589 | 0.7 | 430 | 1.0 |
| Adak | 589 | 0.7 | 364 | 0.8 |
| Women's Bay, Kodiak | 552 | 0.7 | 242 | 0.5 |
| Nushegak River/Bay | 524 | 0.6 | 198 | 0.4 |
| Knik River | 441 | 0.5 | 353 | 0.8 |
| Goose Bay | 377 | 0.4 | 430 | 1.0 |
| Yakutat | 377 | 0.4 | 231 | 0.5 |
| Icy Strait | 331 | 0.4 | 176 | 0.4 |
| Montague, Hawkins & Hinchenbrook Islands | 257 | 0.3 | 209 | 0.5 |
| Middle Bay | 239 | 0.3 | 176 | 0.4 |
| Kalsin Bay | 193 | 0.2 | 143 | 0.3 |
| Ouzinkie | 193 | 0.2 | 88 | 0.2 |
| Kasilof River | 184 | 0.2 | 165 | 0.4 |
| Egegik River | 184 | 0.2 | 110 | 0.2 |
| Skilak Lake | 175 | 0.2 | 99 | 0.2 |
| Ketchikan Area | 175 | 0.2 | 264 | 0.6 |
| Farragut Bay | 166 | 0.2 | 55 | 0.1 |

Table 3. (Cont).

| Location | Ducks | | Hunter days | |
|---|---|---|---|---|
| | Calculated harvest | % of state total | Calculated days | % of state total |
| Afognak | 166 | 0.2 | 209 | 0.5 |
| Eielson AFB | 156 | 0.2 | 121 | 0.3 |
| Norton Sound | 147 | 0.2 | 33 | 0.1 |
| Pasagshak | 147 | 0.2 | 66 | 0.1 |
| Safety Lagoon | 138 | 0.2 | 187 | 0.4 |
| Seymour Canal | 138 | 0.2 | 66 | 0.1 |
| Subtotals | 63,324 | 75.0 | 31,887 | 71.5 |
| Statewide Totals | 84,429 | 100 | 44,625 | 100 |

Duck Harvest. According to state and FWS surveys, the average harvests per active hunter were 9.2 and 4.7 ducks, respectively (Martin et al. 1989), compared with a FWS 20-year average of 5.3 ducks/active hunter and a 12-year state survey average of 8.5 ducks/active hunter (Fig. 5). Average daily hunting success from state data was 1.9 ducks/hunter in 1988.

The projected statewide harvest was 84,429 ducks, of which 78,065 (89.4%) were dabbling and diving ducks and 6,364 (10.6%) were sea ducks and mergansers (Table 4), compared with the FWS estimate (Martin et al. 1989) of 67,865, of which 60,671 (89.4%) were dabbling and diving ducks and 7,194 (10.6%) were sea ducks and mergansers (Table 5). The 1988 state duck harvest estimate was down 5.5% from the FWS 20-year average and down 9.8% from the 12-year state average (Fig. 5).

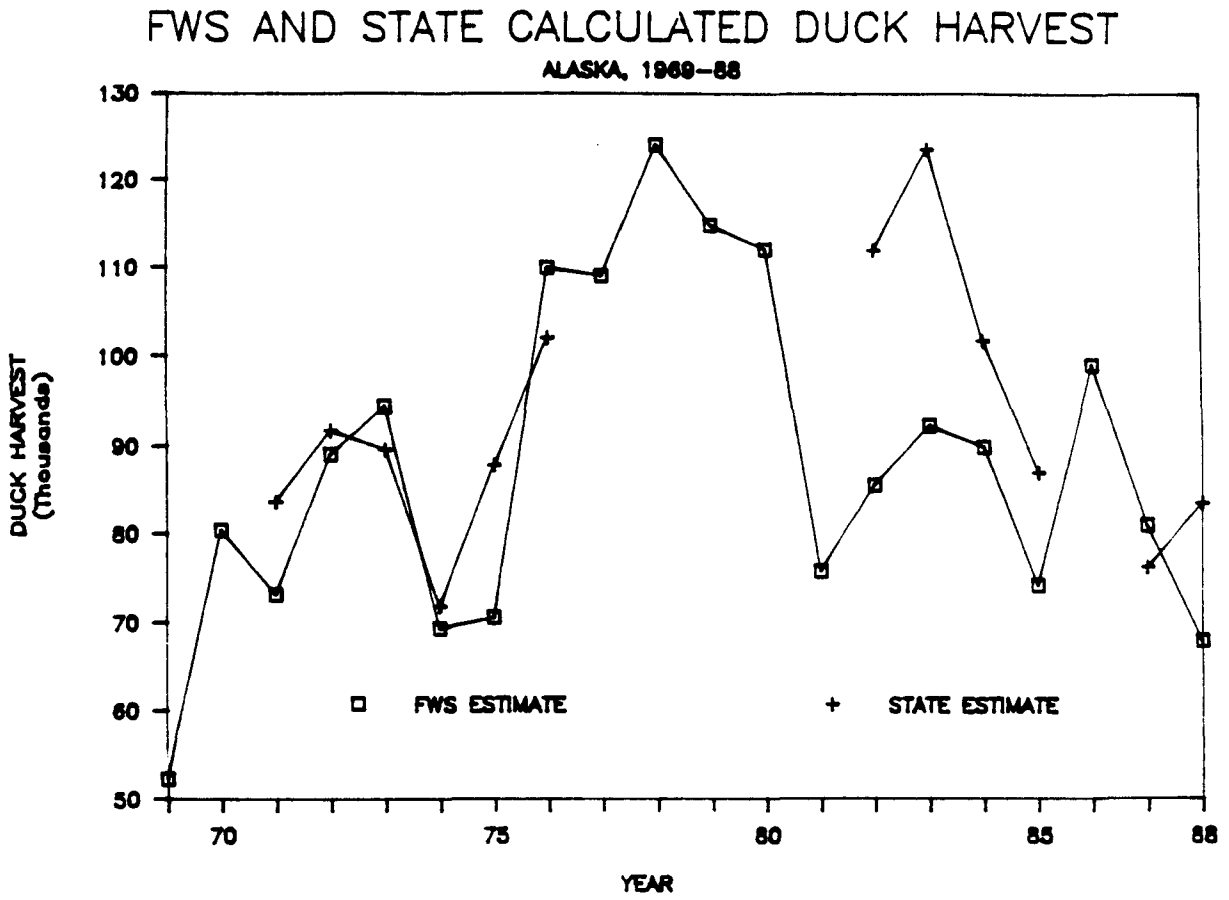
Based on the FWS parts collection survey, which is believed to provide the best estimate of duck species composition in the harvest, the mallard (Anas Platyrhynchos) was the most important game duck in 1988, composing about 33% of the harvest. The green-winged teal (Anas crecca) was the second-most important game duck, composing a little over 14% of the harvest, followed by the Northern pintail (Anas acuta) (14%) and American wigeon (Anas americana) (13%) (Table 5). Species composition of the statewide duck harvest has remained relatively constant during the past 20 years; 86% of the harvest has been composed of dabbling ducks, 10% diving ducks, and 4% sea ducks and mergansers (Table 6).

As calculated from the state survey, about 45% of the statewide duck harvest occurred in Cook Inlet, followed by about 20% in the central region and 12% in Southeast Alaska (Table 4). Nearly 25% of the statewide harvest and 20% of the hunter days occurred at 3 locations in Cook Inlet: Susitna, Palmer Hay, and Kenai River Flats. The only other area in the state with similar harvest and hunter effort was Minto Flats northwest of Fairbanks (Table 3). Nearly 23% of the statewide sea duck and merganser harvest occurred in Kachemak Bay.

Goose Harvest. Hunters reported taking an average 1.0 geese/active hunter in 1988; this was above the 20-year FWS average of 0.7 geese/hunter but somewhat below the 12-year state survey average of 1.2 geese/hunter (Fig. 7). The FWS estimate of 0.4/hunter (Martin et al. 1989) was also considerably below both the state and FWS averages.

The calculated 1988 goose harvest was 8,781 (Table 2), up over 60% from the 1987 average but still well below the 12-year average. The FWS estimated harvest of 6,059 was also up from the 1987 estimate of 5,389 but well below the 20-year average (Fig. 6).

