

**ALASKA PRODUCTIVITY SURVEYS**  
**OF GEESE, SWANS, AND BRANT**  
**2011**

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May 2012

**TITLE:**

Alaska Productivity Surveys of Geese, Swans, and Brant – 2011

**SPECIES SURVEYED:**

Pacific Brant (*Branta bernicla nigricans*)

Trumpeter Swan (*Cygnus buccinator*)

Emperor Goose (*Chen canagica*)

Dusky Canada Goose (*Branta canadensis occidentalis*)

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    Migratory Bird Management, Anchorage

    Migratory Bird Management, Fairbanks

Alaska Department of Fish and Game

    Division of Wildlife Conservation, Statewide Waterfowl Program

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## ABSTRACT

Productivity surveys were conducted by several agencies and individuals during late summer, fall, and/or winter of 2011 and early 2012 to estimate juvenile-to-adult age ratios for Pacific brant (*Branta bernicla nigricans*), the Pacific Coast population of trumpeter swans (*Cygnus buccinator*), emperor geese (*Chen canagica*), and dusky Canada geese (*Branta canadensis occidentalis*). The results of these surveys appear in the tables of this report, along with short narratives in the Results section.

The following productivity measures were estimated for 2011:

| Species                   | Type of Year          | Productivity Estimate | % Change From 2010 | % Change From Mean |
|---------------------------|-----------------------|-----------------------|--------------------|--------------------|
| <b>Pacific Brant</b>      | <b>Below Average</b>  |                       |                    |                    |
| Fall % Juv.               |                       | 17.6%                 | -13%               | -22%               |
| Fall Juv./Fam.            |                       | 2.25                  | -10%               | -14%               |
| Winter % Juv.             |                       | ---                   | ---                | ---                |
|                           |                       |                       |                    |                    |
| <b>Trumpeter Swan</b>     | <b>Average</b>        |                       |                    |                    |
| Late Summer Brood Size    |                       | ---                   | ---                | ---                |
| Late Summer % Juv.        |                       | ---                   | ---                | ---                |
| Late Summer % Prs. w/ Brd |                       | ---                   | ---                | ---                |
| Winter % Juv.             |                       | 15.4%                 | -1%                | -14%               |
| Winter Juv./Fam.          |                       | ---                   | ---                | ---                |
|                           |                       |                       |                    |                    |
| <b>Emperor Goose</b>      | <b>Below Average?</b> |                       |                    |                    |
| Fall % Juv.               |                       |                       |                    |                    |
| From ground counts        |                       | 15.9%                 | -25%               | -33%               |
| From aerial photos        |                       | 19.5%                 | 0%                 | +2%                |
| Fall Juv./Fam.            |                       | 1.89                  | -22%               | -31%               |
|                           |                       |                       |                    |                    |
| <b>Dusky Canada Goose</b> | <b>Above Average</b>  |                       |                    |                    |
| Summer % Juv.             |                       |                       |                    |                    |
| Copper River Delta        |                       | 37.4%                 | -5%                | +80%               |
| Middleton Island          |                       | ---                   | ---                | ---                |

## **METHODS**

Fall and winter productivity appraisals generally followed procedures developed by Lynch (1969) and outlined in the Standard Operating Procedures for Productivity Surveys of Geese, Swans and Brant (Draft) 1977. Additional survey methods included late-summer aerial surveys of trumpeter swans (King 1973) and dusky Canada geese (Petrula 2011), analysis of aerial photographs of emperor geese (Dau et al. 2006), and ocular sightings from the ground (e.g. Audubon Christmas Bird Counts).

## **RESULTS**

### **Pacific Brant:**

Fall Productivity: Table 1.

Niels Dau of USFWS, Migratory Bird Management Anchorage reported that 17.6% juveniles were estimated from a sample of 20,399 brant during ground surveys conducted at Izembek NWR, Alaska in October (Dau 2011a). He also reported an estimated mean of 2.25 juveniles per family group from a sample of 83 families. The proportion of juveniles was 13% below the 2010 estimate and 22% below the 48-year mean. The mean family group size was 10% below the 2010 estimate and 14% below the 45-year mean.

Winter Productivity: Table 2.

No winter productivity data were reported in 2011.

### **Trumpeter Swan:**

Late-Summer Productivity: Table 3.

No late-summer productivity data were reported in 2011.

Winter Productivity: Table 4.

On Vancouver Island, British Columbia, Graeme Fowler reported the results of swan surveys conducted from November 2011 through February 2012 by the Comox Valley Naturalists Society. The mean percent juvenile was 14.7% (n = 940) in November, 14.3% (n = 1,816) in December, 17.4% (n = 2,315) in January, and 15.4% (n = 2,134) in February. Note that only the February figure was included in Table 4.

Winter productivity data were not reported from northwest Washington this year. Therefore, the overall winter age-ratio estimate was based solely on data from Vancouver Island in February. This estimate of 15.4% juveniles was 1% below the 2010 estimate and 14% below the 34-year mean. There was no estimate of mean family group size in 2011.

**Emperor Goose:** Tables 5 and 6.

Niels Dau reported that 15.9% juveniles were estimated from a sample of 2,454 emperor geese during ground surveys conducted at Izembek NWR, Alaska in October (Table 5) (Dau 2011b). He also reported an estimated mean of 1.89 juveniles per family group from a sample of 27 families. The proportion of juveniles was 25% below the 2010 estimate and 33% below the 44-year mean. The mean family group size was 22% lower than in 2010 and 31% below the 44-year mean.

