ALASKA - YUKON

WATERFOWL BREEDING POPULATION SURVEY

May 15 to June 7, 2005

By
Bruce Conant
Deborah J. Groves

U.S. Fish and Wildlife Service
Juneau, Alaska
TITLE: Waterfowl Breeding Population Survey:
Alaska-Yukon (Crew Area 1)

STRATA COVERED: 01, 02, 03, 04, 05, 06, 07, 08,
09, 10, 11, 12

DATES: May 15 to June 7, 2005

DATA SUPPLIED BY: Bruce Conant and Deborah J. Groves
U.S. Fish and Wildlife Service, Juneau, Alaska

ABSTRACT

Alaska and the Yukon Territory generally experienced another widespread, early spring breakup,
except for the North Slope which was late and the Old Crow Flats where perhaps more normal
phenology occurred. There was some flooding along some of the major rivers. Generally, favorable
waterfowl production is anticipated for most of Alaska this year.

Calculated total duck populations decreased in size from 2004. Generally, dabblers, divers and the
miscellaneous categories all decreased in size. Some flocked waterfowl were again encountered.
Changes in duck populations by category are as follows. Dabblers are down 6% from last year, are
5% below the 10-year average, and are 59% above the long-term mean. Divers are down 12% from
2004, down 3% from the 10-year average, and are up 9% from the long-term mean. Miscellaneous
are down 6% from 2004, equal to the 10-year average, and are down 17% from the long-term mean.
Total ducks are down 7% from 2004, down 4% from the 10-year average, and are 31% above the
long-term mean.

Overall, goose production should be excellent.

Trumpeter swan production should be excellent while tundra swan production should be excellent as
well on the western tundra but perhaps only fair at best on the North Slope.

INTRODUCTION

This year Waterfowl Management - Juneau completed the 49th consistent, standardized waterfowl
breeding population survey in Alaska. This data set continues to increase in value as a basis for
continental, flyway, and state-wide management of the waterfowl resource. The continuation of this
historic survey is highly recommended.

We are indebted to John Pribbenow, Daryl Carson, Wade Smith, Brian Milbrett and others at OAS
for providing vital maintenance for the aircraft. Doug Alcorn, Russ Oates, Bill Smoke and others in
the regional office provided needed support. Special thanks to Ed Mallek, Mike Rearden, Daryle
Lons, Mike Spindler, Bill Schaff, Lee Anne Ayres, Sally Jo Collins and Sandra Siekaniec for
providing housing and/or vehicles or other logistical support.
METHODS

Survey methods follow "Standard Operating Procedures for Aerial Waterfowl Breeding Ground Population and Habitat Surveys in North America", as revised in 2001. Pond data presented in Table 9 are three year averages from past pond counts using standard methods.

Again this year, positions were captured for all observations with a computer program developed by Jack Hodges. This was accomplished with two computers that are an integral part of the panel of the specially modified de Havilland Turbo Beaver aircraft. A moving map program also developed by Jack was used in conjunction with preprogrammed routes in the GPS to aid in navigation down transect lines. The combination of these two innovations was especially user friendly and significantly reduced the pilot workload again this year. A new computer transcribe program developed by Jack further eased the transcription workload for both observers.

The combination of GPS navigation, experimental satellite transmission of data to ground based computers, and recent advances in voice recognition technology offer enticing possibilities for the future. Perhaps someday soon voice observations attached to precise locations from anywhere over the earth can be sent directly from survey aircraft instantaneously to computers anywhere on the planet. At such a time, one could watch the results of the North American Waterfowl Population Survey accumulate before one's eyes at a computer screen at command central at Laurel, Maryland.

Data entry into laptop computers, in the field, has now become the standard operating procedure for continental aerial waterfowl surveys. All stratum summaries and tables for this report were again computer generated. Data were provided to the Division of Migratory Bird Management (DMBM) via electronic mail from Anchorage after completion of the survey.

