

4-28-2006

# TRUMPETER SWAN SURVEY of the ROCKY MOUNTAIN POPULATION WINTER 2006

James A. Dubovsky  
*Migratory Birds and State Programs*

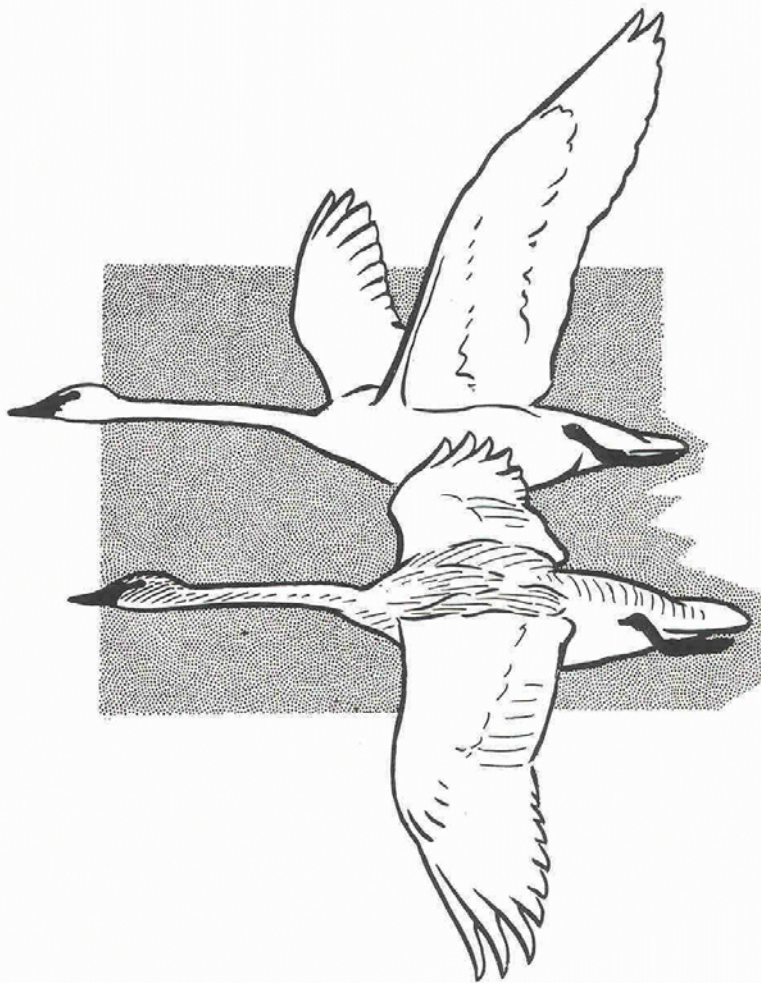
Follow this and additional works at: <http://digitalcommons.unl.edu/usfwspubs>

---

Dubovsky, James A., "TRUMPETER SWAN SURVEY of the ROCKY MOUNTAIN POPULATION WINTER 2006" (2006). *US Fish & Wildlife Publications*. 488.  
<http://digitalcommons.unl.edu/usfwspubs/488>

This Article is brought to you for free and open access by the US Fish & Wildlife Service at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in US Fish & Wildlife Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

**TRUMPETER SWAN SURVEY**  
**of the**  
**ROCKY MOUNTAIN POPULATION**  
**WINTER 2006**



**TRUMPETER SWAN SURVEY  
of the  
ROCKY MOUNTAIN POPULATION  
WINTER 2006**

U.S. Fish and Wildlife Service  
Migratory Birds and State Programs  
Mountain-Prairie Region  
Lakewood, Colorado

April 28, 2006

Prepared by: James A. Dubovsky  
James A. Dubovsky, Wildlife Biologist  
Migratory Birds and State Programs

Reviewed by: John E. Cornely  
John E. Cornely, Chief of Migratory Bird Coordination  
Migratory Birds and State Programs

Approved: John E. Cornely  
Acting Assistant Regional Director  
Migratory Birds and State Programs

Richard A. Coleman  
Richard A. Coleman, Regional Chief  
National Wildlife Refuge System

*Abstract.*— Observers counted 5,484 swans (white birds and cygnets) in the Rocky Mountain Population of trumpeter swans during February 2006, an increase of 2% from the 5,361 counted in February 2005 and the third consecutive record-high count for the Mid-winter Survey. The numbers of white birds (4,261) and cygnets (1,223) increased 1% and 6%, respectively, from counts last year. In the tri-state area, increases in total swans occurred in Montana (+47%) and Wyoming (+2%), but decreased slightly in Idaho (-5%). The number of birds wintering in areas near restoration flocks was slightly higher than the count last year. The number of swans counted in Oregon (50) was higher than that of last year and the 1997-2005 average. However, the count at Ruby Lake NWR was the lowest since 1994, and only about half of that observed during the mid- to late-1990s. The drought conditions that persisted in much of the tri-state area during the last several years abated somewhat, and reservoir levels in early February increased 19% from the very low levels recorded during 2004. Generally, temperatures during winter 2005-06 were slightly warmer than average, although temperatures dropped sharply in many areas of the tri-state region during February. Precipitation in primary winter areas was much above average from December 2005 through February 2006.

---

The Rocky Mountain Population (RMP) of trumpeter swans (*Cygnus buccinator*) consists of birds that nest primarily from western Canada southward to Nevada and Wyoming (Fig. 1). The population is comprised of several flocks that nest in different portions of the overall range. The RMP/Canadian Flocks consist of birds that summer primarily in southeastern Yukon Territory, southwestern Northwest Territories, northeastern British Columbia, Alberta, and western Saskatchewan. The RMP/Tri-state Area Flocks summer in areas at the juncture of the boundaries of Montana, Wyoming, and Idaho (hereafter termed the tri-state area) and nearby areas (Fig. 2). The Canadian and Tri-state Area flocks winter sympatrically primarily in the tri-state area. In addition, efforts have been made to establish several RMP restoration flocks, such as those at Ruby Lake National Wildlife Refuge (NWR) in Nevada (i.e., Nevada flock) and those at Malheur NWR and Summer Lake Wildlife Management Area (WMA) and vicinity (i.e., Oregon flock), by translocating adult swans and cygnets from other portions of the RMP. These birds tend to winter in areas near those where they nest. These terms for the various groups of swans are consistent with the RMP Trumpeter Swan Implementation Plan (Pacific Flyway Study Committee 2002).

Although counts of swans wintering in the tri-state area have been conducted since at least the 1950s (Banko 1960), many early efforts were not well-coordinated and were variable. In an attempt to better coordinate the survey, in 1972 the U.S. Fish and Wildlife Service (Service) began the annual Mid-winter Trumpeter Swan Survey in the tri-state region. During the next decade, the area surveyed increased substantially, and by 1981 it was believed all known occupied wintering sites were included (Gale et al. 1988). Recent attempts to expand the wintering range of RMP trumpeter swans has resulted in the inclusion of yet more areas to the survey. Also, some areas may not be surveyed in a particular year due to weather or resource limitations (e.g., staff, money). Such survey modifications make individual counts from year-to-year less comparable, but the data are sufficient to reasonably depict trends in abundance.