Bob Stehn of USFWS, Migratory Bird Management Anchorage reported the results of aerial photo work on the Alaska Peninsula conducted in late September. He estimated the proportions of juveniles in seven major lagoons from aerial photos and then weighted the proportions by the population counts of those lagoons from an independent aerial population survey. The result was a weighted-mean estimate of 19.5% juveniles for the 2011 fall population, equal to the 2010 estimate and 2% above the 26-year mean (Table 6).

**Dusky Canada Goose:** Table 7.

Dan Rosenberg of the Alaska Department of Fish and Game reported the results of an aerial production survey that was flown over the west Copper River Delta on 17 July (Petrla 2011). Of a total count of 6,564 geese, 37.4% were identified as juveniles. The proportion of juveniles was 5% below the 2010 estimate and 80% above the 40-year mean.

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## ACKNOWLEDGMENTS

The following agencies and individuals are gratefully acknowledged for their contributions to this report:

### U.S. Fish and Wildlife Service

#### Izembek National Wildlife Refuge

Bruce Casler

Nancy Hoffman

Trent Leibich

Chris Peterson

#### Migratory Bird Management, Anchorage

Chris Dau

Niels Dau

Bill Larned

Bob Stehn

Heather Wilson

#### Migratory Bird Management, Fairbanks

Ed Mallek

### Alaska Department of Fish and Game

#### Division of Wildlife Conservation, Statewide Waterfowl Program

Dan Rosenberg

Mike Petrula

### Others

Comox Valley Naturalists Society – Courtenay, British Columbia

Graeme Fowler – Comox, British Columbia

Table 1. Historical fall productivity records for Pacific brant at Izembek Lagoon, AK, 1963-2011.<sup>a</sup>

| Year              | Grouped Birds |           |        | Family Associations |           |             |
|-------------------|---------------|-----------|--------|---------------------|-----------|-------------|
|                   | Adults        | Juveniles | % Juv. | Families            | Juveniles | Juv./Family |
| 1963              | 3968          | 1243      | 23.9   |                     |           |             |
| 1964              | 13324         | 4577      | 25.6   |                     |           |             |
| 1965              | 21210         | 5050      | 19.2   |                     |           |             |
| 1966              | 9927          | 7134      | 41.8   | 195                 | 557       | 2.86        |
| 1967              | 15219         | 3081      | 16.8   | 359                 | 926       | 2.58        |
| 1968              | 15110         | 3117      | 17.1   | 145                 | 377       | 2.60        |
| 1969              | 12829         | 3577      | 21.8   | 293                 | 780       | 2.66        |
| 1970              | 12104         | 6256      | 34.1   | 148                 | 476       | 3.22        |
| 1971              | 4820          | 1953      | 28.8   | 295                 | 716       | 2.43        |
| 1972              | 6599          | 3698      | 35.9   | 153                 | 416       | 2.72        |
| 1973              | 12025         | 4999      | 29.4   | 327                 | 938       | 2.87        |
| 1974              | 13118         | 632       | 4.6    | 105                 | 239       | 2.28        |
| 1975              | 9396          | 5452      | 36.7   | 189                 | 543       | 2.87        |
| 1976              | 7962          | 4340      | 35.3   | 237                 | 674       | 2.84        |
| 1977              | 8856          | 4092      | 31.6   | 240                 | 603       | 2.51        |
| 1978              | 10696         | 1842      | 14.7   | 110                 | 326       | 2.96        |
| 1979              | 13674         | 2349      | 14.7   | 146                 | 361       | 2.47        |
| 1980              | 9618          | 3341      | 25.8   | 177                 | 489       | 2.76        |
| 1981              | 4109          | 936       | 18.6   | 154                 | 431       | 2.80        |
| 1982              | 11509         | 1213      | 9.5    | 89                  | 237       | 2.66        |
| 1983              | 6149          | 1947      | 24.0   | 173                 | 515       | 2.98        |
| 1984              | 9451          | 1499      | 13.7   | 192                 | 564       | 2.94        |
| 1985              | 12032         | 1915      | 13.7   | 624                 | 1538      | 2.46        |
| 1986              | 15621         | 2823      | 15.3   | 137                 | 352       | 2.57        |
| 1987              | 17411         | 7882      | 31.2   | 948                 | 2587      | 2.73        |
| 1988              | 16138         | 3847      | 19.2   | 263                 | 633       | 2.41        |
| 1989              | 13654         | 4281      | 23.9   | 303                 | 914       | 3.02        |
| 1990              | 24215         | 5750      | 19.2   | 349                 | 894       | 2.56        |
| 1991              | 31432         | 12127     | 27.8   | 415                 | 1066      | 2.57        |
| 1992              | 55795         | 11044     | 16.5   | 404                 | 1127      | 2.79        |
| 1993              | 103254        | 31942     | 23.6   | 979                 | 2727      | 2.79        |
| 1994              | 21371         | 2808      | 11.6   | 353                 | 735       | 2.08        |
| 1995              | 26964         | 15240     | 36.1   | 78                  | 218       | 2.79        |
| 1996              | 15148         | 4201      | 21.7   | 50                  | 152       | 3.04        |
| 1997              | 15216         | 3105      | 16.9   | 40                  | 106       | 2.65        |
| 1998              | 8214          | 2836      | 25.7   | 220                 | 488       | 2.22        |
| 1999              | 12500         | 3450      | 21.6   | 111                 | 254       | 2.29        |
| 2000              | 6669          | 2982      | 30.9   | 91                  | 202       | 2.22        |
| 2001              | 14829         | 1198      | 7.5    | 68                  | 167       | 2.46        |
| 2002              | 18441         | 4751      | 20.5   | 92                  | 222       | 2.41        |
| 2003              | 27517         | 4371      | 13.7   | 197                 | 446       | 2.26        |
| 2004              | 19715         | 4384      | 18.2   | 129                 | 322       | 2.50        |
| 2005              | 16906         | 8455      | 33.3   | 89                  | 257       | 2.89        |
| 2006              | 26684         | 6798      | 20.3   | 222                 | 583       | 2.63        |
| 2007              | 22450         | 8819      | 28.2   | 208                 | 526       | 2.53        |
| 2008              | 39169         | 6971      | 15.1   | 214                 | 542       | 2.53        |
| 2009              | 43517         | 15923     | 26.8   | 266                 | 604       | 2.27        |
| 2010              | 27884         | 7086      | 20.3   | 281                 | 706       | 2.51        |
| 2011              | 16816         | 3583      | 17.6   | 83                  | 187       | 2.25        |
| Mean <sup>b</sup> |               |           | 22.6   |                     |           | 2.63        |
| % Change from:    |               |           |        |                     |           |             |
| 2010              |               |           | -13%   |                     |           | -10%        |
| Mean              |               |           | -22%   |                     |           | -14%        |