Based on the state survey, which had a sample size 7 times greater than the FWS parts collection survey, the Canada goose



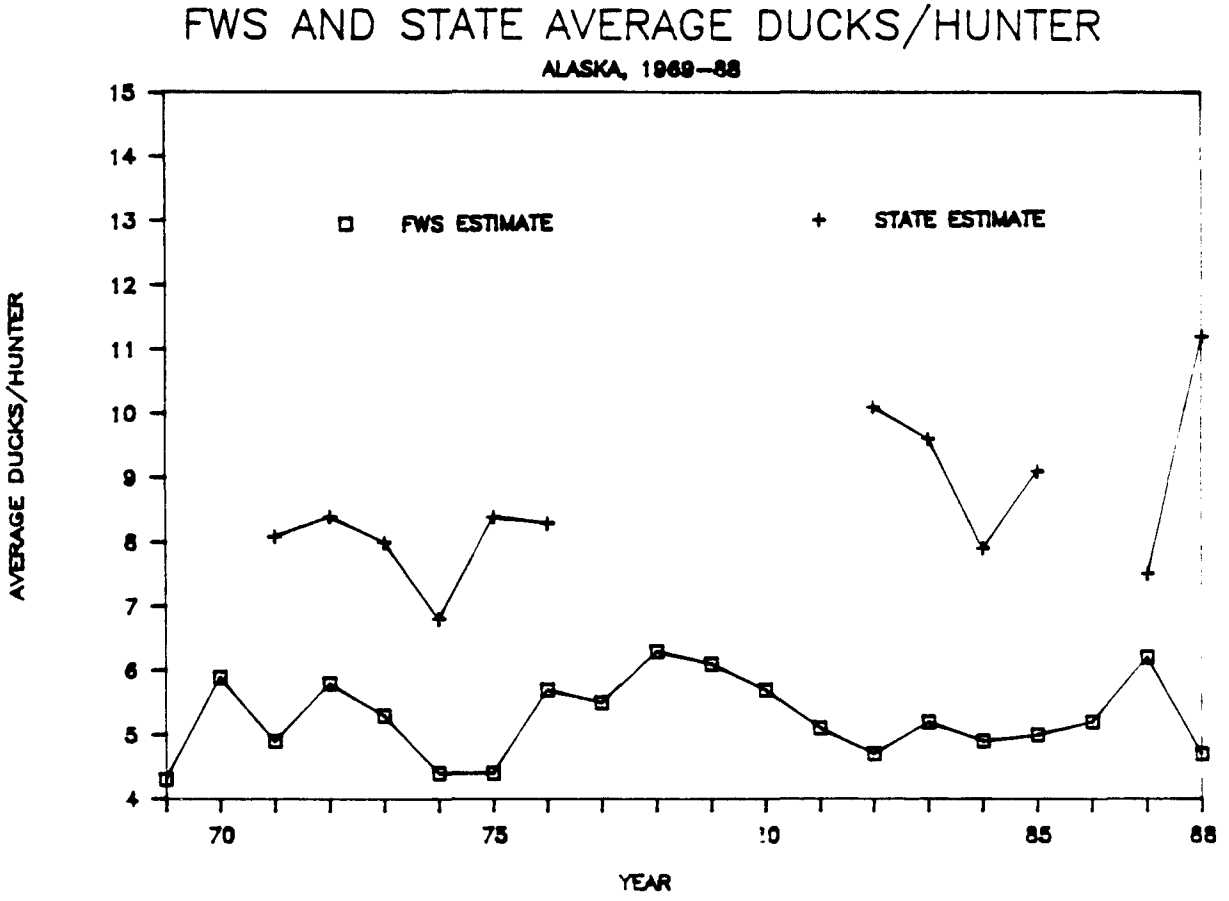




Figure 5. Twenty year trends in the duck harvest and average ducks/hunter in Alaska as estimated by the State and U.S. Fish and Wildlife Service (FWS).

Table 4. Proportion (%) of duck, goose, crane, and snipe sport harvests and hunter activity in the fall by geographic region from the state survey for 1988-89.

| Harvest Region | Hunter Days | Dabblers/ Divers | Sea Ducks | Geese | Cranes | Snipe |
|---|---|---|---|---|---|---|
| North Slope | 0.7 | 0.1 | 1.0 | 0.7 | 0.0 | 0.6 |
| Seward Peninsula | 2.7 | 1.1 | 2.0 | 3.7 | 9.2 | 0.6 |
| Upper Yukon Valley | 1.6 | 0.9 | 0.0 | 0.9 | 2.3 | 0.0 |
| Lower Yukon Valley | 0.8 | 1.7 | 0.0 | 2.0 | 0.0 | 0.0 |
| Central | 17.4 | 21.1 | 3.0 | 13.2 | 69.5 | 11.6 |
| Yukon Delta | 1.4 | 2.0 | 2.3 | 0.1 | 5.3 | 5.5 |
| Cook Inlet | 41.0 | 45.3 | 37.3 | 37.1 | 9.2 | 52.4 |
| Gulf Coast | 7.3 | 6.3 | 3.2 | 6.8 | 0.0 | 7.9 |
| Southeast | 15.2 | 11.4 | 17.2 | 10.5 | 3.8 | 19.5 |
| Kodiak | 5.8 | 5.4 | 24.0 | 0.2 | 0.0 | 0.0 |
| Alaska Peninsula | 5.1 | 4.2 | 2.6 | 24.3 | 0.8 | 1.8 |
| Aleutian Chain | 0.8 | 0.2 | 7.2 | 0.0 | 0.0 | 0.0 |
| Unknown | 0.7 | 0.5 | 0.1 | 0.5 | 0.0 | 0.0 |
| Statewide Days/Harvest | 44,625 | 78,065 | 6,364 | 8,781 | 1,443 | 1,807 |

Table 5. Regional species composition of the 1988-89 Alaska duck harvest from FWS Parts Collection Survey[a]

| Species | Seward Pen. | Yukon Valley | Central | Yukon Delta | Cook Inlet | Gulf Coast | South-east | Kodiak | Ak Pen. | State-wide[b] |
|---|---|---|---|---|---|---|---|---|---|---|
| Mallard | 0.0 | 100.0 | 27.0 | 20.3 | 33.2 | 52.0 | 26.5 | 65.5 | 18.3 | 32.6 |
| Green-winged Teal | 23.6 | 0.0 | 10.9 | 0.0 | 14.6 | 11.5 | 13.4 | 6.5 | 29.9 | 14.2 |
| Northern Pintail | 35.6 | 0.0 | 15.8 | 20.3 | 14.6 | 7.8 | 9.7 | 1.3 | 20.9 | 13.5 |
| Wigeon | 0.0 | 0.0 | 21.9 | 39.8 | 11.8 | 18.0 | 8.1 | 2.6 | 12.2 | 12.9 |
| Northern Shoveler | 5.9 | 0.0 | 6.8 | 0.0 | 7.1 | 1.3 | 1.6 | 0.0 | 0.5 | 4.9 |
| Gadwall | 0.0 | 0.0 | 0.4 | 0.0 | 0.8 | 1.5 | 0.8 | 9.2 | 1.1 | 1.3 |
| Blue-winged Teal | 0.0 | 0.0 | 0.2 | 0.0 | 0.2 | 0.0 | 0.4 | 0.0 | 1.0 | 0.2 |
| Total Dabblers | 65.1 | 100.0 | 83.1 | 80.5 | 82.4 | 92.1 | 60.5 | 85.1 | 83.9 | 79.7 |
| Lesser Scaup | 0.0 | 0.0 | 8.0 | 0.0 | 1.4 | 5.9 | 0.0 | 1.3 | 2.0 | 2.7 |
| Common Goldeneye | 0.0 | 0.0 | 1.7 | 0.0 | 2.6 | 1.3 | 1.5 | 0.7 | 1.5 | 2.0 |
| Barrows Goldeneye | 0.0 | 0.0 | 0.8 | 0.0 | 1.9 | 0.0 | 4.9 | 2.6 | 0.5 | 2.0 |
| Bufflehead | 0.0 | 0.0 | 2.9 | 0.0 | 1.3 | 0.0 | 0.8 | 2.6 | 0.5 | 1.5 |
| Ring-necked duck | 0.0 | 0.0 | 0.9 | 0.0 | 0.4 | 0.6 | 1.1 | 0.0 | 0.0 | 0.6 |
| Greater Scaup | 5.8 | 0.0 | 0.0 | 19.5 | 0.7 | 0.0 | 0.0 | 1.3 | 1.5 | 0.6 |
| Canvasback | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| Redhead | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| Total Divers | 5.8 | 0.0 | 15.5 | 19.5 | 8.7 | 7.9 | 8.4 | 8.4 | 6.0 | 9.7 |
| Surf Scoter | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 0.0 | 20.5 | 0.0 | 0.0 | 4.5 |
| White-W. Scoter | 0.0 | 0.0 | 0.6 | 0.0 | 4.1 | 0.0 | 6.5 | 0.7 | 3.0 | 3.3 |
| Steller's Eider | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 1.3 | 5.0 | 0.6 |
| Black Scoter | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.4 | 1.3 | 0.0 | 0.6 |
| Harlequin | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.8 | 0.6 | 1.0 | 0.5 |
| Oldsquaw | 29.1 | 0.0 | 0.4 | 0.0 | 0.2 | 0.0 | 0.0 | 1.3 | 0.0 | 0.5 |
| R.B. Merganser | 0.0 | 0.0 | 0.2 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| Common Merganser | 0.0 | 0.0 | 0.2 | 0.0 | 0.3 | 0.0 | 0.0 | 1.3 | 1.0 | 0.3 |
| Total Sea ducks | 29.1 | 0.0 | 1.4 | 0.0 | 8.9 | 0.0 | 31.1 | 6.5 | 10.1 | 10.6 |
| Total Ducks | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