The survey design contains 12 strata with 232 segments. Because of poor flying weather, the Copper River Delta (stratum 07) was not surveyed this year and an average was included in this year’s results. The Alaska unit contains 214 segments each 16 miles in length and 10 segments each 8 miles in length. The Yukon unit has 8 segments each 18 miles in length. All segments were flown again in the usual sequence in 2004.

A six year (1986-1991) helicopter-fixed wing comparison study in Alaska resulted in the development of new visibility correction factors (VCFs). New average rates specific for waterfowl habitats in Alaska; boreal forest (strata 1-7), tundra (strata 8-11) and the Old Crow Flats in Canada (stratum 12) were employed starting in 1992 and also were applied to the historical data set.

Because of a slight difference in the application of the VCFs for a few specific years (1986-1991), the data presented here are slightly different for some species for those years than those presented by DMBM. Both interpretations reflect a major step in the direction of presenting a more accurate picture of continental duck populations for the last 50 years. Also, in our analyses we do not apply any VCF to Canada goose observations as DMBM does. In 2002 a decision was made by our Waterfowl Management Branch in Alaska to double all observations of single geese in calculating indicated total geese. Historical tables have been recalculated to reflect this change. Beginning in 2002, DMBM also started deleting all flock sightings of over 45 from the calculation of continental population indices while the results reported here include these flocked observations.
WEATHER AND HABITAT CONDITIONS

This year a generally widespread, early spring breakup occurred throughout Alaska except for the North Slope (which was late) and the Old Crow Flats in the Yukon Territory (which had a more normal phenology). Ice melt and vegetation green up appeared very early and almost no snow cover was observed on the waterfowl nesting habitat during the survey.

Brina Kessel reported ice melt and leaf out in paper birch at Ballaine Lake near Fairbanks were on the very early side of early this year. Normal flooding was encountered on the Koyukuk and Innoko Rivers as well as on the lower Yukon, Kobuk and Selawik Rivers.

BREEDING POPULATION ESTIMATES

A. **Ducks:** Changes in selected species and groups are as follows with all species presented in Table 2 (numbers in thousands).

<table>
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<tr>
<th>Species</th>
<th>2005 Indices</th>
<th>2004 Indices</th>
<th>Percent Change From 10-year mean 1</th>
<th>Percent Change From long-term mean 2</th>
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<tr>
<td>Mallard</td>
<td>703.3</td>
<td>- 13</td>
<td>+ 1</td>
<td>+ 93</td>
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<tr>
<td>Wigeon</td>
<td>873.2</td>
<td>- 3</td>
<td>- 11</td>
<td>+ 68</td>
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<tr>
<td>G.W. Teal</td>
<td>713.1</td>
<td>- 13</td>
<td>- 7</td>
<td>+ 94</td>
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<td>Shoveler</td>
<td>666.2</td>
<td>+ 4</td>
<td>+ 5</td>
<td>+147</td>
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<tr>
<td>Pintail</td>
<td>905.5</td>
<td>- 2</td>
<td>- 8</td>
<td>n.c.</td>
</tr>
<tr>
<td><strong>Total Dabblers</strong></td>
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<td>- 6</td>
<td>- 5</td>
<td>+ 59</td>
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<td>Canvasback</td>
<td>95.1</td>
<td>- 55</td>
<td>- 23</td>
<td>+ 4</td>
</tr>
<tr>
<td>Scaups</td>
<td>960.8</td>
<td>- 4</td>
<td>- 3</td>
<td>+ 4</td>
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<tr>
<td>Bufflehead</td>
<td>51.7</td>
<td>+ 18</td>
<td>+ 18</td>
<td>+ 18</td>
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<tr>
<td><strong>Total Divers</strong></td>
<td>1247.4</td>
<td>- 12</td>
<td>- 3</td>
<td>+ 9</td>
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<tr>
<td>Long-tailed Duck</td>
<td>66.3</td>
<td>- 20</td>
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<td>- 52</td>
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<td>Eiders</td>
<td>7.9</td>
<td>- 55</td>
<td>- 42</td>
<td>- 72</td>
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<tr>
<td>Scoters</td>
<td>350.2</td>
<td>- 5</td>
<td>+ 4</td>
<td>- 7</td>
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<tr>
<td><strong>Total Miscellaneous</strong></td>
<td>460.7</td>
<td>- 6  n.c.</td>
<td></td>
<td>+ 17</td>
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<tr>
<td><strong>TOTAL DUCKS</strong></td>
<td>5574.9</td>
<td>- 7</td>
<td>- 4</td>
<td>+ 31</td>
</tr>
</tbody>
</table>

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1 Average for Alaska-Yukon (strata 1-12) for 1995-2004.