<sup>a</sup> Data supplied by Izembek National Wildlife Refuge and USGS Alaska Science Center.

<sup>b</sup> Mean excludes 2011.

Table 2. Historical winter productivity records for brant in the Pacific Flyway, 1983-2011.

| Year <sup>a</sup> | Birch/Oak Bays, WA <sup>b</sup> |      |        | Padilla/Samish Bays, WA <sup>b</sup> |      |        | Willapa Bay, WA <sup>c</sup> |      |        | Olympic Peninsula, WA <sup>d</sup> |      |        | Oregon Coast <sup>e</sup> |      |        | Combined Productivity |
|-------------------|---------------------------------|------|--------|--------------------------------------|------|--------|------------------------------|------|--------|------------------------------------|------|--------|---------------------------|------|--------|-----------------------|
|                   | Ad.                             | Juv. | % Juv. | Ad.                                  | Juv. | % Juv. | Ad.                          | Juv. | % Juv. | Ad.                                | Juv. | % Juv. | Ad.                       | Juv. | % Juv. | % Juv.                |
| 1983              |                                 |      |        |                                      |      |        | 982                          | 166  | 14.5   |                                    |      |        |                           |      |        | 14.5                  |
| 1984              |                                 |      |        |                                      |      |        | 2605                         | 251  | 8.8    |                                    |      |        |                           |      |        | 8.8                   |
| 1985              |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| 1986              |                                 |      |        | 3731                                 | 292  | 7.3    | 1925                         | 186  | 8.8    | 217                                | 11   | 4.8    |                           |      |        | 7.7                   |
| 1987              |                                 |      |        | 3110                                 | 1242 | 28.5   | 997                          | 196  | 16.4   | 1540                               | 306  | 16.6   |                           |      |        | 23.6                  |
| 1988              |                                 |      |        | 2003                                 | 297  | 12.9   | 1167                         | 184  | 13.6   | 1544                               | 311  | 16.8   |                           |      |        | 14.4                  |
| 1989              |                                 |      |        | 4928                                 | 622  | 11.2   | 982                          | 88   | 8.2    | 2231                               | 232  | 9.4    |                           |      |        | 10.4                  |
| 1990              |                                 |      |        | 3047                                 | 837  | 21.5   |                              |      |        | 2013                               | 88   | 4.2    |                           |      |        | 15.5                  |
| 1991              |                                 |      |        | 2464                                 | 336  | 12.0   | 1189                         | 126  | 9.6    | 913                                | 123  | 11.9   |                           |      |        | 11.4                  |
| 1992              |                                 |      |        | 6294                                 | 669  | 9.6    | 944                          | 88   | 8.5    | 839                                | 46   | 5.2    |                           |      |        | 9.0                   |
| 1993              |                                 |      |        | 3032                                 | 1074 | 26.2   |                              |      |        | 1299                               | 265  | 16.9   |                           |      |        | 23.6                  |
| 1994              |                                 |      |        | 3771                                 | 197  | 5.0    | 937                          | 97   | 9.4    | 1034                               | 26   | 2.5    |                           |      |        | 5.3                   |
| 1995              |                                 |      |        | 1083                                 | 185  | 14.6   |                              |      |        | 634                                | 15   | 2.3    |                           |      |        | 10.4                  |
| 1996              |                                 |      |        | 1964                                 | 530  | 21.3   | 70                           | 12   | 14.6   | 793                                | 20   | 2.5    |                           |      |        | 16.6                  |
| 1997              |                                 |      |        | 1660                                 | 189  | 10.2   |                              |      |        | 779                                | 50   | 6.0    |                           |      |        | 8.9                   |
| 1998              |                                 |      |        | 2573                                 | 466  | 15.3   | 125                          | 19   | 13.2   |                                    |      |        |                           |      |        | 15.2                  |
| 1999              |                                 |      |        | 1199                                 | 349  | 22.5   |                              |      |        | 386                                | 29   | 7.0    |                           |      |        | 19.3                  |
| 2000              |                                 |      |        | 877                                  | 337  | 27.8   | 1818                         | 183  | 9.1    | 430                                | 32   | 6.9    |                           |      |        | 15.0                  |
| 2001              |                                 |      |        | 1089                                 | 11   | 1.0    |                              |      |        | 361                                | 24   | 6.2    |                           |      |        | 2.4                   |
| 2002              |                                 |      |        |                                      |      |        |                              |      |        | 368                                | 28   | 7.1    |                           |      |        | 7.1                   |
| 2003              |                                 |      |        | 752                                  | 48   | 6.0    |                              |      |        | 551                                | 25   | 4.3    | 476                       | 51   | 9.7    | 6.5                   |
| 2004              |                                 |      |        | 647                                  | 85   | 11.6   |                              |      |        |                                    |      |        |                           |      |        | 11.6                  |
| 2005              |                                 |      |        | 97                                   | 22   | 18.5   |                              |      |        |                                    |      |        | 60                        | 7    | 10.4   | 15.6                  |
| 2006              | 422                             | 33   | 7.3    |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        | 7.3                   |
| 2007 <sup>f</sup> |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| 2008 <sup>f</sup> |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| 2009 <sup>f</sup> |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| 2010 <sup>f</sup> |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| 2011 <sup>f</sup> |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| Mean              |                                 |      | 7.3    |                                      |      | 14.9   |                              |      | 11.2   |                                    |      | 7.7    |                           |      | 10.1   | 12.2                  |
| % Change from:    |                                 |      |        |                                      |      |        |                              |      |        |                                    |      |        |                           |      |        |                       |
| 2010              |                                 |      | N/A    |                                      |      | N/A    |                              |      | N/A    |                                    |      | N/A    |                           |      | N/A    | N/A                   |
| Mean              |                                 |      | N/A    |                                      |      | N/A    |                              |      | N/A    |                                    |      | N/A    |                           |      | N/A    | N/A                   |