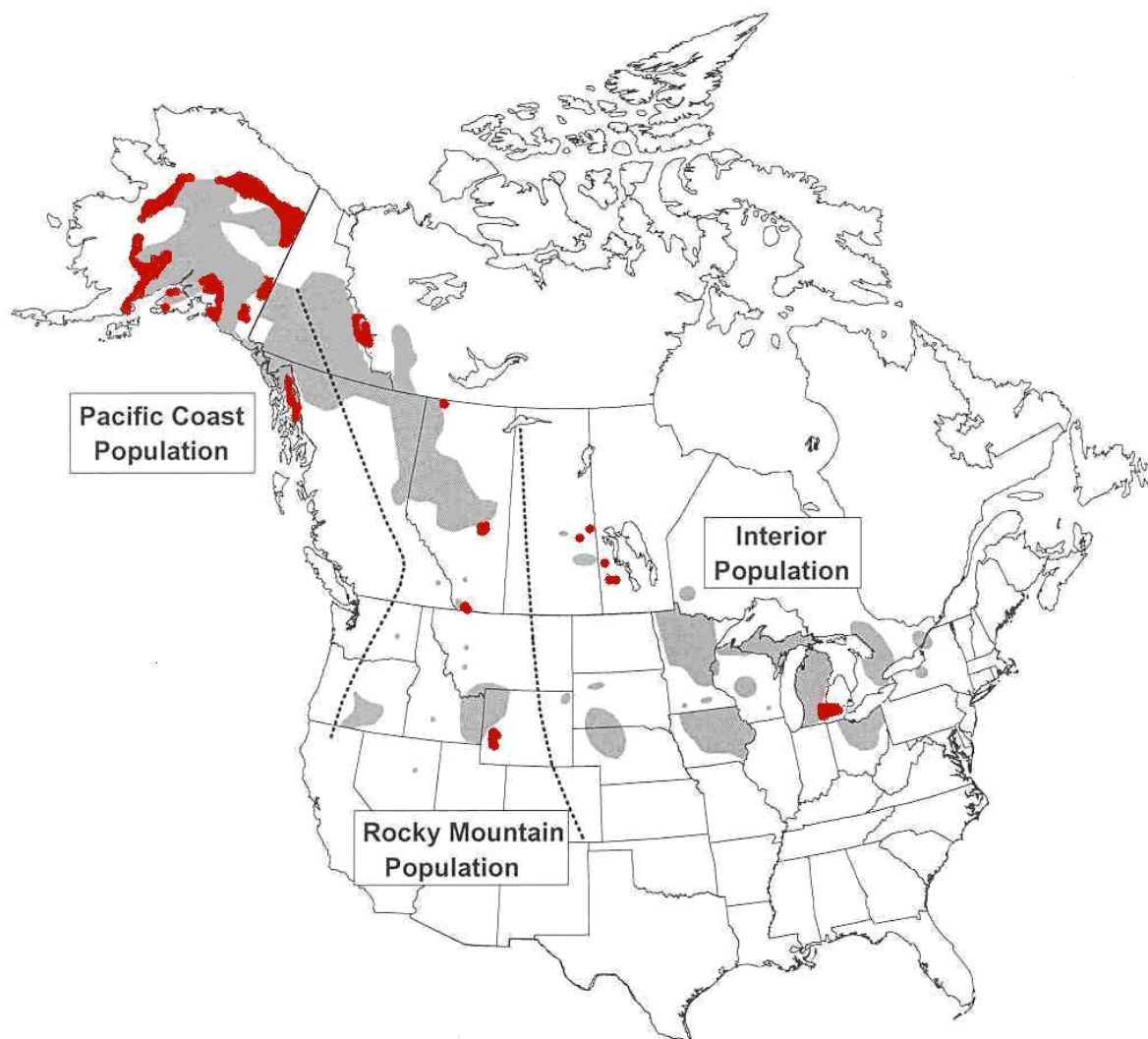


Fig. 1. Approximate ranges of trumpeter swans during summer. Range expansions reported by survey biologist during the 2005 North American trumpeter swan survey are shown in black (from Moser 2006).



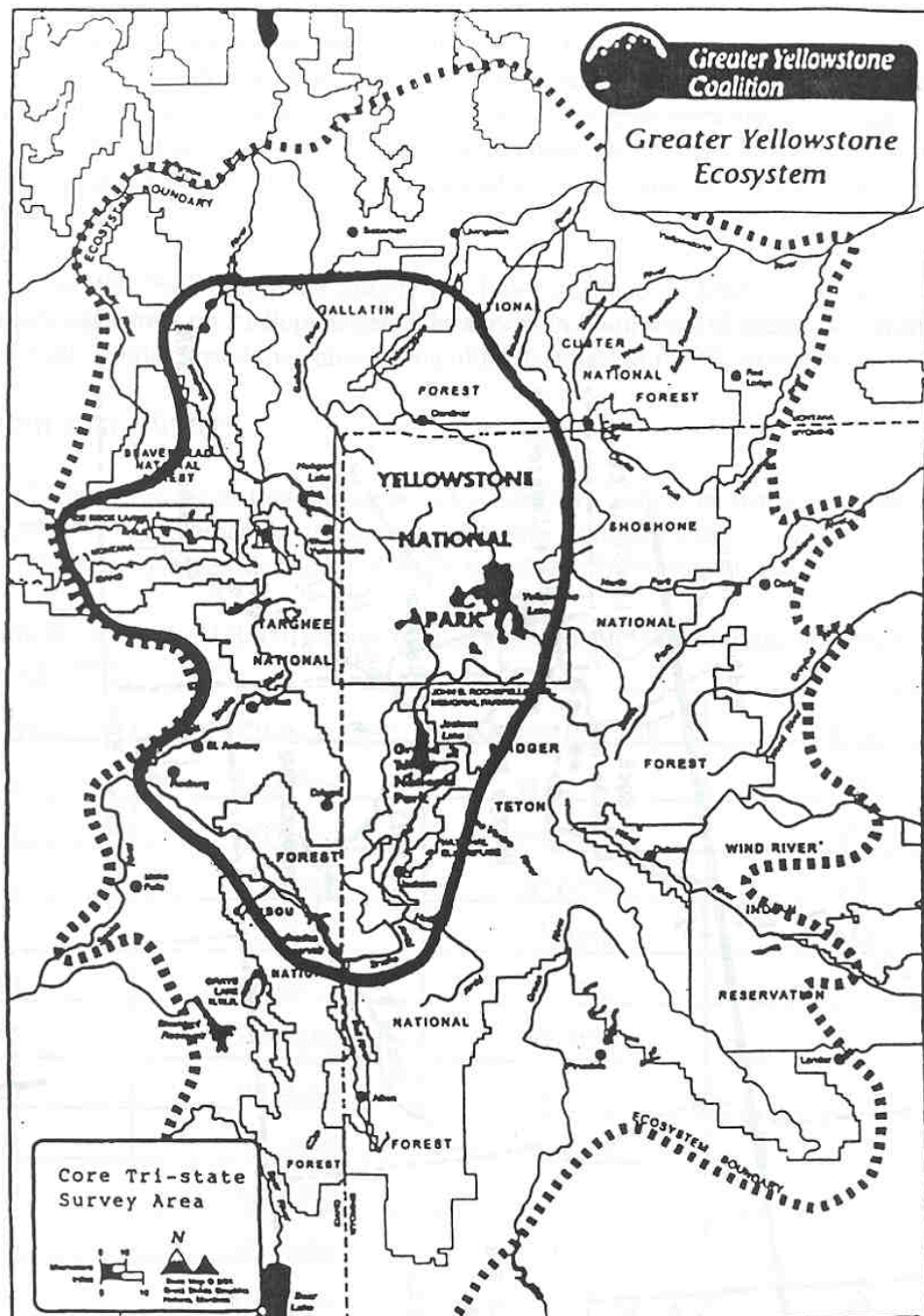


Fig. 2. Map showing the 'core' tri-state area of southeast Idaho, southwest Montana, and northwest Wyoming (provided by the Greater Yellowstone Coalition, Bozeman, Montana).

The Mid-winter Trumpeter Swan Survey is conducted annually in late January or early February. The survey is conducted cooperatively by several administrative entities and is intended to provide an annual assessment of the number of RMP trumpeter swans. Only data from 1972 to present, the time frame during which the Service has coordinated the survey, were analyzed for this report.

## METHODS

The survey generally is conducted within a relatively short time frame (i.e., 1 week) to reduce the possibility of counting swans more than once due to movements of birds among areas. Aerial cruise surveys were used to count numbers of swans in the tri-state area and in the Summer Lake WMA and vicinity; ground surveys were used to count the number of swans in Nevada, at Malheur NWR and in isolated pockets of habitat not covered by aerial surveys. During aerial surveys, data are collected by observers seated in a single-engine, fixed-winged aircraft. Flying altitude varies with changes in terrain and surface winds, but generally averages 30-60 m above ground level, and flight speed is between 135-155 kph. One to two observers and the pilot count white (i.e., adults and subadults) and gray (i.e., cygnets) swans in known or suspected habitats. Counts are not adjusted for birds present but not seen by aerial crews, and have an unknown and unmeasured sampling variance associated with them. Ground surveys are used to verify species composition of some swan flocks, because trumpeter and tundra (*C. columbianus*) swans are difficult to differentiate during aerial surveys. Efforts are made to identify and exclude tundra swans from the survey counts.

Annual estimates of abundance for Canadian Flocks are determined by subtracting the count of the RMP/U.S. Breeding Segment in the previous fall (e.g., U.S. Fish and Wildlife Service 2005a) from the Mid-winter count. For the estimate of the size of the Canadian Flocks to be accurate, several conditions must be met. First, all swans must be correctly identified to species. Second, the Mid-winter count and the fall count of swans in the RMP/U.S. Breeding Segment must be accurate. Additionally, we must assume that mortality in the RMP/U.S. Breeding Segment between the time of the fall and winter surveys is negligible. Because of problems inherent in surveying biological populations, these conditions probably are seldom met. Thus, this methodology for estimating the size of the RMP/Canadian Flocks likely leads to somewhat biased estimates of the composition of the RMP. However, we assume that these possible inaccuracies, if they occur, are random.

During fall and winter 2005-06, the quinquennial rangewide survey of trumpeter swans also was conducted. This survey attempts to conduct a complete census of all trumpeter swans in North America (Moser 2006). Every 5 years, the results of this survey allow the opportunity to compare our annual estimate of the number of birds in the Canadian flocks, derived from subtraction, to actual estimates of those birds on their nesting range.

To assess production for the RMP, we calculated the percentage of annual total swan counts that were cygnets. However, surveys in Nevada and Oregon did not separate counts into white birds and cygnets until 1992. Therefore, to allow an assessment over a longer time frame with data that are relatively comparable from year-to-year, we used only information from birds counted in the tri-state

region. This subset contained a large majority (range = 87%-99%,  $\bar{x}$  = 95%) of the total RMP counts during 1972-2005. Counts used for analyses in this report are provided in Appendix A.