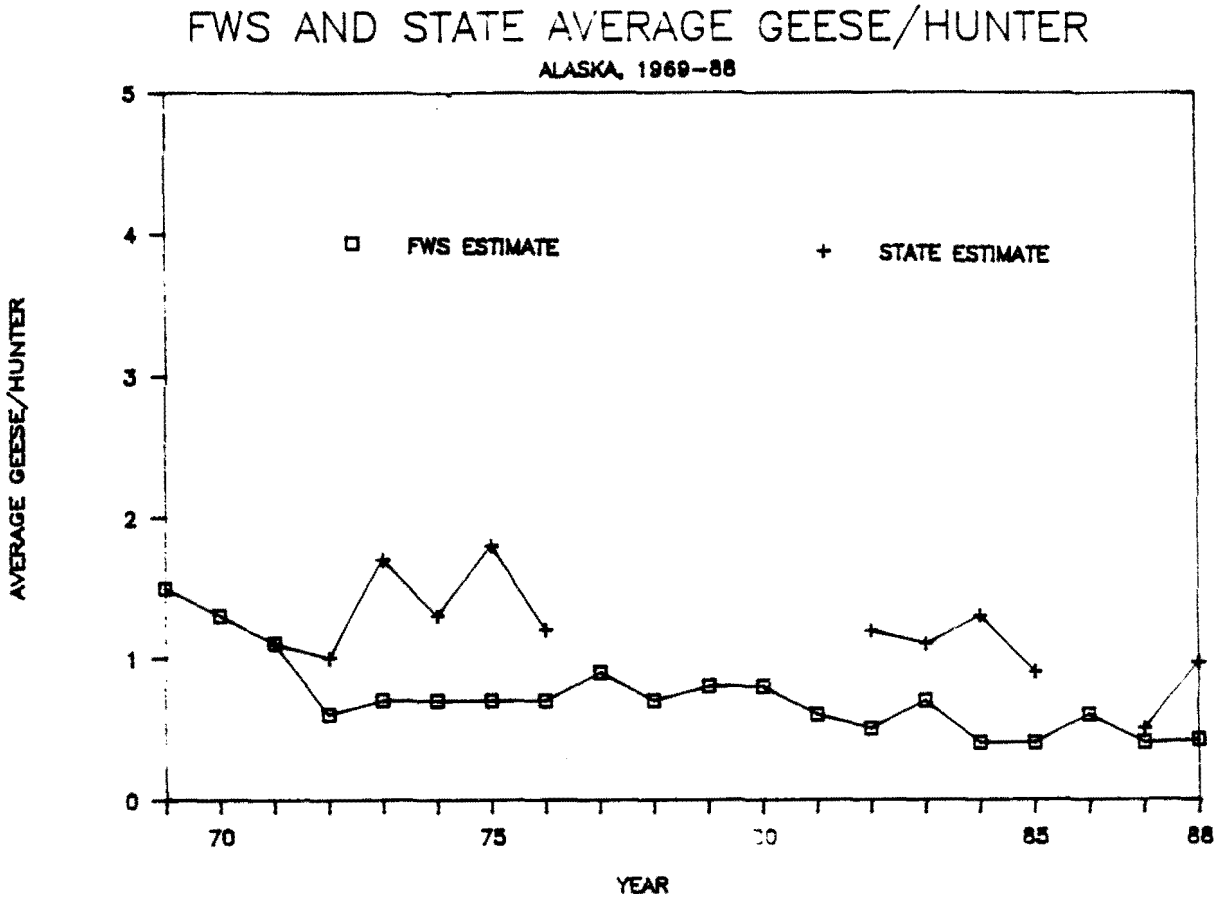
[a] No harvest reported by FWS for the North Slope or Aleutian chain regions.

[b] Includes birds harvested in unknown locations.

Table 6. Composition (%) of the statewide duck harvest in Alaska, 1969-88[a].

| Year | Dabbling ducks | Diving ducks | Sea ducks/ mergansers |
|---|---|---|---|
| 1966 | 86.5 | 10.3 | 3.0 |
| 1967 | 84.6 | 10.1 | 5.1 |
| 1968 | 89.6 | 8.9 | 1.8 |
| 1969 | 83.8 | 10.1 | 6.1 |
| 1970 | 86.0 | 9.0 | 5.0 |
| 1971 | 89.7 | 5.9 | 4.3 |
| 1972 | 90.0 | 7.6 | 2.3 |
| 1973 | 90.5 | 8.7 | 0.9 |
| 1974 | 82.3 | 16.4 | 1.4 |
| 1975 | 88.0 | 5.8 | 6.2 |
| 1976 | 82.6 | 9.5 | 7.9 |
| 1977 | 88.2 | 10.3 | 1.5 |
| 1978 | 82.5 | 11.1 | 6.5 |
| 1979 | 87.5 | 8.2 | 4.2 |
| 1980 | 85.0 | 12.5 | 2.5 |
| 1981 | 87.8 | 9.9 | 2.3 |
| 1982 | 85.4 | 11.0 | 3.6 |
| 1983 | 82.7 | 15.3 | 2.2 |
| 1984 | 88.3 | 9.6 | 1.8 |
| 1985 | 84.0 | 10.9 | 4.9 |
| 1986 | 82.7 | 13.1 | 4.2 |
| 1987 | 84.8 | 10.1 | 5.1 |
| 1988 | 79.7 | 9.7 | 10.6 |
| x | 85.6 | 10.2 | 4.2 |
| S.D. | ±3.0 | ±2.7 | ±2.5 |

[a] Based on FWS parts collection surveys.



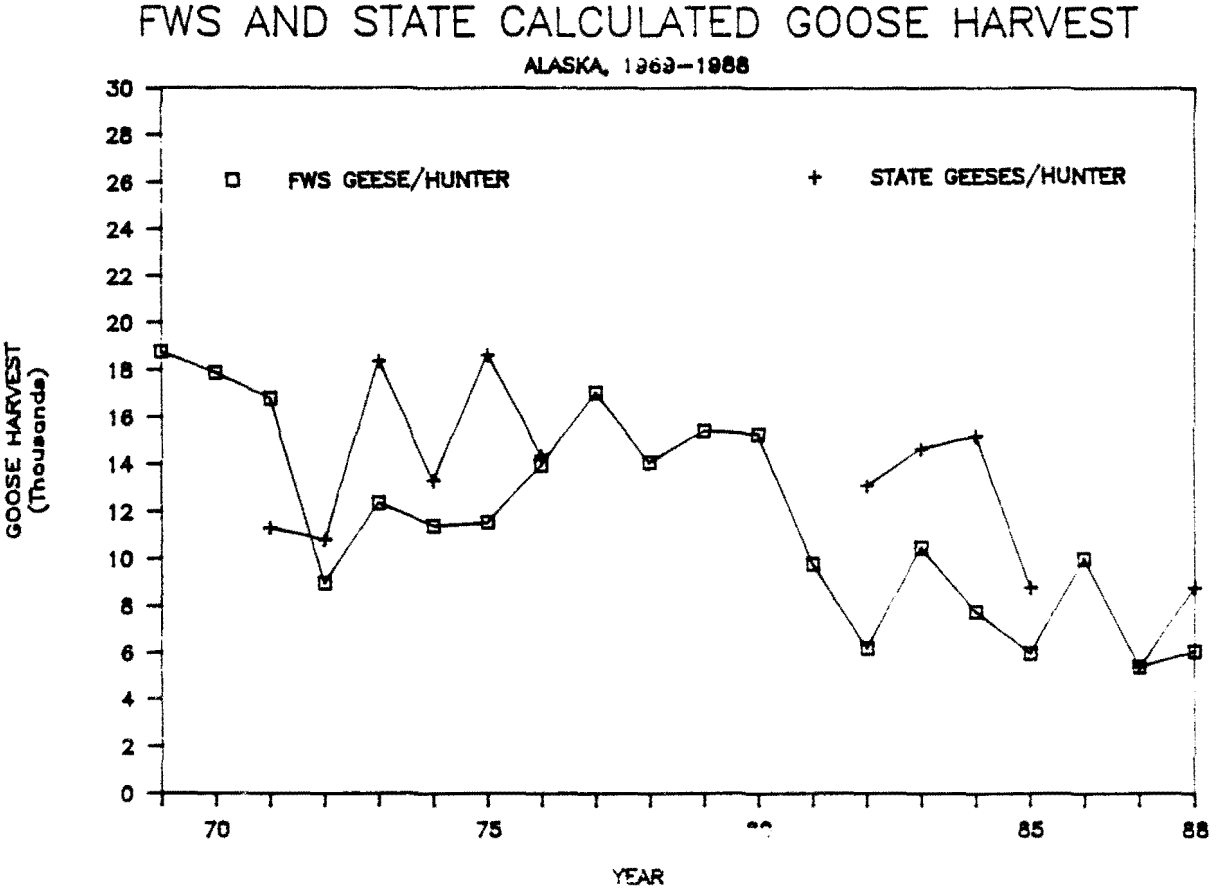




Figure 6. Twenty year trends in average geese/hunter and goose harvest in Alaska as estimated by the State and U.S. Fish and Wildlife Service (FWS).

(Branta canadensis) was by far the most common goose harvested by sport hunters in 1988 (Table 2). This species made up over 80% of the harvest, followed by the white-fronted goose (Anser albifrons) (10%), Pacific brant (Branta bernicula) (7%), and Snow goose (Chen caerulescens) (1%). A small portion of the harvest (< 1%) was composed of emperor geese (Chen canagica) and unknown geese. The FWS estimated that the Canada goose made up 79% of the sport harvest, followed by white-fronted geese (17%), brants (2%), and snow geese (2%) (Martin et al. 1989), compared with a 1987 harvest composition of 83% Canadas, 7% white-fronts, 6% Pacific brants, 3% snow geese, 1% emperors, and 1% unknown (Campbell et al. 1989).