<sup>a</sup> Surveys conducted some time between November of the stated year and March of the next year.

<sup>b</sup> Data supplied by Russ Canniff and Washington Department of Wildlife. A high proportion of birds at Padilla/Samish bays were the "gray-bellied" variety.

<sup>c</sup> Data supplied by Willapa National Wildlife Refuge and Washington Department of Wildlife.

<sup>d</sup> Data supplied by Washington Maritime National Wildlife Refuge Complex.

<sup>e</sup> Data supplied by Oregon Coast National Wildlife Refuge Complex.

<sup>f</sup> No data were reported.



Table 3. Historical late-summer productivity records for trumpeter swans in Alaska, 1968-2011. <sup>a</sup>

| Year              | Number of<br>1:63,360 Maps<br>Surveyed | Adults and Subadults |               |              |          | Cygnets | Total<br>Swans | Broods | Mean<br>Brood Size | % Juv. | % Pairs<br>w/ Brood |
|-------------------|--|----------------------|---------------|--------------|----------|---------|----------------|--------|--------------------|--------|---------------------|
|                   |  | In<br>Pairs          | As<br>Singles | In<br>Flocks | Subtotal |         |                |        |                    |        |                     |
| 1968              | 181                                    | 1320                 | 108           | 496          | 1924     | 923     | 2847           | 257    | 3.6                | 32.4   | 35.4                |
| 1975              | 285                                    | 2102                 | 151           | 740          | 2993     | 1177    | 4170           | 378    | 3.1                | 28.2   | 35.4                |
| 1978              | 13                                     | 284                  | 36            | 130          | 450      | 116     | 566            | 37     | 3.1                | 20.5   | 26.1                |
| 1979              | 13                                     | 264                  | 26            | 229          | 519      | 164     | 683            | 46     | 3.6                | 24.0   | 32.6                |
| 1980              | 297                                    | 3324                 | 169           | 1766         | 5259     | 2437    | 7696           | 683    | 3.6                | 31.7   | 40.3                |
| 1981              | 19                                     | 632                  | 23            | 673          | 1328     | 547     | 1875           | 136    | 4.0                | 29.2   | 41.5                |
| 1982              | 36                                     | 1164                 | 97            | 443          | 1704     | 421     | 2125           | 138    | 3.1                | 19.8   | 23.4                |
| 1983              | 46                                     | 1260                 | 69            | 488          | 1817     | 903     | 2720           | 230    | 3.9                | 33.2   | 35.7                |
| 1984              | 43                                     | 1358                 | 125           | 780          | 2263     | 755     | 3018           | 230    | 3.3                | 25.0   | 33.1                |
| 1985              | 425                                    | 5120                 | 449           | 2204         | 7773     | 1686    | 9459           | 588    | 2.9                | 17.8   | 22.6                |
| 1986              | 113                                    | 2560                 | 184           | 678          | 3422     | 1349    | 4771           | 438    | 3.1                | 28.3   | 33.3                |
| 1987              | 73                                     | 1640                 | 108           | 760          | 2508     | 1030    | 3538           | 294    | 3.5                | 29.1   | 35.7                |
| 1988              | 54                                     | 1610                 | 103           | 1203         | 2916     | 1087    | 4003           | 322    | 3.4                | 27.2   | 39.1                |
| 1989              | 63                                     | 1150                 | 105           | 295          | 1550     | 488     | 2038           | 158    | 3.1                | 23.9   | 26.8                |
| 1990              | 625                                    | 7056                 | 647           | 2039         | 9742     | 3595    | 13337          | 1124   | 3.2                | 27.0   | 31.2                |
| 1991              | 61                                     | 1968                 | 123           | 936          | 3027     | 923     | 3950           | 322    | 2.9                | 23.4   | 32.1                |
| 1992              | 80                                     | 1592                 | 119           | 819          | 2530     | 825     | 3355           | 270    | 3.1                | 24.6   | 32.9                |
| 1993              | 76                                     | 1766                 | 127           | 663          | 2556     | 1080    | 3636           | 341    | 3.2                | 29.7   | 37.0                |
| 1994              | 69                                     | 1982                 | 128           | 1094         | 3204     | 1196    | 4400           | 374    | 3.2                | 27.2   | 37.2                |
| 1995              | 674                                    | 7946                 | 859           | 3184         | 11989    | 3834    | 15823          | 1218   | 3.1                | 24.2   | 30.1                |
| 1996              | 50                                     | 1624                 | 116           | 1042         | 2782     | 814     | 3596           | 256    | 3.2                | 22.6   | 30.5                |
| 1997              | 46                                     | 1212                 | 72            | 566          | 1850     | 584     | 2434           | 189    | 3.1                | 24.0   | 30.5                |
| 1998              | 51                                     | 1702                 | 104           | 740          | 2546     | 976     | 3522           | 281    | 3.5                | 27.7   | 32.4                |
| 1999              | 27                                     | 508                  | 36            | 212          | 756      | 228     | 984            | 71     | 3.2                | 23.2   | 26.0                |
| 2000              | 733                                    | 9986                 | 899           | 3049         | 13934    | 3223    | 17157          | 1149   | 2.8                | 18.8   | 22.4                |
| 2001              | 22                                     | 1164                 | 66            | 491          | 1721     | 531     | 2252           | 168    | 3.2                | 23.6   | 28.0                |
| 2002              | 35                                     | 1118                 | 111           | 521          | 1750     | 488     | 2238           | 165    | 3.0                | 21.8   | 28.3                |
| 2003              | 55                                     | 2066                 | 206           | 844          | 3116     | 1212    | 4328           | 407    | 3.0                | 28.0   | 37.5                |
| 2004              | 39                                     | 1086                 | 118           | 792          | 1996     | 529     | 2525           | 177    | 3.0                | 21.0   | 30.8                |
| 2005              | 780                                    | 11940                | 1157          | 4148         | 17245    | 6447    | 23692          | 2084   | 3.1                | 27.2   | 33.9                |
| 2006              | 43                                     | 1962                 | 188           | 1051         | 3201     | 1246    | 4447           | 396    | 3.1                | 28.0   | 39.4                |
| 2007              | 31                                     | 910                  | 81            | 510          | 1501     | 350     | 1851           | 124    | 2.8                | 18.9   | 25.9                |
| 2008              | 28                                     | 1082                 | 57            | 448          | 1587     | 455     | 2042           | 154    | 3.0                | 22.3   | 28.1                |
| 2009              | 36.25                                  | 2030                 | 141           | 1135         | 3306     | 934     | 4240           | 329    | 2.8                | 22.0   | 32.1                |
| 2010              | 100                                    | 14276                | 1591          | 3771         | 19638    | 5709    | 25347          | 2004   | 2.8                | 22.5   | 27.2                |
| 2011 <sup>b</sup> | 0                                      |                      |               |              |          |         |                |        |                    |        |                     |
| Mean              |  |                      |               |              |          |         |                |        | 3.2                | 25.1   | 31.8                |
| % Change from:    |  |                      |               |              |          |         |                |        |                    |        |                     |
| 2010              |  |                      |               |              |          |         |                |        | N/A                | N/A    | N/A                 |
| Mean              |  |                      |               |              |          |         |                |        | N/A                | N/A    | N/A                 |