## **RESULTS AND DISCUSSION**

The 2006 Mid-winter survey was conducted between 25 January and 11 February. Weather conditions were favorable for conducting surveys in most areas. Generally, skies were clear with light winds and good-to-excellent visibility. However, the weather was variable in Idaho, where conditions were sometimes poor with strong winds. These conditions required survey crews to spread their effort over several days. Nonetheless, visibility was fair to excellent when the survey was being conducted. Approximately 26 h of flight time and additional ground survey time were required to complete the survey. Most of the areas typically visited during the Mid-winter survey were surveyed this year.

Precipitation during December to February was 125% to 200% of average throughout much of the tri-state area (Joint Agricultural Weather Facility 2006), resulting in much better moisture conditions than during recent winters. Water levels at 5 reservoirs (American Falls, Island Park, Jackson Lake, Palisades, and Minidoka Dam/Lake Walcott) cumulatively were at 59% of storage capacity on February 1 (data from U.S. Bureau of Reclamation 2006a), 19% above the very low level of last year and only 3% below the 1972-2005 average. Together, these reservoirs comprise about 97% of the water-storage capacity for reservoirs listed in the Snake River Basin in eastern Idaho and extreme western Wyoming (U.S. Bureau of Reclamation 2006b). Snowpack as of 1 February throughout much of the tri-state area was about 110-150% of normal, and >150% of normal in central Oregon and portions of northeastern Nevada (U.S. Department of Agriculture 2006).

The average streamflow on the Henrys Fork near Island Park Reservoir, Idaho, during 15 January to 15 February 2006 was 389 cfs, essentially identical to the 1972-2005 average for that recording station (U.S. Bureau of Reclamation 2006a) (Fig. 3). Although highly variable during December-February, the temperatures in the tri-state area during winter were slightly warmer than average (Fig. 4). Temperatures dropped sharply in February, and set record lows in several areas within the tri-state region (Joint Agricultural Weather Facility 2006).

### **Historical Trends**

Methods used to estimate trends in rates of change in RMP abundance were detailed in a previous report (U.S. Fish and Wildlife Service 2003), and will not be reiterated here. Briefly, however, we used least-squares regression on log-transformed counts to assess rates of change in counts of swans over time. Counts from the current Mid-winter survey (2006) were compared to results from 1972-2005, a practice used in Service survey reports for other waterfowl (e.g., Wilkins et al. 2005, U.S. Fish and Wildlife Service 2005b). Because Nevada and Oregon did not separate total counts of swans into white birds and cygnets prior to 1992 (see above), analyses to assess trends for white birds and cygnets used only counts from the tri-state area.



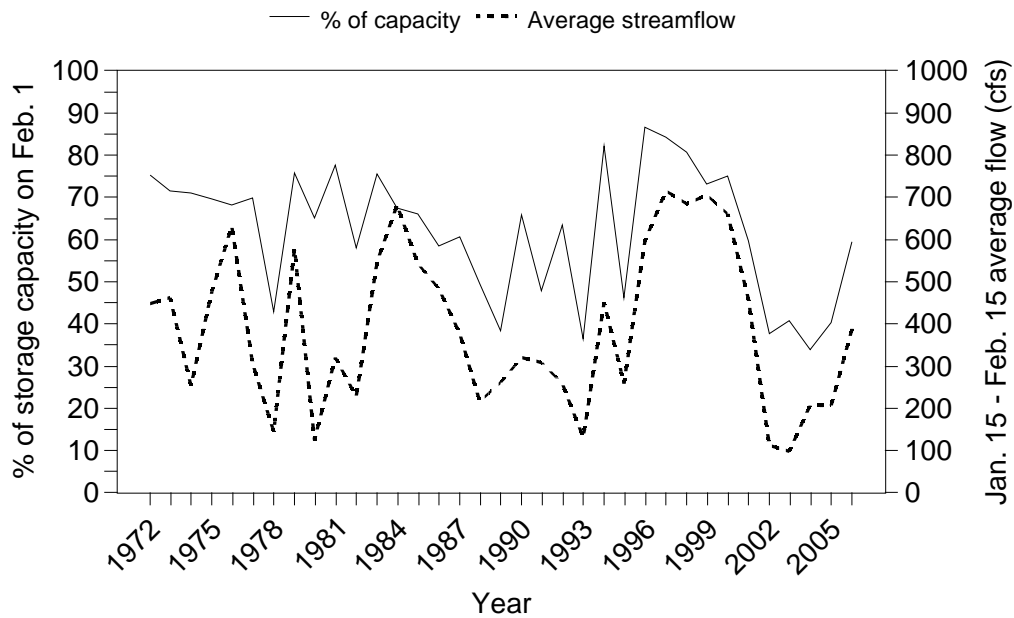


Fig. 3. Water storage for 5 reservoirs (see text) in the tri-state region on 1 February, and average streamflow between 15 January and 15 February on the Henrys Fork, 1972-2006.

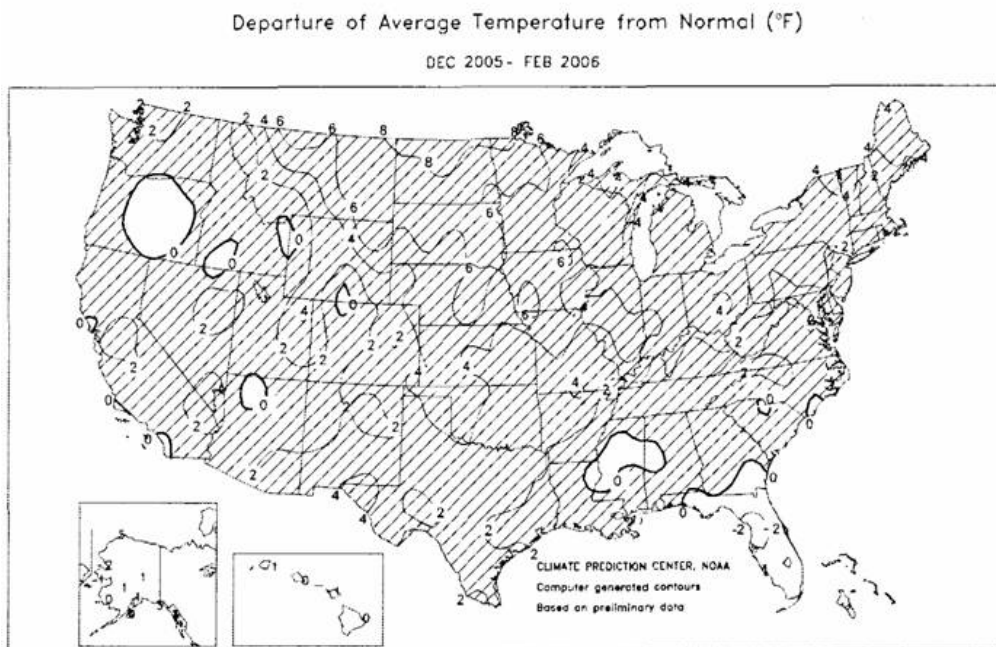


Fig. 4. Departure of temperatures from normal during winter 2005-06 (Joint Agricultural Weather Facility 2006).

The counts for total swans of the RMP suggested an increase ( $P < 0.01$ ) of about 6.1% per year during 1972-2005 (Table 1, Fig. 5). The number of white birds and cygnets counted in the tri-state region both increased ( $P < 0.01$ ) at 6.0% per year. Counts of birds in Montana (white birds + cygnets) increased slightly (+1.8% per year,  $P < 0.01$ ), whereas rates of growth for birds wintering in Idaho and Wyoming were much higher (+7.5% per year for each state)(Table 2, Fig. 6). Although the number of birds wintering in each of the 3 states in the tri-state region generally have increased since 1972, the distribution of birds among the states has changed substantially. Whereas during the 1970s and early 1980s about 36% of wintering swans were counted in Montana, only about 13% of the birds wintering in the tri-state area have been counted there during the last decade (Fig. 7). In contrast, the percentage of birds in Idaho has increased from about 53% to about 68% during that same time period. The percentage of birds counted in Wyoming during winter also has increased slightly, from about 11% to 19%.

Counts of total swans wintering in Nevada have fluctuated over time, but suggest an increase ( $P = 0.01$ ) of about 1.3% per year during 1972-2005 (Table 2, Fig. 8). Counts in Nevada during the early 2000s generally were near historic highs. Trumpeter swans in Oregon primarily occur in 2 areas, Malheur NWR and the Summer Lake WMA and vicinity. Introductions of trumpeter swans to Malheur NWR began in the late 1930s, whereas birds were not translocated to Summer Lake WMA until the winter of 1992. Analyzing trends for the Oregon Flock as a whole (Table 2) could lead to inappropriate inferences. Therefore, we analyzed data for Malheur NWR (1972-2005) separate from those for Summer Lake WMA. Results suggest a decline (-2.6% per year,  $P = 0.05$ ) for birds wintering at Malheur NWR (Fig. 8, Appendix A). At Summer Lake WMA, most birds were translocated to the area during winter, and generally remained in the area for only a few months after being translocated (M. St. Louis, personal communication). Thus, in 1997, the winter following the termination of translocations to Summer Lake WMA, the number counted during the survey dropped sharply (Fig. 8). From 1997-2005, an average of about 25 birds have been observed during winter surveys (excluding years with incomplete surveys).