2 Average for Alaska-Yukon (strata 1-12) for 1957-2004.
This year’s waterfowl population estimates should again be viewed with caution. Our survey timing was normal this year but, because of the very early arrival of spring, the migration of waterfowl from southern wintering areas was probably advanced for some species such as interior scoters and scaup.

Total dabbler populations decreased from last year but remain above the long term mean. All population estimates for the major dabbler species decreased except for those for shovelers which increased slightly.

Canvasback populations decreased significantly from last year and the previous ten year average and included some flocked birds. Bufflehead numbers increased from last year and are above both averages. Total scaup numbers decreased slightly from 2004 and are near both averages. The following graphs illustrate recent scaup trends (minus the North Slope).

Based on a small sample, the eider index decreased significantly from last year and remains below the long term average. It should be noted that all of the eiders identified to species again this year were common eiders.
Long-tailed duck numbers decreased from last year and are significantly below both averages. We are encouraged that the downward slide is being investigated. Here is a graphic presentation of the last 29 year trend in the long-tailed duck index (minus the North Slope).

Interior scoter numbers may be misleading but total scoter populations decreased from those for last year and are above the 10 year average and below the long term mean. Special scoter surveys underway on the Yukon Flats and the Yukon Delta will better evaluate scoter populations. A graph of the scoter index over the last 29 years is presented below (minus the North Slope).
Historical data from this survey, 1957-1994, have been analyzed and a major paper detailing the results has been published \( \text{(Hodges et al, 1996)} \). Two lines were fitted to the duck data because of the increased visibility from the use of the turbine beaver (N-754) beginning in 1977. Because of the need to partition all of the historical duck data into two parts (1957-1976/1977-present), the comparisons to just long-term averages presented above may be misleading.

The generally early arrival of spring in Alaska with just normal flooding will enhance waterfowl production south of the Brooks Range. Overall, excellent duck production is anticipated from a major portion of these northwestern areas in 2005. The results of similar surveys on the North Slope of Alaska will be reported separately.

Intensive waterfowl breeding population surveys have been conducted over all the major tundra habitat in Alaska during the last decade. A detailed comparison of the results of these expanded surveys over the years with this historical survey is underway for all of our tundra strata. The comprehensive duck production surveys conducted in recent years in Alaska remain on hold. A detailed analysis and summary report of those surveys are in progress.

The pintail has traditionally been Alaska's most numerous dabbling species and in recent years a significant proportion of Pacific Flyway pintails have been tallied in Alaska. The following graph depicts pintail populations measured in Alaska-Yukon (minus the North Slope) in relation to continental (strata 1-50) populations since 1955. Fitted lines show a dramatic decline in continental populations since 1969 (\( p<.01 \)) and a slight increase in Alaska populations (\( p=.07 \)) over the history of the survey. This year Alaska-Yukon hosted 35% of the continental index. We are encouraged by the recent creation of a Pintail Action Group to bring attention to the continental decline.

![Pintail Populations](image-url)

- Alaska-Yukon (Strata 1-12)
- Continental (Strata 1-50)
This survey was designed for ducks but other species (geese, swans, cranes, loons, grebes) are recorded routinely and an impression of their welfare is developed from our observations and the reports of others in the field.