<sup>a</sup> Years shaded in gray were statewide surveys (complete censuses except in 2010, when a stratified random sample design was used). In other years, surveys were conducted by various agencies to meet local objectives.

<sup>b</sup> No data were reported.

Table 4. Historical winter productivity records for trumpeter swans in the Pacific Flyway, 1977-2011.

| Year <sup>a</sup> | Alaska <sup>b</sup> |      |        |          |           | SE Vancouver Island, BC <sup>c</sup> |      |        | Skagit Valley/Port Susan, WA <sup>d</sup> |      |        |          |           | Combined Productivity |
|-------------------|---------------------|------|--------|----------|-----------|--------------------------------------|------|--------|---|------|--------|----------|-----------|-----------------------|
|                   | Ad.                 | Juv. | % Juv. | No. Fam. | Juv./Fam. | Ad.                                  | Juv. | % Juv. | Ad.                                       | Juv. | % Juv. | No. Fam. | Juv./Fam. | % Juv.                |
| 1977              |                     |      |        |          |           |                                      |      |        | 214                                       | 70   | 24.6   |          |           | 24.6                  |
| 1978              |                     |      |        |          |           | 384                                  | 134  | 25.9   | 218                                       | 76   | 25.9   |          |           | 25.9                  |
| 1979              | 431                 | 129  | 23.0   | 15       | 2.60      | 459                                  | 158  | 25.6   | 273                                       | 82   | 23.1   |          |           | 24.1                  |
| 1980              | 167                 | 65   | 28.0   | 27       | 2.41      | 499                                  | 211  | 29.7   | 310                                       | 127  | 29.1   | 45       | 2.82      | 29.2                  |
| 1981              |                     |      |        |          |           |                                      |      |        | 316                                       | 92   | 22.5   | 41       | 2.24      | 22.5                  |
| 1982              | 110                 | 35   | 24.1   | 14       | 2.50      |                                      |      |        | 339                                       | 56   | 14.2   | 24       | 2.33      | 16.9                  |
| 1983              | 115                 | 29   | 20.1   | 4        | 1.50      | 533                                  | 113  | 17.5   | 330                                       | 94   | 22.2   | 39       | 2.41      | 19.4                  |
| 1984              | 109                 | 79   | 42.0   | 5        | 2.40      | 1101                                 | 216  | 16.4   | 359                                       | 62   | 14.7   | 29       | 2.14      | 18.5                  |
| 1985              | 95                  | 14   | 12.8   | 1        | 2.00      | 1336                                 | 98   | 6.8    | 340                                       | 44   | 11.5   | 22       | 2.00      | 8.1                   |
| 1986              | 146                 | 40   | 21.5   | 7        | 1.29      | 1228                                 | 280  | 18.6   | 356                                       | 113  | 24.1   | 49       | 2.31      | 20.0                  |
| 1987              | 146                 | 52   | 26.3   | 20       | 2.60      | 1081                                 | 334  | 23.6   | 347                                       | 133  | 27.7   | 49       | 2.71      | 24.8                  |
| 1988              | 164                 | 52   | 24.1   |          |           | 1353                                 | 304  | 18.3   | 473                                       | 111  | 19.0   | 48       | 2.31      | 19.0                  |
| 1989              | 239                 | 55   | 18.7   |          |           | 1209                                 | 194  | 13.8   | 568                                       | 128  | 18.4   |          |           | 15.8                  |
| 1990              | 266                 | 57   | 17.6   | 14       | 2.21      | 1553                                 | 295  | 16.0   | 678                                       | 111  | 14.1   |          |           | 15.6                  |
| 1991              | 696                 | 267  | 27.7   | 21       | 2.67      | 1049                                 | 165  | 13.6   | 810                                       | 155  | 16.1   | 64       | 2.42      | 18.7                  |
| 1992              | 578                 | 169  | 22.6   | 19       | 2.53      | 1639                                 | 149  | 8.3    | 905                                       | 94   | 9.4    | 45       | 2.09      | 11.7                  |
| 1993              | 667                 | 322  | 32.6   | 30       | 2.70      | 1801                                 | 530  | 22.7   | 762                                       | 233  | 23.4   | 167      | 2.40      | 25.1                  |
| 1994              | 562                 | 190  | 25.3   | 15       | 3.27      | 1543                                 | 536  | 25.8   | 927                                       | 242  | 20.7   | 112      | 2.41      | 24.2                  |