The percentage of the entire RMP estimated to be comprised of Canadian Flocks increased from about 19% during February of 1972 to 92% during February 2005 (Table 3). The data fit a 2nd-order logarithm model ( $P < 0.01$ , adjusted  $R^2 = 0.96$ ), suggesting that the percentage may be approaching a plateau value near 90% (Fig. 9). The number of swans estimated to be from Canadian Flocks exhibited a fairly steady increase since the early 1980s, and was nearly 5,000 birds in 2005 (Table 3, Fig. 9).

### **Results from the 2006 survey**

During February 2006, observers counted 5,484 trumpeter swans in the RMP, an increase of 2% from the count of last February (5,361) and the third consecutive record-high count for the Mid-winter Survey (Table 1). The number of white birds and cygnets increased 1% and 6%, respectively, from counts last year. The number of swans wintering in the tri-state area increased 2%, which also

Table 1. Counts of trumpeter swans of the Rocky Mountain Population during winter, 1972-2006.

| Year              | Tri-state area |         |                  | Oregon and Nevada <sup>a</sup> |                 |       | Total RMP                |                      |       |
|-------------------|----------------|---------|------------------|--------------------------------|-----------------|-------|--------------------------|----------------------|-------|
|                   | White birds    | Cygnets | Total            | White birds                    | Cygnets         | Total | White birds <sup>b</sup> | Cygnets <sup>b</sup> | Total |
| 1972              | c              | c       | 616              |                                |                 | 91    |                          |                      | 707   |
| 1973              | c              | c       | 581 <sup>d</sup> |                                |                 | 60    |                          |                      | 641   |
| 1974              | 553            | 156     | 709              |                                |                 | 61    |                          |                      | 770   |
| 1975              | 595            | 128     | 723              |                                |                 | 40    |                          |                      | 763   |
| 1976              | 623            | 102     | 725              |                                |                 | 55    |                          |                      | 780   |
| 1977              | 839            | 178     | 1017             |                                |                 | 46    |                          |                      | 1063  |
| 1978              | 695            | 179     | 874              |                                |                 | 27    |                          |                      | 901   |
| 1979              | 743            | 123     | 866              |                                |                 | 62    |                          |                      | 928   |
| 1980              | 767            | 172     | 939              |                                |                 | 86    |                          |                      | 1025  |
| 1981              | 1000           | 247     | 1247             |                                |                 | 98    |                          |                      | 1345  |
| 1982              | 952            | 266     | 1218             |                                |                 | 105   |                          |                      | 1323  |
| 1983              | 1025           | 207     | 1232             |                                |                 | 90    |                          |                      | 1322  |
| 1984              | 1128           | 332     | 1460             |                                |                 | 98    |                          |                      | 1558  |
| 1985              | 1326           | 190     | 1516             |                                |                 | 82    |                          |                      | 1598  |
| 1986              | 1304           | 299     | 1603             |                                |                 | 59    |                          |                      | 1662  |
| 1987              | 1196           | 386     | 1582             |                                |                 | 77    |                          |                      | 1659  |
| 1988              | 1314           | 408     | 1722             |                                |                 | 51    |                          |                      | 1773  |
| 1989              | 1452           | 291     | 1743             |                                |                 | 54    |                          |                      | 1797  |
| 1990              | 1591           | 416     | 2007             |                                |                 | 38    |                          |                      | 2045  |
| 1991              | 1589           | 342     | 1931             |                                |                 | 49    |                          |                      | 1980  |
| 1992              | 1642           | 397     | 2039             | 99                             | 58              | 157   | 1741                     | 455                  | 2196  |
| 1993              | 1659           | 419     | 2078             | 121                            | 36              | 157   | 1780                     | 455                  | 2235  |
| 1994              | 1753           | 543     | 2296             | 127                            | 101             | 228   | 1880                     | 644                  | 2524  |
| 1995              | 2012           | 668     | 2680             | 93                             | 30              | 123   | 2105                     | 698                  | 2803  |
| 1996              | 2129           | 580     | 2709             | 163                            | 64              | 227   | 2292                     | 644                  | 2936  |
| 1997              | 2179           | 407     | 2586             | 77                             | 18              | 95    | 2256                     | 425                  | 2681  |
| 1998 <sup>e</sup> | 1756           | 307     | 2063             | 64                             | 29              | 93    | 1820                     | 336                  | 2156  |
| 1999              | 2698           | 772     | 3470             | 45 <sup>f</sup>                | 10 <sup>f</sup> | 71    | 2743 <sup>f</sup>        | 782 <sup>f</sup>     | 3541  |
| 2000              | 2694           | 746     | 3440             | 50 <sup>f</sup>                | 15 <sup>f</sup> | 84    | 2744 <sup>f</sup>        | 761 <sup>f</sup>     | 3524  |
| 2001              | 3198           | 719     | 3917             | 47 <sup>f</sup>                | 11 <sup>f</sup> | 90    | 3245 <sup>f</sup>        | 730 <sup>f</sup>     | 4007  |
| 2002              | 3814           | 546     | 4360             | 48 <sup>f</sup>                | 7 <sup>f</sup>  | 67    | 3862 <sup>f</sup>        | 553 <sup>f</sup>     | 4427  |
| 2003 <sup>g</sup> | 3365           | 532     | 3897             | 62                             | 15              | 77    | 3427                     | 547                  | 3974  |
| 2004 <sup>g</sup> | 3785           | 746     | 4531             | 46                             | 7               | 53    | 3831                     | 753                  | 4584  |
| 2005              | 4147           | 1143    | 5290             | 59                             | 12              | 71    | 4206                     | 1155                 | 5361  |
| 2006              | 4203           | 1209    | 5412             | 58                             | 14              | 72    | 4261                     | 1223                 | 5484  |

<sup>a</sup> Total counts not separated into white birds and cygnets prior to 1992.

<sup>b</sup> Not calculated prior to 1992 because of no counts for Oregon and Nevada.

<sup>c</sup> Not provided because counts for Yellowstone National Park not separated into white birds and cygnets.

<sup>d</sup> In Wyoming only Yellowstone National Park surveyed.

<sup>e</sup> 1998 counts for the Tri-state area and Total RMP are biased low because aerial survey of Yellowstone National Park not conducted due to hazardous weather; counted by snowmobile with incomplete coverage.

<sup>f</sup> Counts biased low because white-bird and cygnet counts for Malheur NWR not available.

<sup>g</sup> Oregon/Nevada and Total RMP counts biased low due to incomplete surveys at Summer Lake WMA.

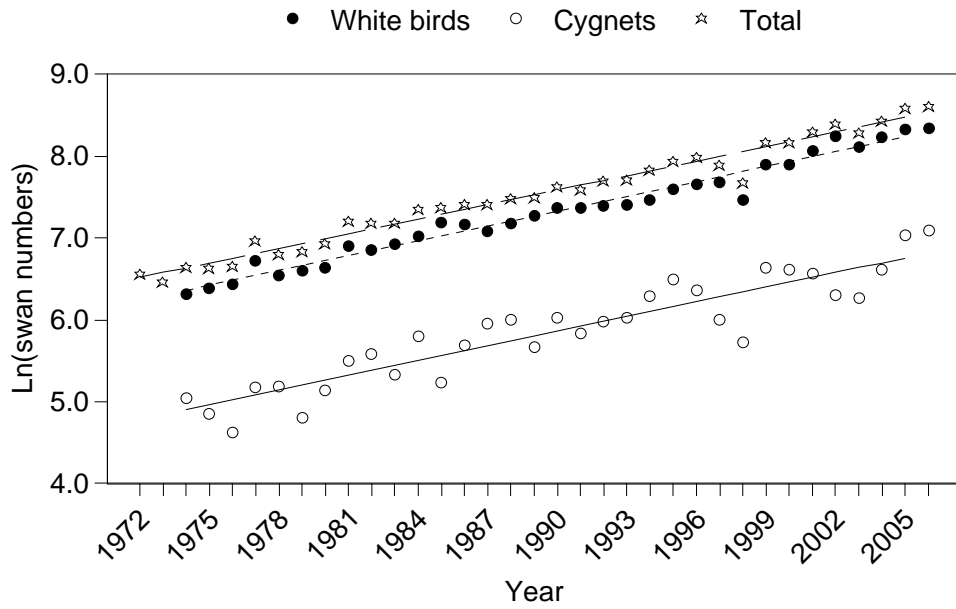


Fig. 5. Rates of change for counts of swans in the RMP during the Mid-winter Trumpeter Swan Survey, 1972-2006 (dotted and solid lines depict trends for white birds and cygnets, respectively, for swans counted in the tri-state region [see text]; dashed line depicts total RMP swans).