B. **Geese:**

The following graph depicts the trend of all geese recorded on the 5 segments of the duck survey within the coastal zone of the Yukon-Kuskokwim Delta (actual geese seen on transect only). One year, 1964, was excluded because of the extreme weather conditions experienced that year (King and Conant 1983). Two lines were fit to these data (first 1957-1984, second 1985-2004). Restricted hunting regulations were first employed in 1984 and in subsequent years within the Yukon-Kuskokwim Delta Goose Management Plan. Thus data for 1985 and the years following probably reflect a response of goose populations (mostly white-fronts and cacklers) to those restrictions. The recent, dramatic upward trend is heartening and continued surveys in the years ahead will reveal whether populations can be maintained or even increased from former levels as hunting effort increases. The dramatic decline depicted in 2002 is thought to be a result of an unusual spring migration.

![COASTAL GEESE SEEN ON TRANSECT](image)

Probably an excellent rate of goose production can be expected south of the Brooks Range.

A progress report by Migratory Birds - Anchorage will detail the results of the nineteenth year of an intensive aerial survey program on the coastal goose nesting zone of the Yukon-Kuskokwim Delta.
The specialized survey for Dusky Canada geese that this project had flown for 8 continuous years (1983-1990) was discontinued in 1991. The more extensive survey flown on the Copper River Delta by Migratory Birds - Anchorage since 1986 is now the breeding population survey which best monitors this nesting population. The results of that effort will be detailed elsewhere.

Little specific information on other populations of white-fronted and lesser Canada geese is available, but production should, on the whole, be excellent for interior Alaska.

C. **Swans:**

1. Trumpeter - A census of Trumpeters, after hatching, on the breeding grounds in Alaska in 2000 found 17,155 total swans. Swan observations from boreal forest strata (1-4, 6 and 7) on the duck survey in 2005 suggest a population of 12,100 adults and sub adults (includes 1,500 from 2004 for stratum 7), a slight decrease from last year which may be a reflection of the mounting losses to lead poisoning in western Washington and southwestern British Columbia in recent years. A census of Trumpeters in Alaska, planned for this August, can better detect suspected changes in the population size. Production this year should generally be excellent in Alaska.

2. Tundra - The population index this year from the tundra strata (8-11), not including the North Slope, is 141,700; 38% below last year and 6% above the 10-year average. The breeding index (singles and pairs) is 73,900; down 1% from 2004 and 6% below average. The total number of swans sighted with nests is down 9% from last year's and is 5% above the 10 year average. Overall, excellent production is expected from tundra swans in western Alaska in 2005.

D. **Cranes:**

The Sandhill Crane index in 2005 was 33,100 for Alaska, down 22% from 2004 and 27% below the 10-year average.

E. **Loons:**

1. The 2005 Red-Throated Loon index for Alaska was 10,000, down 11% from 2004 and 14% above the 10-year average.

2. The 2005 Pacific Loon index for Alaska was 43,200, down 19% from 2004 and 13% below the 10-year average.

3. The 2005 Common Loon index for Alaska was 10,500, down 7% from 2004 and 12% above the 10-year average.
CONCLUSION

The generally widespread, early arriving spring breakup in Alaska should result in generally excellent waterfowl production except on the North Slope of Alaska and the Old Crow Flats in the Yukon.

Perhaps an advanced spring waterfowl migration of a few species (diving and miscellaneous ducks) resulted in population estimates of these species which are not strictly comparable to past years. Generally excellent waterfowl production in this northwestern corner of the North American continent can be expected.

TELEMETRY

A Telonics, telemetry, receiver-scanner is an integral component of the special survey aircraft used. Throughout the survey we listened for a list of frequencies of radio transmitters put on scoters south of Alaska. Extensive coverage of most waterfowl nesting habitats in Alaska (except the North Slope) plus the Old Crow Flats in the Yukon was accomplished during the course of this survey but for most of the trip we were at low level (where reception is limited). The following signals were received.