| 1995              | 294                 | 61   | 17.2   |          |           | 1427                                 | 398  | 21.8   | 1187                                      | 239  | 16.8   | 83       | 2.46      | 19.4                  |
| 1996              |                     |      |        |          |           | 1307                                 | 195  | 13.0   | 1774                                      | 312  | 15.0   | 93       | 2.31      | 14.1                  |
| 1997              |                     |      |        |          |           | 1540                                 | 272  | 15.0   | 1569                                      | 249  | 13.7   | 102      | 2.23      | 14.4                  |
| 1998              | 272                 | 35   | 11.4   |          |           | 1427                                 | 286  | 16.7   | 2180                                      | 381  | 14.9   | 76       | 2.34      | 15.3                  |
| 1999              | 338                 | 59   | 14.9   |          |           | 1380                                 | 198  | 12.5   | 2384                                      | 336  | 12.4   | 67       | 2.03      | 12.6                  |
| 2000              | 585                 | 118  | 16.8   |          |           | 1612                                 | 275  | 14.6   | 2256                                      | 355  | 13.6   | 84       | 2.04      | 14.4                  |
| 2001              | 191                 | 79   | 29.3   |          |           | 1763                                 | 204  | 10.4   | 1936                                      | 366  | 15.9   | 53       | 2.19      | 14.3                  |
| 2002              | 76                  | 17   | 18.3   |          |           | 1659                                 | 263  | 13.7   | 2256                                      | 521  | 18.8   | 149      | 2.31      | 16.7                  |
| 2003              | 580                 | 151  | 20.7   |          |           | 1479                                 | 339  | 18.6   | 4158                                      | 912  | 18.0   | 210      | 2.19      | 18.4                  |
| 2004              | 508                 | 84   | 14.2   |          |           | 1886                                 | 377  | 16.7   | 3301                                      | 706  | 17.6   | 106      | 2.50      | 17.0                  |
| 2005              | 548                 | 98   | 15.2   |          |           | 1820                                 | 485  | 21.0   | 2758                                      | 761  | 21.6   | 28       | 2.35      | 20.8                  |
| 2006              |                     |      |        |          |           | 1632                                 | 297  | 15.4   | 2958                                      | 567  | 16.1   | 117      | 2.24      | 15.8                  |
| 2007              |                     |      |        |          |           | 2001                                 | 273  | 12.0   | 2927                                      | 376  | 11.4   | 45       | 2.24      | 11.6                  |
| 2008              |                     |      |        |          |           | 1457                                 | 218  | 13.0   | 3873                                      | 486  | 11.1   | 57       | 2.32      | 11.7                  |
| 2009              |                     |      |        |          |           | 1558                                 | 285  | 15.5   | 4110                                      | 555  | 11.9   | 72       | 2.29      | 12.9                  |
| 2010              |                     |      |        |          |           | 1451                                 | 337  | 18.8   | 2325                                      | 356  | 13.3   | 53       | 2.08      | 15.5                  |
| 2011              |                     |      |        |          |           | 1806                                 | 328  | 15.4   |   |      |        |          |           | 15.4                  |
| Mean <sup>e</sup> |                     |      | 21.9   |          | 2.36      |                                      |      | 17.1   |   |      | 17.7   |          | 2.30      | 17.9                  |
| % Change from:    |                     |      |        |          |           |                                      |      |        |   |      |        |          |           |                       |
| 2010              |                     |      | N/A    |          | N/A       |                                      |      | -18%   |   |      | N/A    |          | N/A       | -1%                   |
| Mean              |                     |      | N/A    |          | N/A       |                                      |      | -10%   |   |      | N/A    |          | N/A       | -14%                  |

<sup>a</sup> Surveys conducted between November of the given year and February of the next year.

<sup>b</sup> Data supplied by AK Dept. of Fish and Game, USFS Cordova and Yakutat, AK, USFWS Region 7 Migratory Bird Management, Peter Walsh, and Paul Meyers.

<sup>c</sup> Data supplied by British Columbia Ministry of Environment, Land, and Parks, Comox Valley Naturalists Society, and Graeme Fowler.

<sup>d</sup> Data supplied by Russ Canniff.

<sup>e</sup> Mean excludes 2011.