A regional breakdown of the 1988 goose harvest indicates that, similar to the duck harvest, over a one-third of the harvest occurred in Cook Inlet. An additional 13% of the harvest occurred in the central region, followed by 16% on the Alaska Peninsula and 10% in Southeast Alaska (Table 7). Major regions for the Canada goose harvest were Cook Inlet (40%), Alaska Peninsula (24%), Gulf Coast (8%), and Central Alaska (8%). Most of the white-fronted goose harvest (65%) occurred in the central region (midcontinent population), followed by Cook Inlet (26%) with Pacific white-fronts. Most of the Pacific brant harvest took place on the Alaska Peninsula (71%). Snow geese were harvested primarily in Cook Inlet and Southeast Alaska and, while questionable because emperor geese are not common in the area, the only reported emperor goose harvest was in Cook Inlet. Table 8 summarizes the 1988 goose harvest by specific location.

Crane Harvest. A calculated 1,443 sandhill cranes (Grus canadensis) were harvested in 1988 (Table 2), up 42% from 1987 and 18% above the 1971-87 state survey average (Table 9). No estimate of the Alaska harvest was made by the FWS. Approximately 86.3% of the harvest were from midcontinent populations and 13.7% were from the Pacific Flyway population of lesser sandhill cranes (Table 4).

Snipe Harvest. The calculated snipe (Capella gallinago) harvest for 1988 was 1,807 (Table 2), down 32% from 1987 and 50% below the 17-year average (Table 9).

## Literature Cited

Campbell, B. H., and Thomas C. Rothe. 1989. Annual report of survey and inventory activities. Waterfowl. Alaska Dep. Fish and Game. Fed. Aid Wildl. Rest. Vol. XIX, Part XIII, Proj. W-23-1, Study 11.0. Juneau. 42pp.

Martin E. M., A. N. Novara, P. H. Geissler, and S. M. Carney. 1989. Preliminary estimates of waterfowl harvest and hunter activity in the United States during the 1988 hunting season. U.S Fish and Wildl. Ser. Admin. Rep. 8pp.

Voelzer, J. F., E. Q. Lauxen, S. L. Rhodes, and K. D. Norman, eds. 1982. Waterfowl status report. 1979. U.S. Fish and Wildl. Ser. Special Sci. Rep. Wildl. 246:1-96. Washington D.C.

Table 7. Distribution (%) of the fall goose harvest by species and harvest region, 1988-89.

| Region | Canada | White-fronts | Pacific brant | Snow | Emperor | Total |
|---|---|---|---|---|---|---|
| North Slope | 0.1 | 5.7 | 0.0 | 0.0 | 0.0 | 0.7 |
| Seward Peninsula | 4.0 | 0.0 | 6.8 | 0.0 | 0.0 | 3.7 |
| Upper Yukon Valley | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 |
| Lower Yukon Valley | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| Central | 7.8 | 64.8 | 1.7 | 0.0 | 0.0 | 13.2 |
| Yukon Delta | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.1 |
| Cook Inlet | 40.6 | 26.1 | 8.5 | 66.7 | 100.0 | 37.1 |
| Gulf Coast | 7.6 | 1.1 | 3.4 | 0.0 | 0.0 | 6.8 |
| Southeast | 12.4 | 0.0 | 0.0 | 33.3 | 0.0 | 10.5 |
| Kodiak | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Alaska Peninsula | 23.6 | 2.3 | 71.2 | 0.0 | 0.0 | 16.7 |
| Aleutian Chain | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unknown | 0.0 | 0.0 | 6.8 | 0.0 | 0.0 | 0.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table 8. Calculated goose harvest and proportion of the state total for specific locations in Alaska where more than 0.2% of the harvest occurred in 1988-89.

| Location | Calculated harvest | %of state total |
|---|---|---|
| Cold Bay | 2,120 | 24.1 |
| Susitna Flats | 1,117 | 12.7 |
| Palmer Hay Flats | 952 | 10.8 |
| Delta | 662 | 7.5 |
| Chickaloon Flats | 662 | 7.5 |
| Copper River Delta | 486 | 5.5 |
| Minto Flats | 186 | 2.1 |
| Goose Bay | 124 | 1.4 |
| Prince William Sound | 93 | 1.1 |
| Kachemak Bay | 83 | 0.9 |
| Trading Bay | 83 | 0.9 |
| Stikine River Flats | 83 | 0.9 |
| Duncan Canal | 62 | 0.7 |
| Mendenhall | 52 | 0.6 |
| Safety Lagoon | 41 | 0.5 |
| Eielson AFB | 41 | 0.5 |
| Creamer's Field | 41 | 0.5 |
| Potter's Marsh | 41 | 0.5 |
| Portage | 31 | 0.4 |
| Kenai River Flats | 31 | 0.4 |
| Norton Sound | 31 | 0.4 |
| Tok-Northway | 21 | 0.2 |
| Tuxedni Bay | 21 | 0.2 |
| Shishmaref | 21 | 0.2 |
| Montague, Hawkins, Hinchenbrook Is. | 21 | 0.2 |
| Prince of Wales Is. | 21 | 0.2 |
| Rocky Pass | 21 | 0.2 |
| Sitka Area | 21 | 0.2 |
| Subtotals | 7,171 | 81.8 |
| Statewide Totals | 8,781 | 100.0 |

Table 9. FWS and state estimated crane and snipe harvest in Alaska, 1971-88

| Year | Crane | | Snipe | |
|---|---|---|---|---|
| | FWS | State | FWS | State |
| 1971 | -- | 502 | -- | 3,087 |
| 1972 | -- | 765 | -- | 3,498 |
| 1973 | -- | 602 | -- | 1,661 |
| 1974 | -- | 640 | -- | 2,205 |
| 1975 | 288 | 1,642 | -- | 4,318 |
| 1976 | 1,082 | 873 | -- | 7,003 |
| 1977 | 619 | -- | -- | -- |
| 1978 | 312 | -- | -- | -- |
| 1979 | 675 | -- | -- | -- |
| 1980 | 1,049 | -- | -- | -- |
| 1981 | 553 | -- | -- | -- |
| 1982 | 948 | 1,746 | -- | 4,833 |
| 1983 | 903 | 1,805 | -- | 3,476 |
| 1984 | 1,552 | 2,376 | -- | 3,564 |
| 1985 | 642 | 1,270 | -- | 1,597 |
| 1986 | 731 | -- | -- | -- |
| 1987 | 1,206 | 1,014 | -- | 2,654 |
| 1988 | -- | 1,443 | | 1,807 |
| $\bar{x}$ | 812 | 1,197 | -- | 3,445 |
| SD | $\pm$358.5 | $\pm$643.9 | | $\pm$1,557.4 |

# DUSKY CANADA GOOSE STUDIES

GAME MANAGEMENT UNIT: 6

GEOGRAPHIC DESCRIPTION: Copper River Delta

PERIOD COVERED: 1 July 1988 - 30 June 1989

## Introduction

Dusky Canada geese (Brant canadensis occidentalis) are known to nest only on the Copper River Delta and Middleton Island in Alaska and winter primarily in southwestern Washington and the Willamette Valley of Oregon. Until the late 1970's population size, which has ranged from a midwinter index of 7,500-8,000 in 1953 to 28,000 in 1960, was limited by hunting on the wintering grounds. Hunting was responsible for nearly all (95%) of the 45% annual population mortality (Chapman et al. 1969). Band recoveries indicated that about 70% of this harvest occurred in Oregon; the remaining 30% was about equally split between Washington, British Columbia, and Alaska. Production was typically good, and during the mid-1970's the population increased, despite a heavy annual harvest. Around 1979 production dropped off considerably and the population began to decline. Poor response of the population to harvest restrictions between 1983 and the present indicate that conditions influencing production are now limiting the population.

The Dusky Canada Goose Subcommittee of the Pacific Flyway Study Committee was formed in the early 1970's to set objectives and coordinate management of the dusky goose. In 1985 this subcommittee developed a council-endorsed management plan that established a population objective of 20,000 (i.e., based on a midwinter population index) and recommended guidelines for achieving and maintaining that objective. The recommended management procedures in the plan that involve ADF&G are as follows: (1) monitor and describe changes in nest site selection and nest success as related to changes in vegetation; (2) monitor annual nest density and success; (3) conduct annual production surveys and develop fall flight forecasts; (4) mark and band geese annually to monitor population age structure, survival rates, harvest distribution, and support studies on the wintering grounds; and (5) describe and evaluate interactions between habitat change, predator ecology, and production.

## Study Area

The Copper River Delta is an approximately 650-$km^2$ deltaic plain at the mouth of the Copper River on the Gulf of Alaska (Fig. 1). It is bounded on west, north, and east by the Chugach Mountain Range and to the south by the Gulf of Alaska. The area has a typical maritime climate: cool summers, mild winters, and abundant precipitation. Annual precipitation averages 205 centimeters, including 319 centimeters of snowfall; annual

temperatures average 3.4 C, ranging from averages of -5 C in January to 12 C in July.