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<th>Frequency</th>
<th>Date</th>
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<tr>
<td>167.020</td>
<td>5/15</td>
<td>22 nm NE of Kenai</td>
</tr>
<tr>
<td>167.998</td>
<td>5/26</td>
<td>15 nm SW of Fairbanks</td>
</tr>
<tr>
<td>168.030?</td>
<td>5/28</td>
<td>85 nm S of King Salmon (we recorded 164.030)</td>
</tr>
<tr>
<td>165.282</td>
<td>5/29</td>
<td>32 nm S of Dillingham</td>
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<td>167.556</td>
<td>5/29</td>
<td>34 nm SE of Bethel</td>
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<td>166.596</td>
<td>6/03</td>
<td>92 nm SW of Kotzebue (we recorded 164.596)</td>
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<td>166.094</td>
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<td>90 nm NE of Fairbanks</td>
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<tr>
<td>166.007</td>
<td>6/05</td>
<td>37 nm N of Fairbanks</td>
</tr>
</tbody>
</table>

Note: No double beats were noticed on any of these receptions.

LITERATURE CITED

ADDENDUM

The following figures show the relative distribution and abundance by stratum of total scoter populations for 2005 (Figure 1) and the relative species composition of the three species of scoters identified within each stratum (Figure 2). Note that total populations are calculated from counts within the whole transect width (200 m each side of the flight line) while species composition was calculated from counts only within the closest half of the transect width (100 m each side of the flight line).

Also attached is Figure 3 with graphs showing the historical trends of the most numerous waterfowl species recorded. The graphs include strata 1-12, except for swans as noted. Note that not all species were counted from the beginning of aerial surveys in 1957. Caution should be exercised in viewing these graphs because of the visibility factor mentioned above with the introduction of the special survey aircraft in 1977.
Figure 1. The relative abundance and distribution of total scoter populations in Alaska-Yukon Strata 1-12 from the air survey in 2005. Populations are calculated using data from the full transect width (200 m each side of the flight line). Copper Delta stratum was not flown in 2005.
Figure 2. The relative species composition of the three species of scoters in Alaska-Yukon Strata 1-12 from the air survey in 2005. The species composition was calculated from counts only within the closest half of the transect width (100 m each side of the flight line). N = the number of indicated birds that were identified to species. Copper Delta stratum was not flown in 2005.
Figure 3. Historical trends for selected species or groups for strata 1-12 (except as noted) from Alaska-Yukon Breeding Population Surveys.
Figure 3. (Continued)
Figure 3. (Continued)
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<td>89.0</td>
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* 1-7 Interior Alaska Taiga; 8-11 Coastal Alaska Tundra; 12 Old Crow Flats, Yukon Territory, Canada
### Table 3. Alaska. Ten year trend in tundra swan breeding population observations, 1996 - 2005 (estimates in thousands).

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Note: There are additional tundra swans nesting in Alaska outside of these strata. Actual swans observed are expanded for area only.

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Note: There are additional red-throated loons nesting in Alaska - Yukon outside of these strata. Actual red-throated loons observed are expanded for area only.

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Note: There are additional Pacific loons nesting in Alaska – Yukon outside of these strata. Actual Pacific loons observed are expanded for area only.
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Note: There are additional common loons nesting in Alaska - Yukon outside of these strata. Actual common loons observed are expanded for area only.
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<td>102.308</td>
<td>137.500</td>
<td>111.458</td>
<td>54.722</td>
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Note: Stratum 7 has 8 mile segments; stratum 12 has 18 mile segments.
Table 9. Relationship of total ducks to square miles of habitat and number of ponds in 2005.

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<th>Sq. Miles of Habitat</th>
<th>Number of Ponds (thousands)</th>
<th>Total Ducks (thousands)</th>
<th>Ponds per Sq. Mi.</th>
<th>Ducks per Sq. Mi.</th>
<th>Ducks per Pond</th>
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<td>3. Tanana-Kusko.</td>
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</table>