Table 5. Historical fall productivity records (from ground counts) for emperor geese at Izembek Lagoon and Cold Bay, AK, 1966-2011.<sup>a</sup>

| Year              | Grouped Birds |           |        | Family Associations <sup>b</sup> |           |             |
|-------------------|---------------|-----------|--------|----------------------------------|-----------|-------------|
|                   | Adults        | Juveniles | % Juv. | Families                         | Juveniles | Juv./Family |
| 1966              | 699           | 265       | 27.5   | 132                              | 331       | 2.51        |
| 1967              | 1457          | 585       | 28.6   | 66                               | 215       | 3.26        |
| 1968              | 1195          | 585       | 32.9   | 40                               | 112       | 2.80        |
| 1969              | 4149          | 2980      | 41.8   | 161                              | 530       | 3.29        |
| 1970              | 9722          | 4933      | 33.7   | 383                              | 1115      | 2.91        |
| 1971              | 8142          | 3458      | 29.8   | 484                              | 1318      | 2.72        |
| 1972              | 4680          | 2270      | 32.7   | 210                              | 641       | 3.05        |
| 1973              |               |           |        |                                  |           |             |
| 1974              | 2025          | 377       | 15.7   | 50                               | 130       | 2.60        |
| 1975              | 744           | 405       | 35.2   | 51                               | 149       | 2.92        |
| 1976              | 1923          | 324       | 14.4   | 207                              | 567       | 2.74        |
| 1977              | 996           | 683       | 40.7   | 108                              | 302       | 2.80        |
| 1978              | 1395          | 495       | 26.2   | 62                               | 188       | 3.03        |
| 1979              | 841           | 113       | 11.8   | 117                              | 329       | 2.81        |
| 1980              | 1446          | 454       | 23.9   | 40                               | 93        | 2.33        |
| 1981              | 1527          | 747       | 32.8   | 235                              | 750       | 3.19        |
| 1982              | 1653          | 140       | 7.8    | 32                               | 85        | 2.66        |
| 1983              | 1326          | 543       | 29.1   | 192                              | 612       | 3.19        |
| 1984              | 2753          | 795       | 22.4   | 80                               | 230       | 2.88        |
| 1985              | 2245          | 503       | 18.3   | 125                              | 354       | 2.83        |
| 1986              | 3283          | 1381      | 29.6   | 266                              | 794       | 2.98        |
| 1987              | 1706          | 808       | 32.1   | 305                              | 993       | 3.26        |
| 1988              | 3884          | 1242      | 24.2   | 200                              | 616       | 3.08        |
| 1989              | 3811          | 1136      | 23.0   | 145                              | 455       | 3.14        |
| 1990              | 4002          | 1068      | 21.1   | 97                               | 309       | 3.19        |
| 1991              | 8599          | 2882      | 25.1   | 147                              | 480       | 3.27        |
| 1992              | 9291          | 1347      | 12.7   | 151                              | 451       | 2.99        |
| 1993              | 13976         | 2176      | 13.5   | 161                              | 441       | 2.74        |
| 1994              | 4658          | 792       | 14.5   | 301                              | 702       | 2.33        |
| 1995              | 6434          | 1618      | 20.1   | 99                               | 319       | 3.22        |
| 1996              | 3128          | 631       | 16.8   | 125                              | 330       | 2.64        |
| 1997              | 1345          | 144       | 9.7    | 43                               | 114       | 2.65        |
| 1998              | 1595          | 432       | 21.3   | 97                               | 239       | 2.46        |
| 1999              | 2395          | 527       | 18.0   | 82                               | 200       | 2.44        |
| 2000              | 1870          | 410       | 18.0   | 93                               | 192       | 2.06        |
| 2001              | 1232          | 228       | 15.6   | 42                               | 103       | 2.45        |
| 2002              | 4789          | 1842      | 27.8   | 260                              | 696       | 2.68        |
| 2003              | 5744          | 785       | 12.0   | 218                              | 439       | 2.01        |
| 2004              | 4600          | 1288      | 21.9   | 235                              | 568       | 2.42        |
| 2005              | 2844          | 1139      | 28.6   | 131                              | 365       | 2.79        |
| 2006              | 3360          | 2062      | 38.0   | 476                              | 1074      | 2.26        |
| 2007              | 5124          | 1146      | 18.3   | 179                              | 387       | 2.16        |
| 2008              | 3739          | 1323      | 26.1   | 250                              | 687       | 2.75        |
| 2009              | 2114          | 743       | 26.0   | 148                              | 340       | 2.30        |
| 2010              | 1688          | 455       | 21.2   | 27                               | 65        | 2.41        |
| 2011              | 2065          | 389       | 15.9   | 27                               | 51        | 1.89        |
| Mean <sup>c</sup> |               |           | 23.6   |                                  |           | 2.75        |
| % Change from:    |               |           |        |                                  |           |             |
| 2010              |               |           | -25%   |                                  |           | -22%        |
| Mean              |               |           | -33%   |                                  |           | -31%        |

<sup>a</sup> Data supplied by Izembek National Wildlife Refuge, USGS Alaska Science Center, and USFWS Region 7 Migratory Bird Management.

<sup>b</sup> 1979, 1981, and 1987 data include Izembek Lagoon and Alaska Peninsula; 1984-1995 data include Izembek Lagoon and Nelson Lagoon.

<sup>c</sup> Mean excludes 2011.