The major dusky goose nesting area is the approximately 450-$km^2$ west Copper River Delta. This area is interlaced with tidal sloughs; glacial streams; and numerous small, shallow, freshwater ponds between drainages. Plant communities are evolving as a result of uplifting of the area by as much as 2 meters during the 1964 Good Friday earthquake (Potyondy et al. 1975). Currently coastal communities are dominated by freshwater sedge (Carex spp.) meadows interspersed with dense tall shrub (Alnus crispa and Salix spp.) stringers along drainages. Stands of tall shrub and shrub-bog (Myrica gale, Carex spp., and Menyanthes trifoliata) increase in frequency inland from the coast. An Alder, Sitka spruce (Picea sitchensis), and western hemlock (Tsuga heterophylla) community becomes dominant 7-11 km from the coast.

Projects

Monitor and Describe Changes in Nest Site Availability and Selection:

This project was completed in 1988. A final report has been submitted to the Canadian Field Naturalist.

Describe and Evaluate Interactions Between Habitat Change, Predator Ecology, and Production:

A manuscript for a paper summarizing the results of an investigation of the activities of brown bears (Ursus arctos) on the Copper River Delta and their impacts on nesting geese has been submitted to The Journal of Wildlife Management. Manuscripts summarizing the effects of an experimental reduction of bear numbers on dusky goose production and homing of bears translocated off of the Delta are in preparation.

Monitor Nest Densities and Fate:

Methods. The number and size of study plots used to sample nest densities and fates have varied since they were originally established in 1974 (Campbell and Rothe 1989). Seven plots totaling 2.49 $km^2$ were sampled twice in 1989 (Fig. 2). Each was extensively sampled immediately after the peak of incubation and again after the peak of hatch. During the first sampling, clutch size and stage of development (i.e., based on egg flotation) were recorded for active nests (Westerkov 1950). To facilitate relocation, all nests were also marked with wands and their location plotted on large-scale (1:330-1:700) maps. Wands were placed at least 50 feet from the nests to minimize the possibility of attracting predators.

During the second visit, the fates of both previously located and newly discovered nests were determined. Nests in which one or

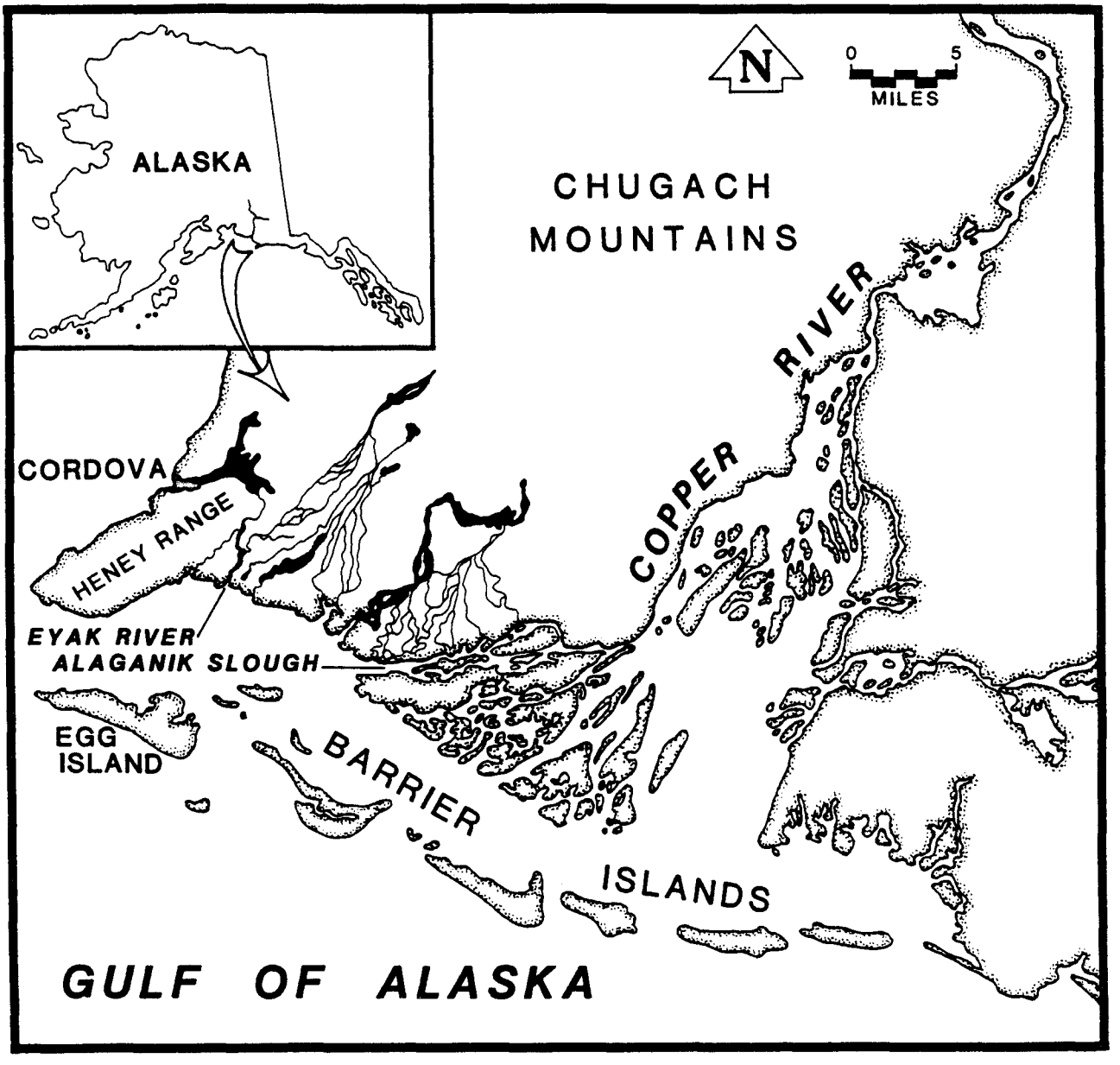



Figure 1. The Copper River Delta, Alaska.

more eggs had hatched were considered successful. Attended nests were considered to be incubating, and nest that were unattended and where egg development had ceased were classified as abandoned. Nest destruction was classified as avian, unknown mammal, canid, or bear, when sufficient evidence allowed, using published characteristics of predation (Darrow 1938, Sooter 1946, Rearden 1951) and techniques applicable to the local area that were developed during the project.

Areas adjacent to the study plots that had similar habitat were searched after the peak of hatch. Nest fate information from these areas was used as a control to determine if the presence of field crews had influenced nest fates on the study plots. Because this project is a cooperative venture, assistance was provided by the Oregon Department of Fish and Wildlife, Washington Department of Wildlife, U.S. Fish and Wildlife Service (Region 1), U.S. Forest Service, and nongovernmental volunteers.

Results. As a result of the Exxon Valdez oil spill, personnel were not available to document the arrival of dusky geese on the Copper River Delta in 1989; however, based on observations by local residents, geese arrived around 20 April. Conditions on the nesting grounds were favorable when they arrived; heavier-than-normal spring snow pack had been removed by above-normal temperatures, and spring appeared to be "early". Unfortunately, about the time nest initiation should have occurred the weather became cold and wet, with frequent below-freezing temperatures and heavy precipitation. As a result, development of vegetation for nest cover was retarded and nest sites became limited because of wet conditions and flooding.

Very few nests were still active when study plots were initially sampled in mid-May, limiting nest initiation and clutch size data. Based on the stage of development of 26 nests, the peak of nest initiation in 1989 was around 11-17 May. A secondary peak, primarily on Egg Island, occurred during the period 22-25 May. Average clutch size ($N = 25$) was $5.3 \pm 1.5$ eggs. The calculated density of nests was $98/mi^2$, down about 16% and 6% from 1988 and the 1980-88 averages, respectively (Table 1).

Nest success was 4.3% in 1989, the poorest success rate on record. Nest predation was the primary cause of this poor success. Avian predators, including ravens, crows, magpies, gulls, and jaegers, were responsible for nearly half of the nest destruction, while brown bears contributed an additional 34% and canids 20% (Table 2). Most of the destruction occurred early in the nesting period, probably before clutches were complete. Of the 70 nests visited during the first sample period, over 70% had already been destroyed. Many of these appeared to have had incomplete clutches of 1-3 eggs.

While control data were difficult to obtain because low nest densities, it appears that the presence of field crews had little influence on the fates of nests on the mainland sample plots.