| 8. Bristol Bay        | 9900                        | 209.3                   | 499.3             | 21.1             | 50.4           | 2.4           |
| 9. Yukon Delta        | 26600                       | 960.1                   | 1678.4            | 36.1             | 63.1           | 1.7           |
| 10. Seward Pen.       | 3850                        | 94.1                    | 291.2             | 24.4             | 75.6           | 3.1           |
| 11. Kotzebue So.      | 5350                        | 87.8                    | 403.3             | 16.4             | 75.4           | 4.6           |
| **Subtotal - Tundra** | **45700**                   | **1351.3**              | **2872.2**        | **29.6**         | **62.8**       | **2.1**       |

| **TOTAL - ALASKA**    | **79800**                   | **1788.9**              | **5291.9**        | **22.4**         | **66.3**       | **3.0**       |

| 12. Old Crow Flats    | 1970                        | 27.1                    | 283.0             | 13.8             | 143.7          | 10.4          |

Note: Number of ponds is averaged from 1982-1984 transect counts. Totals are for surveyed areas only.
### Waterfowl Breeding Population Survey

**Stratum: 1**  
**Kenai-Susitna**

**Dates:** 5 / 15 / 2005 thru 5 / 15 / 2005

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<th>Species</th>
<th>Drakes</th>
<th>Pairs</th>
<th>Birds</th>
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<th>TOTAL</th>
<th>VISIBILITY</th>
<th>POPULATION</th>
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**Computation of the Population Index**

\[
P = \frac{P}{\text{INDICATED}} = \frac{P}{(T)} = \frac{(T/S1) \times V}{(P)}
\]

a Drakes not doubled in arriving at indicated total birds (T).

---

\[\text{DATES: 5/15/2005 THRU 5/15/2005}
\]

\[\text{WATERFOWL BREEDING POPULATION SURVEY}
\]

---

\[\text{STRATUM: 1}
\]

---

\[\text{KENAI-SUSITNA}
\]

---

\[\text{TOTAL: 79168}
\]

---

\[\text{INDICATED: 4589}
\]

---

\[\text{VISIBILITY: 2.1}
\]

---

\[\text{POPULATION INDEX: 20.2}
\]

---

\[\text{NUMBER OF OBSERVED PONDS (x2): 0}
\]
## WATERFOWL BREEDING POPULATION SURVEY

**STRATUM: 2**

**NELCHINA**

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### COMPUTATION OF THE POPULATION INDEX

- $P = \text{POPULATION INDEX}$
- $A = \text{SQUARE MILES IN THE STRATUM}$
- $T = \text{INDICATED TOTAL BIRDS}$
- $S = \text{SQUARE MILES IN THE SAMPLE}$
- $V = \text{VISIBILITY RATIO}$

\[
P = A \times \left( \frac{T}{S} \right) \times V
\]

a Drakes not doubled in arriving at indicated total birds (T).
### Waterfowl Breeding Population Survey

**Stratum: 3**  
**Tanana-Kuskokwim**

**Dates:** 5/18/2005 thru 5/27/2005

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**Computation of the Population Index**

\[
P = \text{Population Index}
\]

\[
A = \text{Square Miles in the Stratum}
\]

\[
T = \text{Indicated Total Birds}
\]

\[
S = \text{Square Miles in the Sample}
\]

\[
V = \text{Visibility Ratio}
\]

\[
P = A \times (T/S) \times V
\]

---

*Drakes not doubled in arriving at indicated total birds (T).*

---

27
### Waterfowl Breeding Population Survey

**Dates:** 5 / 20 / 2005 THRU 5 / 20 / 2005

**Stratum:** 4  
**Location:** Yukon Flats

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\[ p = \frac{A \times (T/S) \times V}{P} \]

---

a Drakes not doubled in arriving at indicated total birds (T).

---

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### Waterfowl Breeding Population Survey

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**Dates:** 5/27/2005 thru 5/27/2005

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**Computation of the Population Index**

- \( P = \text{Population Index} \)
- \( A = \text{Square Miles in the Stratum} \)
- \( T = \text{Indicated Total Birds} \)
- \( V = \text{Visibility Ratio} \)
- \( P = A \times (T/S) \times V \)

\( a \) Drakes not doubled in arriving at indicated total birds (T).
### WATERFOWL BREEDING POPULATION SURVEY

**DATE**: 5 / 21 / 2005 THRU 5 / 21 / 2005

**STRATUM**: 6

**KOYUKUK**

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### COMPUTATION OF THE POPULATION INDEX

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Drakes not doubled in arriving at indicated total birds (T).