Table 6. Historical fall productivity records (from aerial photos) for emperor geese on the Alaska Peninsula, 1985-2011.<sup>a</sup>

| Year              | No. Photos | No. Birds      |                         |
|-------------------|------------|----------------|-------------------------|
|                   |            | Aged in Photos | % Juvenile <sup>b</sup> |
| 1985              | 155        | 3193           | 16.5                    |
| 1986              | 311        | 6380           | 25.4                    |
| 1987              | 703        | 10177          | 22.8                    |
| 1988              | 483        | 11180          | 24.4                    |
| 1989              | 390        | 12718          | 21.9                    |
| 1990              | 474        | 13541          | 24.1                    |
| 1991              | 412        | 14569          | 23.2                    |
| 1992              | 403        | 14832          | 15.5                    |
| 1993              | 255        | 5735           | 24.2                    |
| 1994              | 479        | 16881          | 22.8                    |
| 1995              | 361        | 11664          | 25.5                    |
| 1996              | 182        | 10793          | 17.8                    |
| 1997              | 205        | 11138          | 11.1                    |
| 1998              | 336        | 16544          | 11.8                    |
| 1999              | 392        | 13489          | 17.8                    |
| 2000              | 263        | 7748           | 11.2                    |
| 2001              | 365        | 11186          | 11.5                    |
| 2002              | 402        | 6458           | 17.8                    |
| 2003              | 421        | 8686           | 9.3                     |
| 2004              | 370        | 6237           | 11.1                    |
| 2005              | 500        | 6563           | 18.5                    |
| 2006              | 469        | 9773           | 35.2                    |
| 2007              | 347        | 12134          | 17.4                    |
| 2008              | 506        | 10207          | 24.9                    |
| 2009              | 607        | 12404          | 15.7                    |
| 2010              | 436        | 20876          | 19.5                    |
| 2011              | 441        | 19432          | 19.5                    |
| Mean <sup>c</sup> |            |                | 19.1                    |
| % Change from:    |            |                |                         |
| 2010              |            |                | 0%                      |
| Mean              |            |                | 2%                      |

<sup>a</sup> Data supplied by USFWS Migratory Bird Management, Anchorage and Fairbanks, AK.

<sup>b</sup> Mean of % juvenile in each of 7 lagoons from photo samples, weighted by the population counts of those lagoons from an independent aerial survey.

<sup>c</sup> Mean excludes 2011.

Table 7. Historical productivity data for dusky Canada geese on the Copper River Delta and Middleton Island, AK, 1971-2011.<sup>a</sup>

| Year              | Copper River Delta <sup>b</sup> |        | Middleton Island <sup>c</sup> |                     |        |
|-------------------|---------------------------------|--------|-------------------------------|---------------------|--------|
|                   | Geese Sampled                   | % Juv. | Adults                        | Estimated Juveniles | % Juv. |
| 1971              | 5717                            | 16.2   |                               |                     |        |
| 1972              | 8193                            | 10.6   |                               |                     |        |
| 1973              | 5873                            | 36.0   |                               |                     |        |
| 1974              | 8199                            | 51.4   |                               |                     |        |
| 1975              | 8990                            | 17.9   |                               |                     |        |
| 1976              | 7092                            | 24.2   |                               |                     |        |
| 1977              | ----                            | 44.3   |                               |                     |        |
| 1978              | ----                            | 24.8   |                               |                     |        |
| 1979              | 12700                           | 16.0   |                               |                     |        |
| 1980              | 7500                            | 23.7   |                               |                     |        |
| 1981              | 8740                            | 17.9   |                               |                     |        |
| 1982              | 8473                            | 23.7   |                               |                     |        |
| 1983              | 7740                            | 15.0   |                               |                     |        |
| 1984              | 11913                           | 18.3   |                               |                     |        |
| 1985              | 13780                           | 3.7    |                               |                     |        |
| 1986              | 13309                           | 10.7   |                               |                     |        |
| 1987              | 12448                           | 9.8    |                               |                     |        |
| 1988              | 6917                            | 22.5   |                               |                     |        |
| 1989              | 6114                            | 8.6    |                               |                     |        |
| 1990              | 5530                            | 23.5   |                               |                     |        |
| 1991              | 7098                            | 21.5   |                               |                     |        |
| 1992              | 7633                            | 23.1   |                               |                     |        |
| 1993              | 4542                            | 5.0    |                               |                     |        |
| 1994              | 6977                            | 5.7    |                               |                     |        |
| 1995              | 5818                            | 3.9    |                               |                     |        |
| 1996              | 6329                            | 21.7   | 1497                          | 673                 | 31.0   |
| 1997              | 6253                            | 10.5   | 1168                          | 884                 | 43.1   |
| 1998              | 4919                            | 11.7   |                               |                     |        |
| 1999              | 4156                            | 14.7   |                               |                     |        |
| 2000              | 4397                            | 24.1   | 1309                          | 1220                | 48.2   |
| 2001              | 3165                            | 25.4   |                               |                     |        |
| 2002              | 3708                            | 30.5   | 1416                          | 806                 | 36.3   |
| 2003              | 5929                            | 7.2    |                               |                     |        |
| 2004              | 5678                            | 27.8   | 1499                          | 876                 | 36.9   |
| 2005              | 5364                            | 11.8   |                               |                     |        |
| 2006              | 6261                            | 23.1   | 1453                          | 974                 | 40.1   |
| 2007              | 4741                            | 20.9   |                               |                     |        |
| 2008              | 7238                            | 47.2   | 1317                          | 795                 | 37.6   |
| 2009              | 7017                            | 36.9   |                               |                     |        |
| 2010              | 8265                            | 39.3   | 1249                          | 976                 | 43.9   |
| 2011              | 6564                            | 37.4   |                               |                     |        |
| Mean <sup>d</sup> |                                 | 20.8   |                               |                     | 39.6   |
| % Change from:    |                                 |        |                               |                     |        |
| 2010              |                                 | -5%    |                               |                     | N/A    |
| Mean              |                                 | 80%    |                               |                     | N/A    |

<sup>a</sup> Data supplied by Alaska Department of Fish and Game.

<sup>b</sup> Aerial survey conducted in mid- to late-July.

<sup>c</sup> Ground survey conducted biennially in mid- to late-June.

<sup>d</sup> Mean excludes 2011.