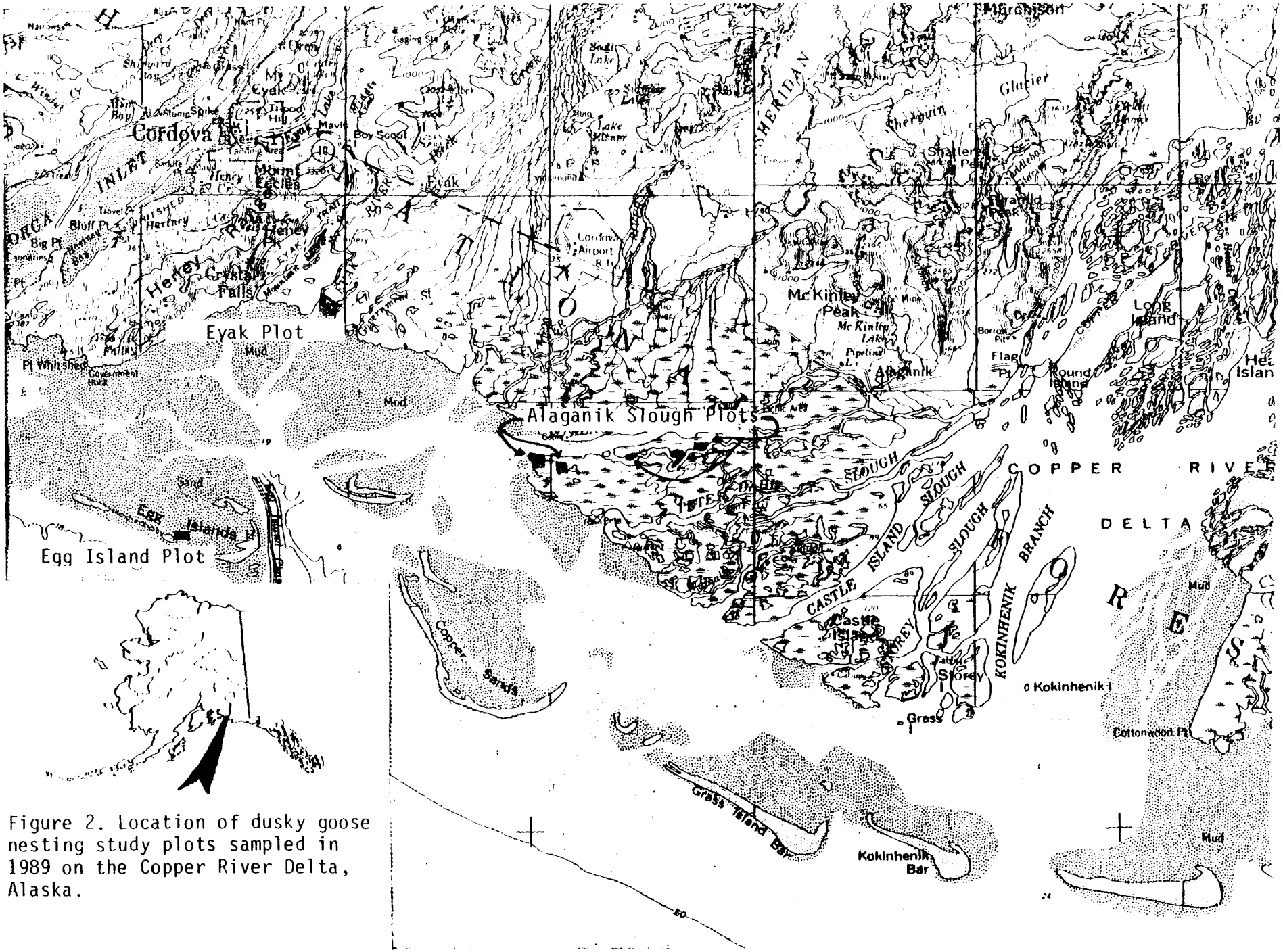



Figure 2. Location of dusky goose nesting study plots sampled in 1989 on the Copper River Delta, Alaska.

Table 1. Dusky Canada goose nest densities, nest success, and average clutch size on the west Copper River Delta, 1959-89.

| Year | Nest density nests/mi$^2$ | Nest Success N | Nest Success % | Clutch Size N | Clutch Size $\bar{x}$ |
|---|---|---|---|---|---|
| 1959 | 105 | 222 | 89.2 | 194 | 5.6 |
| 1964 | | 102 | 82.4 | 114 | 4.3 |
| 1965 | | 221 | 62.9 | 140 | 5.8 |
| 1966 | | 100 | 97.0 | 100 | 4.8 |
| 1967 | 111 | | | | |
| 1968 | | 38 | 86.8 | 75 | 5.1 |
| 1969 | | | | | |
| 1970 | | 164 | 88.2 | 146 | 5.4 |
| 1971 | | 100 | 76.0 | 113 | 3.6 |
| 1972 | | 116 | 81.0 | 92 | 4.4 |
| 1973 | | | | 48 | 4.9 |
| 1974 | | 81 | 82.7 | | |
| 1975 | 179 | 215 | 31.6 | 215 | 4.8 |
| 1976 | 156 | 168 | | 168 | 4.8 |
| 1977 | 175 | 229 | 79.0 | 181 | 5.4 |
| 1978 | 183 | 390 | 56.2 | | |
| 1979 | 133 | 409 | 18.8 | 338 | 5.7 |
| 1980 | 108 | | | 152 | 5.4 |
| 1981 | | | | 28 | 4.9 |
| 1982 | 102 | 158 | 49.2 | 135 | 4.8 |
| 1983 | 91 | 162 | 51.9 | 87 | 5.5 |
| 1984 | 95 | 161 | 75.8 | 123 | 5.6 |
| 1985 | 97 | 168 | 8.9 | 64 | 4.4 |
| 1986 | 119 | 201 | 11.4 | 78 | 4.9 |
| 1987 | 116 | 196 | 23.7 | 121 | 5.2 |
| 1988 | 116 | 111 | 17.3 | 121 | 5.2 |
| 1989 | 98 | 94 | 4.3 | 25 | 5.3 |

The fates of 24 control nests were similar to sample plot nests (Table 2). No control data were obtained for Egg Island.

Predation of adult geese was again a problem in 1989. A calculated 16.7 goose carcasses or kill sites per $mi^2$ were recorded (Table 3). This was down from last year but still considerably above the 1983-88 average of 11.7 $\pm$ 10.1/$mi^2$. The continued high rate of loss was probably related to the absence of alternate prey. Only 1 small mammal was captured on the Alaganik Slough assessment trap lines during 3,600 trap-hours (Table 3).

Production Survey:

Methods. A production survey was conducted on 18 July 1989, using techniques that facilitate development of weighted regression corrections for visual estimates (Campbell et al. 1988). Because of limited biometrics staff and priority of studies associated with the impacts of the Exxon Valdez oil spill, statistical analyses and correction factors have not yet been completed. The production estimate for 1989 is based on visual estimates only.

Results. Conditions were good for flying, with clear sunny skies and light, variable winds; however, the very bright light conditions and temperatures in the high 70's took their toll on the observers. Contrary to 1988 when production was estimated from a sampling of the population, a reasonably complete survey of the west delta and count of geese was obtained during 5.6 hours of survey in 1989. An estimated 5,590 adults and 524 young were observed for an uncorrected production estimate of 8.6% young. This was the second-lowest production estimate on record; only the 3.7% young recorded in 1985 was lower.

Goose Banding and Collaring:

This project has two objectives: (1) maintain a sample of marked geese in the population to facilitate monitoring of population size, age structure, survival rates, harvest distribution and (2) estimate annual collar retention rates in support of studies on the wintering grounds. Assistance was provided by the Washington Department of Game.

Methods. Molting, flightless geese with young were captured by driving them into portable traps with a helicopter. Unmarked geese were banded with FWS leg bands, and approximately 500 birds were fitted with red plastic collars supporting white characters. Previously marked geese were released after their identity has beem determined and recorded. A ratio of the birds retaining collars to those losing them was obtained by comparing leg band numbers and collar status of these geese with original banding records.

Table 2. Fate of dusky Canada goose nests on the west Copper River Delta study area, 1958, 1974-75, 1982-89.

| Year | No. nests | % Successful | % Abandoned | % Fate unknown | % Destroyed | Type destruction: % Mammal | % Avian | % Flooded | % Unknown |
|---|---|---|---|---|---|---|---|---|---|
| 1959[a] | 1,162[b] | 79.6 | 1.8 | 2.0 | 6.0 | 0 | 11.4 | 88.6 | 0 |
| 1974[c] | 81 | 82.7 | 2.5 | ND[d] | 14.8 | ND[d] | --[e] | 0 | ND[d] |
| 1975[c] | 215 | 31.6 | 3.7 | ND[d] | 64.6 | ND[d] | --[e] | 0 | ND[d] |
| 1982 | 158 | 49.2 | 1.8 | ND[d] | 49.0 | 45.0 | 33.8 | 0 | 21.8 |
| 1983 | 162 | 51.9 | 3.7 | 8.0 | 35.2 | 64.8 | 5.6 | 0 | 29.6 |
| 1984 | 161 | 745.8 | 3.1 | 6.2 | 14.9 | 62.4 | 37.6 | 0 | 4.0 |
| 1985 | 258 | 7.0 | 1.9 | 10.9 | 81.0 | 78.8 | 18.4 | 0 | 2.8 |
| 1986 | 201 | 11.4 | 9.0 | 12.5 | 67.2 | 83.7 | 5.2 | 0 | 11.1 |
| 1987 | 213 | 23.9 | 14.1 | 1.0 | 61.0 | 45.6 | 47.3 | 7.0 | 0.2 |
| 1988 | 110 | 17.3 | 3.6 | 17.3 | 61.8 | 53.3 | 40.0 | 6.7 | 0.1 |
| 1989 | 94 | 4.3 | 3.2 | 14.8 | 76.6 | 54.1 | 45.8 | 0.0 | 0.1 |
| 1989 control | 24 | 4.2 | 8.3 | 4.2 | 83.3 | 50.0 | 50.0 | 0.0 | 0.0 |

[a] Trainer 1959

[b] Eggs rather than nests

[c] Bromley 1976

[d] Not reported

[e] Percentages not given, but majority of losses attributed to avian predators.