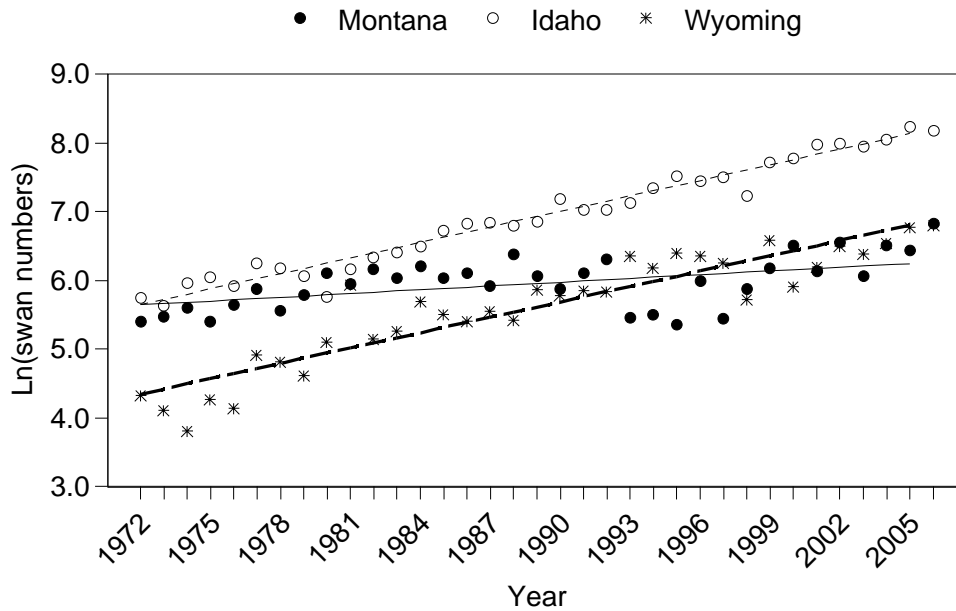


Fig. 6. Rates of change for counts of total swans in states of the tri-state region during the Mid-winter Trumpeter Swan Survey, 1972-2006 (solid, dotted, and dashed lines represent trends for Montana, Idaho, and Wyoming, respectively).

Table 2. Counts of trumpeter swans of the Rocky Mountain Population in individual states during winter, 1972-2006.

| Year | Montana     |         |       | Idaho       |         |       | Wyoming          |                 |                  | Oregon <sup>a</sup> |                |                 | Nevada <sup>a</sup> |         |       |
|------|-------------|---------|-------|-------------|---------|-------|------------------|-----------------|------------------|---------------------|----------------|-----------------|---------------------|---------|-------|
|      | White birds | Cygnets | Total | White birds | Cygnets | Total | White birds      | Cygnets         | Total            | White birds         | Cygnets        | Total           | White birds         | Cygnets | Total |
| 1972 | 209         | 14      | 223   | 303         | 14      | 317   | b                | b               | 76               |                     |                | 50              |                     |         | 41    |
| 1973 | 212         | 28      | 240   | 222         | 58      | 280   | b                | b               | 61 <sup>c</sup>  |                     |                | 32              |                     |         | 28    |
| 1974 | 233         | 40      | 273   | 282         | 109     | 391   | 38               | 7               | 45               |                     |                | 36              |                     |         | 25    |
| 1975 | 192         | 32      | 224   | 333         | 94      | 427   | 70               | 2               | 72               |                     |                | 15              |                     |         | 25    |
| 1976 | 253         | 34      | 287   | 308         | 67      | 375   | 62               | 1               | 63               |                     |                | 30              |                     |         | 25    |
| 1977 | 315         | 43      | 358   | 395         | 126     | 521   | 129              | 9               | 138              |                     |                | 17              |                     |         | 29    |
| 1978 | 194         | 68      | 262   | 392         | 96      | 488   | 109              | 15              | 124              |                     |                | 7               |                     |         | 20    |
| 1979 | 304         | 26      | 330   | 353         | 81      | 434   | 86               | 16              | 102              |                     |                | 41              |                     |         | 21    |
| 1980 | 374         | 80      | 454   | 250         | 70      | 320   | 143              | 22              | 165              |                     |                | 65              |                     |         | 21    |
| 1981 | 352         | 36      | 388   | 370         | 110     | 480   | 278              | 101             | 379              |                     |                | 77              |                     |         | 21    |
| 1982 | 390         | 90      | 480   | 429         | 137     | 566   | 133              | 39              | 172              |                     |                | 65              |                     |         | 40    |
| 1983 | 363         | 59      | 422   | 493         | 122     | 615   | 169              | 26              | 195              |                     |                | 52              |                     |         | 38    |
| 1984 | 389         | 109     | 498   | 503         | 162     | 665   | 236              | 61              | 297              |                     |                | 63              |                     |         | 35    |
| 1985 | 393         | 31      | 424   | 701         | 144     | 845   | 232              | 15              | 247              |                     |                | 51              |                     |         | 31    |
| 1986 | 380         | 73      | 453   | 744         | 183     | 927   | 180              | 43              | 223              |                     |                | 33              |                     |         | 26    |
| 1987 | 314         | 63      | 377   | 690         | 255     | 945   | 192              | 68              | 260              |                     |                | 49              |                     |         | 28    |
| 1988 | 438         | 153     | 591   | 694         | 209     | 903   | 182              | 46              | 228              |                     |                | 24              |                     |         | 27    |
| 1989 | 342         | 90      | 432   | 817         | 141     | 958   | 293              | 60              | 353              |                     |                | 36              |                     |         | 18    |
| 1990 | 319         | 38      | 357   | 1025        | 300     | 1325  | 247              | 78              | 325              |                     |                | 23              |                     |         | 15    |
| 1991 | 385         | 70      | 455   | 918         | 211     | 1129  | 286              | 61              | 347              |                     |                | 31              |                     |         | 18    |
| 1992 | 438         | 114     | 552   | 892         | 249     | 1141  | 312              | 34              | 346              | 67                  | 56             | 123             | 32                  | 2       | 34    |
| 1993 | 168         | 70      | 238   | 1020        | 246     | 1266  | 471              | 103             | 574              | 91                  | 36             | 127             | 30                  | 0       | 30    |
| 1994 | 199         | 48      | 247   | 1164        | 397     | 1561  | 390              | 98              | 488              | 114                 | 94             | 208             | 13                  | 7       | 20    |
| 1995 | 153         | 61      | 214   | 1391        | 475     | 1866  | 468              | 132             | 600              | 72                  | 27             | 99              | 21                  | 3       | 24    |
| 1996 | 319         | 82      | 401   | 1336        | 390     | 1726  | 474              | 108             | 582              | 140                 | 49             | 189             | 23                  | 15      | 38    |
| 1997 | 204         | 30      | 234   | 1555        | 272     | 1827  | 420              | 105             | 525              | 46                  | 9              | 55              | 31                  | 9       | 40    |
| 1998 | 290         | 68      | 358   | 1200        | 200     | 1400  | 266 <sup>d</sup> | 39 <sup>d</sup> | 305 <sup>d</sup> | 31                  | 7              | 38              | 33                  | 22      | 55    |
| 1999 | 335         | 153     | 488   | 1754        | 500     | 2254  | 609              | 119             | 728              | 16 <sup>e</sup>     | 2 <sup>e</sup> | 34              | 29                  | 8       | 37    |
| 2000 | 519         | 155     | 674   | 1881        | 513     | 2394  | 294              | 78              | 372              | 15 <sup>e</sup>     | 6 <sup>e</sup> | 40              | 35                  | 9       | 44    |
| 2001 | 373         | 96      | 469   | 2404        | 549     | 2953  | 421              | 74              | 495              | 16 <sup>e</sup>     | 7 <sup>e</sup> | 55              | 31                  | 4       | 35    |
| 2002 | 600         | 104     | 704   | 2636        | 357     | 2993  | 578              | 85              | 663              | 7 <sup>e</sup>      | 5 <sup>e</sup> | 24              | 41                  | 2       | 43    |
| 2003 | 375         | 58      | 433   | 2490        | 382     | 2872  | 500              | 92              | 592              | 28 <sup>f</sup>     | 8 <sup>f</sup> | 36 <sup>f</sup> | 34                  | 7       | 41    |
| 2004 | 583         | 92      | 675   | 2591        | 563     | 3154  | 611              | 91              | 702              | 8 <sup>f</sup>      | 0 <sup>f</sup> | 8 <sup>f</sup>  | 38                  | 7       | 45    |
| 2005 | 508         | 119     | 627   | 2954        | 828     | 3782  | 685              | 196             | 881              | 27                  | 10             | 37              | 32                  | 2       | 34    |
| 2006 | 713         | 211     | 924   | 2714        | 873     | 3587  | 776              | 125             | 901              | 36                  | 14             | 50              | 22                  | 0       | 22    |

<sup>a</sup> Counts for Oregon and Nevada were not separated into white birds and cygnets until 1992.