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**DATES**: 5 / 21 / 2005 THRU 5 / 21 / 2005

**WATERFOWL BREEDING POPULATION SURVEY**

**STRATUM**: 6

**KOYUKUK**
### Waterfowl Breeding Population Survey

**Dates:** 5/27/2005 thru 5/29/2005

**Stratum:** 8  
**Bristol Bay**

---

#### Computation of the Population Index

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**Notes:**

- Drakes not doubled in arriving at indicated total birds (T).

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### COMPUTATION OF THE POPULATION INDEX

\[
P = \text{Population Index} = \text{Number of Observed Ponds (x2)} 
\]

\[
P = \text{Population Index} = \text{Fond Index} 
\]

\[
P = \text{Population Index} = \text{Number of Segments} 
\]

**P = A * (T/S) * V**

*a* Drakes not doubled in arriving at indicated total birds (T).
### WATERFOWL BREEDING POPULATION SURVEY

**STRATUM: 9**

**YUKON DELTA**

**DATES:** 5 / 30 / 2005 THRU 6 / 3 / 2005

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**COMPUTATION OF THE POPULATION INDEX**

- **$P = \text{POPULATION INDEX}$**
- **$A = \text{SQUARE MILES IN THE STRATUM}$**
- **$T = \text{INDICATED TOTAL BIRDS}$**
- **$S = \text{SQUARE MILES IN THE SAMPLE}$**
- **$V = \text{VISIBILITY RATIO}$**
- **$P = A \times (T/S) \times V$**

---

*a Drakes not doubled in arriving at indicated total birds (T).*
### Waterfowl Breeding Population Survey

**Stratum:** 10  
**Seward Peninsula**

**Dates:** 6 / 3 / 2005 THRU 6 / 3 / 2005

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**Computation of the Population Index**

- \[ P = \text{Population Index} \]
- \[ A = \text{Square Miles in the Stratum} \]
- \[ T = \text{Indicated Total Birds} \]
- \[ S = \text{Square Miles in the Sample} \]
- \[ V = \text{Visibility Ratio} \]

\[
P = A \times \frac{(T/S)}{V}
\]

\(^a\) Drakes not doubled in arriving at indicated total birds (T).

---

**Computed Values**

- Pond Index: 0
- Square Miles in the Stratum (A): 3850
- Square Miles in the Sample (S): 28
- Expansion Factor: 137.500
DRAKES not doubled in arriving at indicated total birds (T).

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**WATERFOWL BREEDING POPULATION SURVEY** **STRATUM:** 11 **KOTZEBUE SOUND**

**COMPUTATION OF THE POPULATION INDEX**

| P = POPULATION INDEX | | NUMBER OF OBSERVED PONDS (x2) | 0 |
|----------------------| | | |
| A = SQUARE MILES IN THE STRATUM | | SQUARE MILES IN THE STRATUM (A) | 5350 |
| T = INDICATED TOTAL BIRDS | | SQUARE MILES IN THE SAMPLE (S) | 48 |
| S = SQUARE MILES IN THE SAMPLE | | NUMBER OF SEGMENTS | 12 |
| V = VISIBILITY RATIO | | EXPANSION FACTOR | 111.458 |
| P = A * (T/S) * V | | | |

---

*a* Drakes not doubled in arriving at indicated total birds (T).
Drakes not doubled in arriving at indicated total birds (T).

\[
P = A \times \frac{T}{S} \times V
\]

- \( P \): Population Index
- \( A \): Square Miles in the Stratum
- \( T \): Indicated Total Birds
- \( S \): Square Miles in the Sample
- \( V \): Visibility Ratio

\[
P = \frac{A \times T}{S \times V}
\]

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Waterfowl Breeding Population Survey

Stratum: 12

Old Crow Flats

35