Table 3. Alternative prey abundance and dusky goose carcass indices for the west Copper River Delta study plots, 1983-89.

| Year | Trap hours | Small mammals captured | Abundance index[a] | Goose carcasses and kill sites | Carcasses/ mi2 |
|---|---|---|---|---|---|
| 1983 | 2,304 | 31 | 13.46 | 3 | 1.7 |
| 1984 | 1,849 | 25 | 13.52 | 4 | 2.3 |
| 1985 | 3,000 | 4 | 1.33 | 17 | 9.8 |
| 1986 | 3,125 | 2 | 0.64 | 34 | 20.1 |
| 1987 | 1,621 | 26 | 16.04 | 15 | 8.9 |
| 1988 | 3,015 | 1 | 0.33 | 26 | 27.1 |
| 1989 | 3,600 | 1 | 0.28 | 16 | 16.7 |

[a] Number of small mammals captured divided by trap-hours multiplied by 1000.

Results. A total of 1,665 geese were captured at 6 locations on the delta between 25 and 27 July (Fig. 3). Three hundred ninety-four had been previously marked, and the remaining 1,271, including 80 goslings, were unmarked. One thousand and eighty-seven birds were marked with FWS leg band, and 492 were also marked with plastic collars (Table 4).

Three hundred ninety-four geese marked between 1984 and 1988 were recaptured in 1989, bringing the 5-year total for recaptures of previously marked geese to 832. While sample size is inadequate for birds marked as goslings, preliminary analysis of data for birds marked as adults indicates that annual retention rates (Table 5) vary significantly and reduce the utility of average retention rates. A logit model of collar retention in adult geese ($G = 10.22$, $df = 9$) indicates that retention rates vary according to sex of the bird, year collared, year of data collection or year of study, and a combination of the year of study and sex of bird. A detailed analysis of collar retention rates is being completed and a manuscript for publication in either the Wildlife Society Bulletin or Journal of Field Ornithology is in preparation.

Goose Transplant:

This was to be the last year of a proposed 3-year transplant of goslings to Middleton Island in the Gulf of Alaska; however, because of the scarcity of goslings, importance of the few goslings that were produced in sustaining the population in the future, apparent poor survival of goslings transplanted to Middleton Island in the past, increasing predation problems on Middleton Island, and apparent expansion of geese that are naturally pioneering on the island, no transplant occurred in 1989.

The results of a 1989 field evaluation of the 1987 and 1988 transplants are presented in the following summary. This evaluation was conducted with cooperation from the FWS and U.S. Coast Guard; it was permitted on private lands by the Chugach Alaska Corporation.

A survey of Middleton Island to determine the size of the summer population of geese on the island, measure goose reproduction, and look for birds transplanted from the Copper River Delta in 1987 and 1988 was conducted on 18 June 1989. The entire Island was covered on foot, and all observations of geese and evidence of habitat use recorded. Weather conditions were ideal for the survey, with clear skies, warm temperatures, and a gentle southeast breeze.

While continual movement of birds and the possibility of multiple counts prevented an actual count, an estimated 150 geese were observed during 8 hours of surveying. Of these, about 85 (56%) were young. Most of the geese were observed at the south end of the island in tidal areas, coastal lowland marshes, beach ridges,

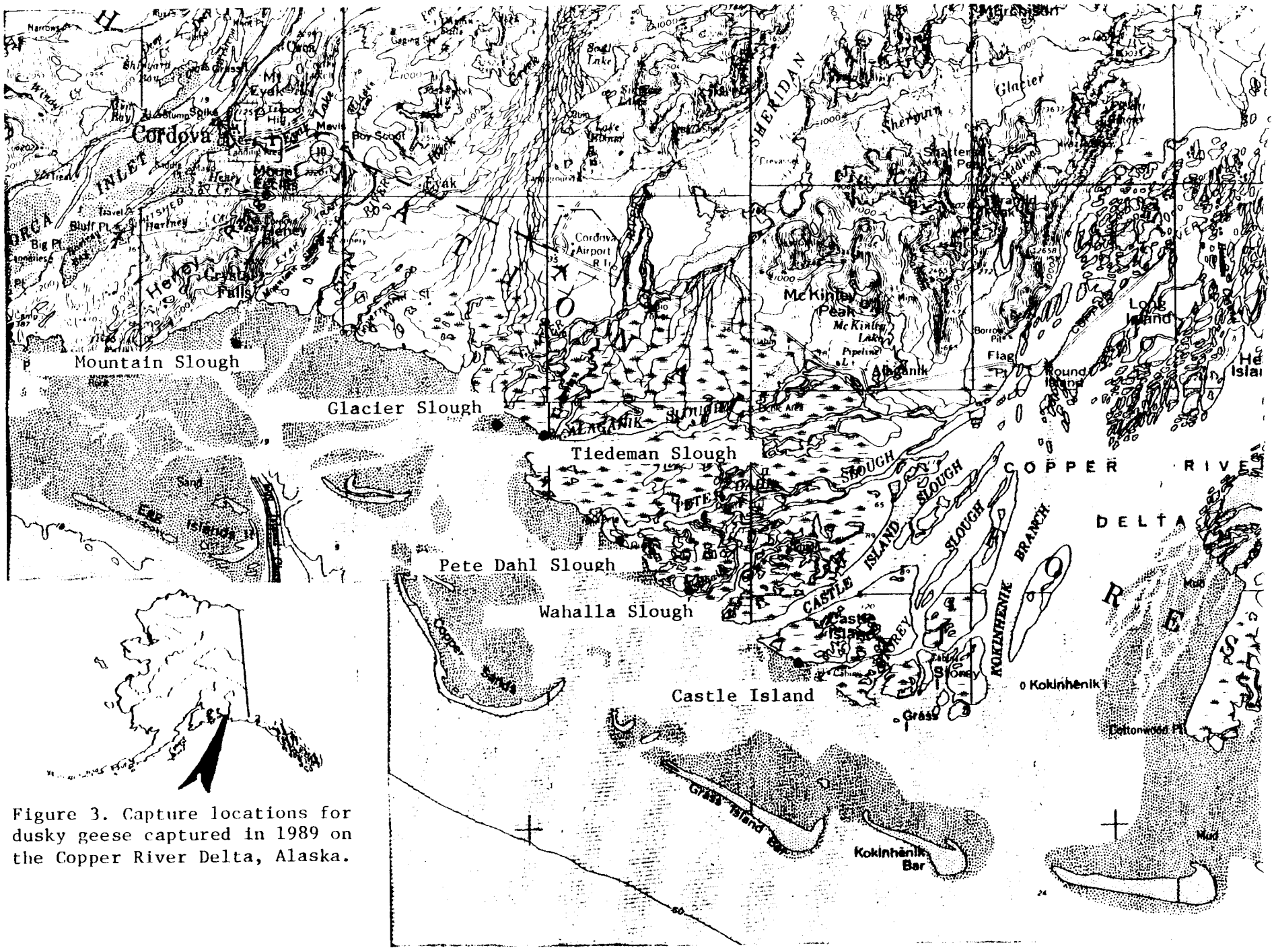



Figure 3. Capture locations for dusky geese captured in 1989 on the Copper River Delta, Alaska.

Table 4. Summary of dusky Canada geese captured and marked on the Copper River Delta, Alaska in 1989.

| Capture location | Total geese captured | Number of recaptures | Banded only[a] | | | | Banded and collared | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AHYM | AHYF | LM | LF | AHYM | AHYF | LM | LF |
| Mountain Slough | 228 | 125 | 0 | 0 | 4 | 7 | 20 | 22 | 8 | 42 |
| Glacier Slough | 126 | 0 | 0 | 0 | 1 | 1 | 60 | 47 | 5 | 12 |
| Pete Dahl Slough | 638 | 150 | 208 | 145 | 0 | 0 | 79 | 56 | 0 | 0 |
| Castle Island[b] | 577 | 90 | 126 | 103 | 0 | 0 | 89 | 52 | 0 | 0 |
| Walhalla Slough[c] | 74 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Teideman Slough | 22 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 1665 | 394 | 334 | 248 | 5 | 8 | 248 | 177 | 13 | 54 |

[a] AHYM = Adult male; AHYF = Adult female; LM = Local Male or male gosling; LF Local female or female gosling.

[b] Includes the capture of 121 (4 recaps) geese for collar retention data only.

[c] Geese not marked, captured for collar retention data.

Table 5. Annual collar retention (%) for adult dusky geese collared on the Copper River Delta between 1984-88.

| Year collared | Sex | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| 1984 | M | 53.8 | 16.7 | 12.5 | 0.0 | 0.0 |
| | F | 25.0 | 90.9 | 83.3 | 88.8 | 85.7 |
| 1985 | M | 96.2 | 93.3 | 57.4 | 40.0 | |
| | F | 96.8 | 95.2 | 95.5 | 90.0 | |
| 1986 | M | 81.8 | 75.0 | 40.0 | | |
| | F | 100.0 | 2.9 | 0.9 | | |
| 1987 | M | 94.7 | 83.3 | | | |
| | F | 93.3 | 93.3 | | | |
| 1988 | M | 95.7 | | | | |
| | F | 96.6 | | | | |

and upland tussock meadows (see 18 June 1987 memo from Campbell to Rothe, and Rausch [1958] for descriptions of habitat types). In contrast to last year when broods were observed in salmon berry thickets at the top of the bluffs, most of the broods were seen in the surf or on tide pools and beaches this year. They may have moved to these areas to avoid survey personnel, because evidence of brooding was found in stands of skunk cabbage and ferns on top of the bluff at the south end of the island.