<sup>b</sup> Not provided because counts for Yellowstone National Park not separated into white birds and cygnets.

<sup>c</sup> Counts for Yellowstone National Park only; remainder of Wyoming not surveyed.

<sup>d</sup> Counts for Wyoming biased low because aerial survey of Yellowstone National Park not conducted due to hazardous weather; counted by snowmobile with incomplete coverage.

<sup>e</sup> Counts biased low because white-bird and cygnet counts for Malheur NWR not available.

<sup>f</sup> Counts biased low due to incomplete surveys at Summer Lake WMA.

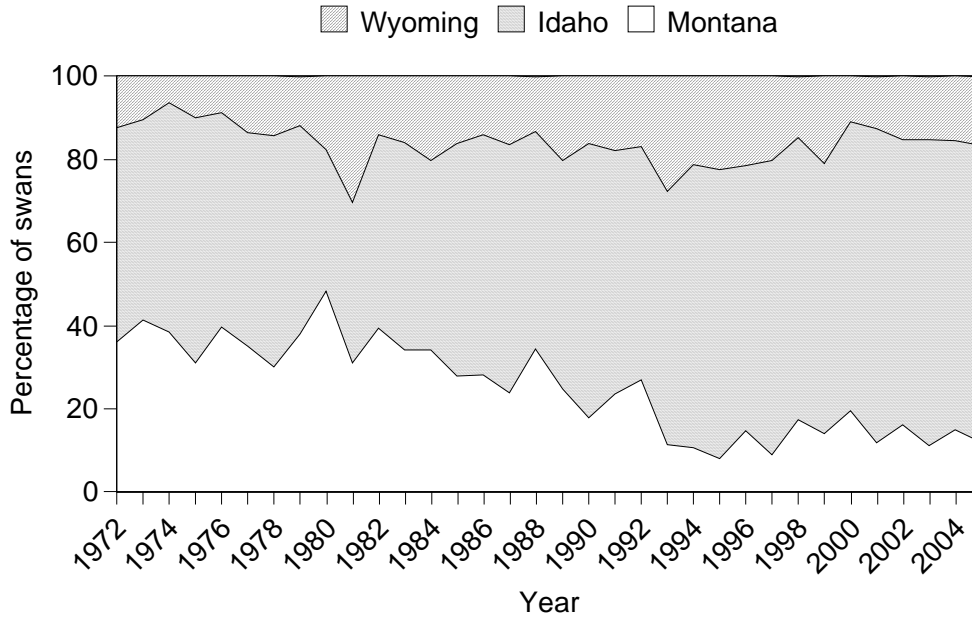


Fig. 7. Proportions of total swans counted in each of the states comprising the tri-state region during the Mid-winter Trumpeter Swan Survey, 1972-2005.

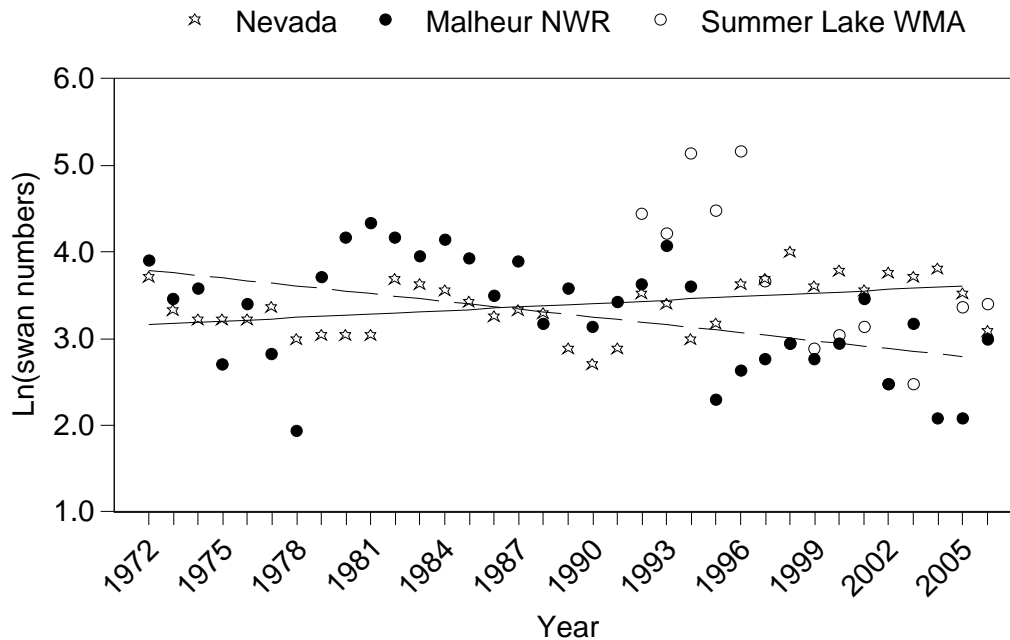


Fig. 8. Rates of change in counts of total swans in Nevada (stars and solid line) and Oregon (Malheur NWR [closed circles and dashed line] and Summer Lake WMA [open circles]) during the Mid-winter Trumpeter Swan Survey, 1972-2006. Data for Summer Lake WMA in 2002 and 2003 are from incomplete surveys.



Table 3. Estimates of swan abundance for flocks comprising the Rocky Mountain Population of Trumpeter swans, 1972-2006.

| Year | Mid-winter count | U.S. Breeding Flocks <sup>a</sup> | Canadian Flocks | Percent Canadian Flocks |
|------|------------------|-----------------------------------|-----------------|-------------------------|
| 1972 | 707              | 572                               | 135             | 19.1                    |
| 1975 | 763              | 581                               | 182             | 23.9                    |
| 1978 | 901              | 544                               | 357             | 39.6                    |
| 1981 | 1345             | 582                               | 763             | 56.7                    |
| 1984 | 1558             | 547                               | 1011            | 64.9                    |
| 1985 | 1598             | 563                               | 1035            | 64.8                    |
| 1986 | 1662             | 575                               | 1087            | 65.4                    |
| 1987 | 1659             | 452                               | 1207            | 72.8                    |
| 1988 | 1773             | 611                               | 1162            | 65.5                    |
| 1989 | 1797             | 659                               | 1138            | 63.3                    |
| 1990 | 2045             | 598                               | 1447            | 70.8                    |
| 1991 | 1980             | 626                               | 1354            | 68.4                    |
| 1992 | 2196             | 555                               | 1641            | 74.7                    |
| 1993 | 2235             | 563                               | 1672            | 74.8                    |
| 1994 | 2524             | 354                               | 2170            | 86.0                    |
| 1995 | 2803             | 454                               | 2349            | 83.8                    |
| 1996 | 2936             | 427                               | 2509            | 85.5                    |
| 1997 | 2681             | 458                               | 2223            | 82.9                    |
| 1998 | 2156             | 427                               | 1729            | 80.2                    |
| 1999 | 3541             | 469                               | 3072            | 86.8                    |
| 2000 | 3524             | 417                               | 3107            | 88.2                    |
| 2001 | 4007             | 481                               | 3526            | 88.0                    |
| 2002 | 4427             | 487                               | 3940            | 89.0                    |
| 2003 | 3974             | 371                               | 3603            | 90.7                    |
| 2004 | 4584             | 417                               | 4167            | 90.9                    |
| 2005 | 5361             | 417                               | 4944            | 92.2                    |
| 2006 | 5484             | 510                               | 4974            | 90.7                    |

<sup>a</sup> From U.S. Fish and Wildlife Service 2005a. Counts are from the previous calendar year (e.g., the 2006 value is from the Fall 2005 survey).

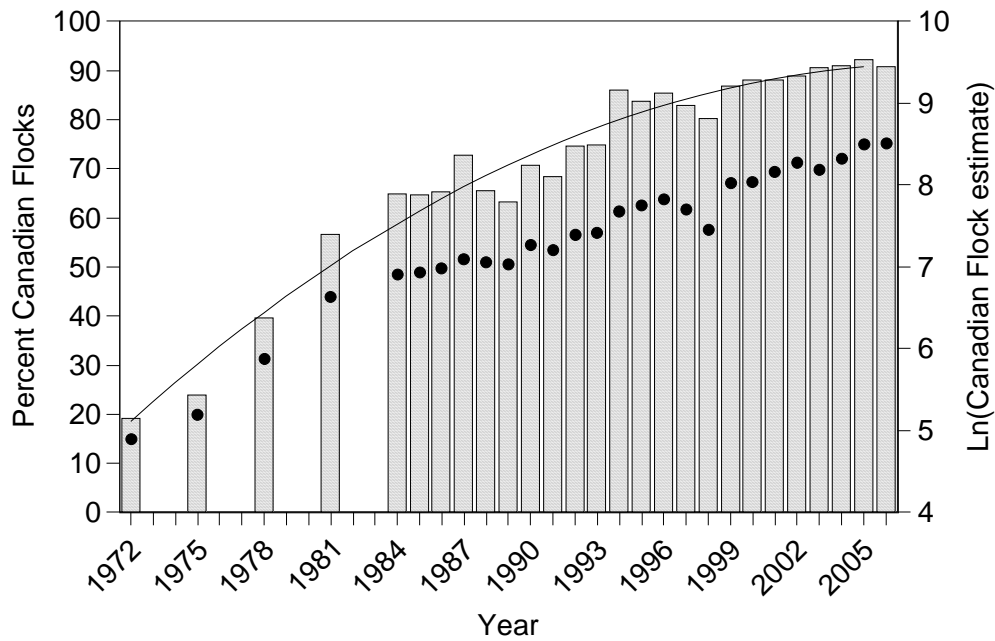


Fig. 9. Percent (bars and solid line) and counts (solid dots) of the entire RMP estimated to be comprised of Canadian Flocks during the Mid-winter Trumpeter Swan Survey, 1972-2006.