Little evidence of transplanted geese were found. One goose with a red collar was seen in a flock of 39 birds, but the collar could not be read. More disconcerting evidence of the fates of transplanted goslings was found by USFWS personnel this spring. While searching for evidence of predation on marine birds they discovered 2 metal leg bands under the active bald eagle nest on the northwest side of the island. Both of these bands had been placed on goslings released in 1988. Predation by the eagles plus a rapidly growing glaucous-winged gull colony (Hatch, pers. commun.) suggests that Middleton Island is not as predator-free as was originally thought.

Several miscellaneous observations of interest were also made during the survey. A sandhill crane was observed at the north end of the island, and 3 immature trumpeter swans were seen in the lowland marsh at the south end of the island. A harrier and an unidentified falciform were also seen.

Based on the apparent poor return of transplanted geese, potential for high predation on transplanted birds, poor production on the Copper River Delta this year, and high production by geese on the island, it is recommended that the transplant scheduled for late July of this year be cancelled. Also, pending results of the current effort to identify the genetic relationship of Canada geese along the gulf coast and Southcentral Alaska, a reevaluation of the transplant project may be warranted.

## Literature Cited

Bromley, R. G. H. 1976. Nesting and habitat studies of the dusky Canada goose (Branta canadensis occidentalis) on the Copper River Delta, Alaska. M.S. Thesis. Univ. Alaska, Fairbanks. 81pp.

Campbell B. H. 1988. Habitat availability utilization, and nest success of dusky Canada geese on the Copper River Delta, Alaska. Admin. Rep. Alaska Dep. Fish and Game Anchorage. 45pp.

_____, and T. C. Rothe. 1989. Annual report of survey and inventory activities. Waterfowl. Alaska Dep. Fish and Game. Fed. Aid Wildl. Res. Vol. XIX, Part XIII, Proj. W-23-1, Study 11.0. Juneau. 42pp.

_____, B. H., D. H. Rosenberg, and T. C. Rothe. 1988. Annual report of survey and inventory activities. Waterfowl. Alaska Dep. Fish and Game. Fed. Aid. Wildl. Res. Vol. XVIII, Part XIII, Proj. W-22-6, Job 11.0. Juneau. 75pp.

Chapman, J. A., C. J. Henney, and H. M. Wright. 1969. The status, population dynamics and harvest of the dusky Canada goose. Wildl. Monogr. 18:1-44.

Darrow, R. 1938. Possibilities of recognizing the evidence of predation and the species involved in the remains of grouse and grouse nests found destroyed. Trans. N. Amer. Wildl. Conf. 3:834-838.

Potyondy, J. P., M. P. Meyer, and A. C. Mace Jr. 1975. An analysis of 1964 earthquake effects upon the vegetation and hydrology of the Copper River Delta Alaska. Inst. Ag. Forest, and Home Econ. Remote Sens. Lab. Rep. 75-6. 84pp.

Rausch, R. 1958. The occurrence and distribution of birds on Middleton Island, Alaska. Condor 60:227-242.

Rearden, J. D. 1951. Identification of waterfowl nest predators. J. Wildl. Manage. 15:386-395.

Sooter, C. A. 1946. Habits of coyotes in destroying nests and eggs of waterfowl. J. Wildl. Manage. 10:33-38.

Westerkov, K. 1950. Methods for determining the age of game bird eggs. J. Wildl. Manage. 14:56-67.

# COLVILLE RIVER DELTA SURVEY AND INVENTORY

GAME MANAGEMENT UNITS: GMU 26

GEOGRAPHIC DESCRIPTION: Colville River Delta

PERIOD COVERED: 1 July 1988 - 30 June 1989

## Introduction

The Colville River Delta is the most productive tundra swan breeding area on Alaska's north slope; it is also an important area for black brant colonies, white-fronted geese, and yellow-billed loons. Stemming from concerns about future development of known oil reserves on the delta and encroachment of the Kuparuk Oilfield from the east, intensive waterfowl studies were initiated in 1981. The USFWS conducted baseline habitat and species projects and began regular June breeding-pair and August production surveys for tundra swans in 1982. In 1984 ADFG assumed responsibility for the surveys and coordinated banding and neck-collaring of a sample of swans.

## Methods

June surveys are targeted at midmonth, but they are often delayed until snow patches are gone so that swans can be easily detected. Production surveys are conducted around mid-August because cygnets are large enough to count and molting birds and still flightless. The survey course, replicated since 1982 on both annual surveys, is a 2-mile band along the east bank mainland and a 4-mile coastal band northwest of the delta through the Fish Creek area that covers the entire delta; i.e., a total area of about 493 $km^2$ (190 $mi^2$). Survey lines are spaced 1 mile apart, providing a half-mile recording corridor for the pilot and a right seat observer. A Cessna 206 is flown at 100-120 knots and a nominal altitude of 800 feet AGL. Data are recorded on 1:63,360-scale topographic maps.

## Results and Discussion

Results of the June and August surveys are shown in Tables 1 and 2, respectively. In general, June surveys indicate that about 60 pairs of swans nest annually in the delta, and fluctuations in total swans are related to the number of flocked birds in the region during June. Based on intensive air and ground surveys in 1982 and 1983, only about half the nests are detected on an aerial survey.

The primary factors influencing production are the timing of snowmelt and spring phenology, but flooding in some years and Arctic fox (Alopex lagopus) predation contribute to nest losses. Total swans in August also fluctuate as a result of the number of swans in groups. Since 1985 number of groups, grouped swans, and

Table 1. Composition of tundra swans, potential pairs, and nests on the Colville River Delta, Alaska observed during June aerial surveys.

| Year | Total singles | Singles +nest | Pairs | Group swans | Groups | Total swans | Potential pairs[a] | Nests[b] |
|---|---|---|---|---|---|---|---|---|
| 1982[c] | 31 | 17 | 17 | 29 | 6 | 94 | 34 | 28(+23) |
| 1983 | 58 | 25 | 45 | 101 | 9 | 249 | 70 | 47(+12) |
| 1984 | 73 | 21 | 48 | 115 | 5 | 284 | 69 | 25 |
| 1985 | 61 | 15 | 73 | 68 | 12 | 275 | 88 | 26 |
| 1986 | 39 | 16 | 55 | 31 | 4 | 180 | 71 | 27 |
| 1987 | 70 | 21 | 46 | 26 | 5 | 188 | 67 | 31 |
| 1988 | 62 | 24 | 49 | 32 | 5 | 192 | 73 | 31 |
| 1989 | 70 | 19 | 51 | 4 | 1 | 176 | 70 | 25 |
| AVG | 58.0 | 19.8 | 48.0 | 50.8 | 5.9 | 204.8 | 67.8 | 30.0 |

[a] Potential pairs = pairs + singles at nests.
[b] Additional nests found by ground survey in parentheses.
[c] Fog precluded survey of 15 miles square of Colville River east shore (91 percent coverage).

Table 2. Composition of tundra swans, number of broods, and average brood size on the Colville River Delta, Alaska observed during August aerial surveys.

| Year | Singles | Pairs | Group swans | Groups | Cygnets | Total swans | Broods | Average brood |
|---|---|---|---|---|---|---|---|---|
| 1982 | 7 | 69 | 105 | 20 | 87 | 337 | 35 | 2.49 |
| 1983 | 10 | 72 | 98 | 20 | 119 | 371 | 47 | 2.53 |
| 1984 | 13 | 67 | 90 | 16 | 41 | 278 | 18 | 2.28 |
| 1985 | 29 | 71 | 67 | 13 | 74 | 312 | 28 | 2.64 |
| 1986 | 15 | 61 | 108 | 18 | 28 | 273 | 14 | 2.00 |
| 1987 | 14 | 82 | 45 | 9 | 68 | 291 | 30 | 2.27 |
| 1988 | 27 | 59 | 14 | 3 | 52 | 211 | 24 | 2.17 |
| 1989 | 24 | 64 | 58 | 9 | 40 | 250 | 20 | 2.00 |
| AVG | 17.4 | 68.1 | 73.1 | 13.5 | 63.6 | 290.4 | 27.0 | 2.36 |

total swans have been lower than those in previous years, possibly suggesting that banding activities and/or field crews from concurrent studies throughout the summer may have caused relocation of swans off the delta. Experience from banding indicates that the majority of flocked birds are subadults that may be easily displaced prior to molting.

Data from this project have been used in local resource plans and the Environmental Protection Agency's advanced identification project for identifying sensitive wetland habitats, and they will continue to provide a baseline on swan productivity for monitoring eventual petroleum development. Jim Helmericks of Golden Plover Air has been an invaluable pilot and skilled observer as well as a source of detailed natural history information on the Colville Delta's bird life.


**Federal Aid Project**
funded by your purchase of
hunting equipment