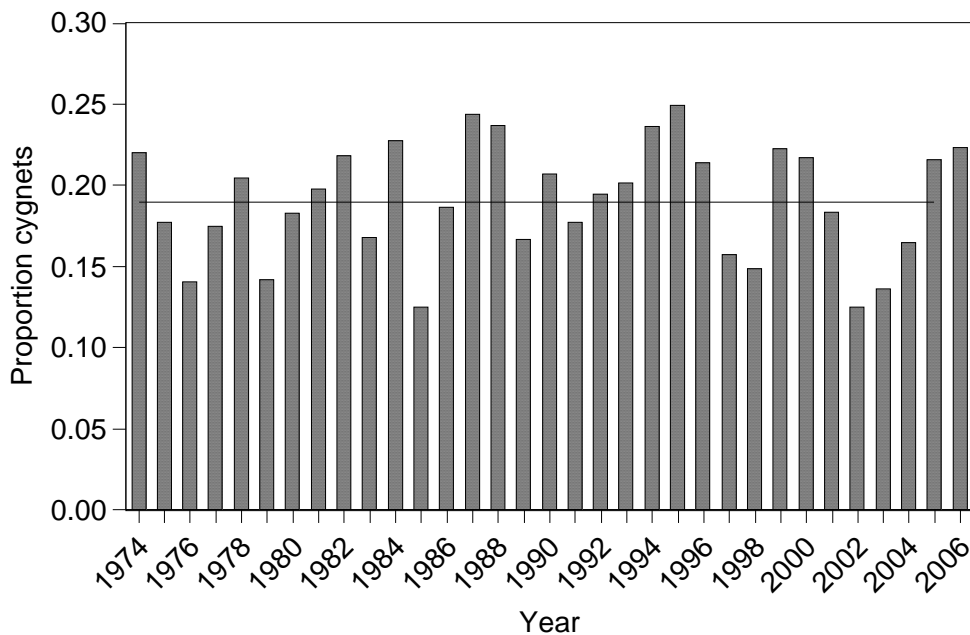


Fig. 10. Proportion of cygnets counted in the tri-state region during the Mid-winter Trumpeter Swan Survey, 1974-2006. The solid line depicts the 1974-2005 average.

was the third consecutive record-high count. Increases of total swans from counts in 2005 occurred in Montana (+47%) and Wyoming (+2%), but a slight decrease occurred in Idaho (-5%) (Table 2). In Montana and Wyoming, the number of birds this year were record-high counts, whereas that for Idaho was second only to the record-high count from last year. Of the birds wintering in the tri-state area during February 2006, about 17% were in Montana, 66% were in Idaho, and 17% inhabited Wyoming.

The number of swans in Nevada (22) was lower than counts in recent winters (Table 2), and about half that from a few years ago. No cygnets were observed during the survey this winter. The total count was 29% below the long-term average (31 swans). Warm weather resulted in small areas of open water, with only about 85% of the marsh area of Ruby Lake frozen. The number of swans counted at Malheur NWR (20) was greater than that of last year, but 39% below the 1972-2005 average (Appendix A). The count at SLWMA (30) was essentially the same as that of last year.

The estimated number of swans from Canadian Flocks was 4,974 birds, a value nearly identical to that of 2005. With the exception of 2003, successive estimates for the size of the Canadian Flocks since 1998 have been record-high counts. The estimate suggested about 91% of the RMP counted in February 2006 was comprised of swans from Canadian Flocks (Table 3, Fig. 9), nearly the same as the average proportion over the last few years.

In contrast to the estimate for the Canadian Flocks derived by subtraction, the count from the quinquennial survey was 4,718 swans (Moser 2006). Thus, the subtraction-method estimate was 5.4% higher than that from the rangewide survey. This result is similar to comparisons of the estimates from previous years when both surveys were conducted. On average, the subtraction method results in estimates about 350 birds higher than those from the quinquennial surveys (Table 4). Assuming that counts are accurate, or at least that biases are constant over time, the difference could be due to the following: (1) the quinquennial rangewide survey does not count all of the Canadian swans on their nesting areas, (2) swans from outside the designated range of the RMP winter in areas surveyed annually for the RMP, or (3) a combination of these possibilities.

The proportion of cygnets for swans counted in the tri-state region during February 2006 was 0.223. This value was 18% above the 1974-2005 average (0.190) (Fig. 10). The 2006 Mid-winter proportion was the second consecutive year suggesting above-average production for the RMP.

In summary, RMP trumpeter swans appeared to increase by about 6.1% annually between 1972 and 2005. Most of the increase over that time was attributable to increases in the number of birds in the Canadian Flocks, which estimates suggest comprise slightly more than 90% of the population. Although estimates of the size of the Canadian Flocks from the winter RMP surveys typically are greater than those from the quinquennial surveys, the estimates appear to track each other. This result suggests that annual estimates of the size of the Canadian Flocks from the winter RMP surveys are reasonable, but may slightly overestimate their abundance.

Table 4. Comparison of estimates from annual RMP surveys and the quinquennial surveys, 1975-2005.

| Year | Subtraction method<br>from RMP surveys <sup>a</sup> | Quinquennial<br>survey <sup>b</sup> | Difference |
|------|---|-------------------------------------|------------|
| 1975 | c   | 131                                 | c          |
| 1980 | 763   | 379                                 | 384        |
| 1985 | 1,087   | 614                                 | 473        |
| 1990 | 1,354   | 1,117                               | 237        |
| 1995 | 2,509   | 2,076                               | 433        |
| 2000 | 3,526   | 3,183                               | 343        |
| 2005 | 4,974   | 4,718                               | 256        |

<sup>a</sup>RMP winter count from year<sub>t+1</sub> minus RMP fall count from year<sub>t</sub> (e.g., 1980 estimate from 1981 RMP winter count minus 1980 RMP fall count).

<sup>b</sup>Estimates from Moser (2006).

<sup>c</sup>Estimate not available because 1975 RMP fall survey was not conducted.

The number of RMP swans increased 2% between the winters of 2004-05 and 2005-06. For the second consecutive year, production appeared to be above average for the RMP as a whole. The Canadian Flocks continue to increase in number, and our estimate was corroborated by the quinquennial rangewide survey this year. Also, the fall count of the RMP/U.S. Breeding Segment was the highest since 1992 (U.S. Fish and Wildlife Service 2005a). This continued improvement in the RMP is encouraging, although counts for the U.S. Breeding Segment remain well below objective levels. The increase in precipitation throughout U.S. nesting areas this winter, and subsequent improved water levels in reservoirs, should improve habitat conditions for swans this spring and summer.

## ACKNOWLEDGMENTS

We would like to especially thank the personnel who conducted the surveys, a list of whom is provided in Appendix C. The survey is a collaborative effort among Red Rock Lakes NWR, Migratory Birds and State Programs -- Mountain-Prairie Region of the U.S. Fish and Wildlife Service, Southeast Idaho Refuge Complex, National Elk Refuge, Harriman State Park, Idaho Department of Fish and Game, Grand Teton National Park, Yellowstone National Park, Wyoming Game and Fish Department, Ruby Lake NWR, Malheur NWR, and the Shoshone-Bannock Tribes. J. Cornely, T. McEneaney, J. Mackay, C. Mitchell, S. Patla, R. Roy, M. St. Louis, and J. Warren provided comments and helpful suggestions for this document.

## LITERATURE CITED

- Banko, W.E. 1960. The trumpeter swan: Its history, habits, and population in the United States. North American Fauna, No. 63. U.S. Fish and Wildlife Service, Washington, D.C. 214pp.
- Gale, R.S., E.O. Garton, and I.J. Ball. 1988. The history, ecology and management of the Rocky Mountain Population of trumpeter swans. Unpublished report. U.S. Fish and Wildlife Service, Montana Cooperative Wildlife Research Unit, Missoula. 532pp.
- Joint Agricultural Weather Facility. 2006. Weekly Weather and Crop Bulletin. Vol. 93, No. 11. URL:<http://www.usda.mannlib.cornell.edu/reports/waobr/weather/2006/full/wwcb1106.pdf>.
- Moser, T.J. 2006. The 2005 North American trumpeter swan survey. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Denver, CO. 14pp.
- Pacific Flyway Study Committee. 2002. RMP Trumpeter Swan Implementation Plan. U.S. Fish and Wildlife Service, Portland, OR. 27pp.
- U.S. Bureau of Reclamation. 2006a. Pacific Northwest Region hydromet historical data access. URL:<http://www.usbr.gov/pn/hydromet/arcread.html>.
- U.S. Bureau of Reclamation. 2006b. Pacific Northwest Region end-of-month water conditions. URL:<http://www.usbr.gov/pn/hydromet/denver.html>.
- U.S. Department of Agriculture. 2006. Mountain snowpack as of February 1, 2006. URL:<ftp://ftp.wcc.nrcs.usda.gov/support/water/westwide/snowpack/wy2006/snow0602.gif>.
- U.S. Fish and Wildlife Service. 2003. Trumpeter swan survey of the Rocky Mountain Population, Winter 2003. Division of Migratory Birds and State Programs, Denver, CO. 28pp.
- U.S. Fish and Wildlife Service. 2005a. Trumpeter swan survey of the Rocky Mountain Population, U.S. Breeding Segment, Fall 2005. Migratory Birds and State Programs, Denver, CO. 31pp.
- U.S. Fish and Wildlife Service. 2005b. Waterfowl population status, 2005. U.S. Department of the Interior, Washington, D.C. 59pp.
- Wilkins, K.A., M.C. Otto, and M.D. Koneff. 2005. Trends in duck breeding populations, 1955-2005. U.S. Fish and Wildlife Service Administrative Report, Division of Migratory Bird Management, Laurel, MD. 21pp.

Appendix A. Counts of trumpeter swans of the Rocky Mountain Population during winter, 1972-2006.

| Year | Montana     |         |       | Idaho       |         |       | Wyoming (outside Yellowstone NP) |         |       |
|------|-------------|---------|-------|-------------|---------|-------|----------------------------------|---------|-------|
|      | White birds | Cygnets | Total | White birds | Cygnets | Total | White birds                      | Cygnets | Total |
| 1972 | 209         | 14      | 223   | 303         | 14      | 317   | 16                               | 4       | 20    |
| 1973 | 212         | 28      | 240   | 222         | 58      | 280   | a                                | a       | a     |
| 1974 | 233         | 40      | 273   | 282         | 109     | 391   | 7                                | 0       | 7     |
| 1975 | 192         | 32      | 224   | 333         | 94      | 427   | 40                               | 2       | 42    |
| 1976 | 253         | 34      | 287   | 308         | 67      | 375   | 30                               | 1       | 31    |
| 1977 | 315         | 43      | 358   | 395         | 126     | 521   | 86                               | 0       | 86    |
| 1978 | 194         | 68      | 262   | 392         | 96      | 488   | 63                               | 4       | 67    |
| 1979 | 304         | 26      | 330   | 353         | 81      | 434   | 15                               | 3       | 18    |
| 1980 | 374         | 80      | 454   | 250         | 70      | 320   | 63                               | 6       | 69    |
| 1981 | 352         | 36      | 388   | 370         | 110     | 480   | 37                               | 10      | 47    |
| 1982 | 390         | 90      | 480   | 429         | 137     | 566   | 76                               | 19      | 95    |
| 1983 | 363         | 59      | 422   | 493         | 122     | 615   | 81                               | 12      | 93    |
| 1984 | 389         | 109     | 498   | 503         | 162     | 665   | 87                               | 11      | 98    |
| 1985 | 393         | 31      | 424   | 701         | 144     | 845   | 78                               | 8       | 86    |
| 1986 | 380         | 73      | 453   | 744         | 183     | 927   | 91                               | 25      | 116   |
| 1987 | 314         | 63      | 377   | 690         | 255     | 945   | 85                               | 18      | 103   |
| 1988 | 438         | 153     | 591   | 694         | 209     | 903   | 115                              | 28      | 143   |
| 1989 | 342         | 90      | 432   | 817         | 141     | 958   | 197                              | 39      | 236   |
| 1990 | 319         | 38      | 357   | 1025        | 300     | 1325  | 169                              | 46      | 215   |
| 1991 | 385         | 70      | 455   | 918         | 211     | 1129  | 225                              | 47      | 272   |
| 1992 | 438         | 114     | 552   | 892         | 249     | 1141  | 204                              | 30      | 234   |
| 1993 | 168         | 70      | 238   | 1020        | 246     | 1266  | 293                              | 64      | 357   |
| 1994 | 199         | 48      | 247   | 1164        | 397     | 1561  | 253                              | 74      | 327   |
| 1995 | 153         | 61      | 214   | 1391        | 475     | 1866  | 327                              | 91      | 418   |
| 1996 | 319         | 82      | 401   | 1336        | 390     | 1726  | 344                              | 84      | 428   |
| 1997 | 204         | 30      | 234   | 1555        | 272     | 1827  | 346                              | 102     | 448   |
| 1998 | 290         | 68      | 358   | 1200        | 200     | 1400  | 109                              | 15      | 124   |
| 1999 | 335         | 153     | 488   | 1754        | 500     | 2254  | 317                              | 71      | 388   |
| 2000 | 519         | 155     | 674   | 1881        | 513     | 2394  | 207                              | 65      | 272   |
| 2001 | 373         | 96      | 469   | 2404        | 549     | 2953  | 368                              | 63      | 431   |
| 2002 | 600         | 104     | 704   | 2636        | 357     | 2993  | 447                              | 72      | 519   |
| 2003 | 375         | 58      | 433   | 2490        | 382     | 2872  | 354                              | 58      | 412   |
| 2004 | 583         | 92      | 675   | 2591        | 563     | 3154  | 462                              | 58      | 520   |
| 2005 | 508         | 119     | 627   | 2954        | 828     | 3782  | 561                              | 166     | 727   |
| 2006 | 713         | 211     | 924   | 2714        | 873     | 3587  | 655                              | 111     | 766   |

<sup>a</sup> Counts not available.

<sup>b</sup> Total counts not separated into white birds and cygnets prior to 1992.

<sup>c</sup> Swans first translocated to Summer Lake WMA in 1992.

<sup>d</sup> Count biased low because aerial survey not conducted due to hazardous weather; snowmobile count with incomplete coverage only.

<sup>e</sup> Count biased low due to incomplete survey coverage.



Appendix A. (cont.)

| Year | Yellowstone NP   |                 |                  | Malheur NWR <sup>b</sup> |         |       | Summer Lake WMA <sup>c</sup> |                |                 | Nevada <sup>b</sup> |         |       |
|------|------------------|-----------------|------------------|--------------------------|---------|-------|------------------------------|----------------|-----------------|---------------------|---------|-------|
|      | White birds      | Cygnets         | Total            | White birds              | Cygnets | Total | White birds                  | Cygnets        | Total           | White birds         | Cygnets | Total |
| 1972 | a                | a               | 56               |                          |         | 50    |                              |                |                 |                     |         | 41    |
| 1973 | a                | a               | 61               |                          |         | 32    |                              |                |                 |                     |         | 28    |
| 1974 | 31               | 7               | 38               |                          |         | 36    |                              |                |                 |                     |         | 25    |
| 1975 | 30               | 0               | 30               |                          |         | 15    |                              |                |                 |                     |         | 25    |
| 1976 | 32               | 0               | 32               |                          |         | 30    |                              |                |                 |                     |         | 25    |
| 1977 | 43               | 9               | 52               |                          |         | 17    |                              |                |                 |                     |         | 29    |
| 1978 | 46               | 11              | 57               |                          |         | 7     |                              |                |                 |                     |         | 20    |
| 1979 | 71               | 13              | 84               |                          |         | 41    |                              |                |                 |                     |         | 21    |
| 1980 | 80               | 16              | 96               |                          |         | 65    |                              |                |                 |                     |         | 21    |
| 1981 | 241              | 91              | 332              |                          |         | 77    |                              |                |                 |                     |         | 21    |
| 1982 | 57               | 20              | 77               |                          |         | 65    |                              |                |                 |                     |         | 40    |
| 1983 | 88               | 14              | 102              |                          |         | 52    |                              |                |                 |                     |         | 38    |
| 1984 | 149              | 50              | 199              |                          |         | 63    |                              |                |                 |                     |         | 35    |
| 1985 | 154              | 7               | 161              |                          |         | 51    |                              |                |                 |                     |         | 31    |
| 1986 | 89               | 18              | 107              |                          |         | 33    |                              |                |                 |                     |         | 26    |
| 1987 | 107              | 50              | 157              |                          |         | 49    |                              |                |                 |                     |         | 28    |
| 1988 | 67               | 18              | 85               |                          |         | 24    |                              |                |                 |                     |         | 27    |
| 1989 | 96               | 21              | 117              |                          |         | 36    |                              |                |                 |                     |         | 18    |
| 1990 | 78               | 32              | 110              |                          |         | 23    |                              |                |                 |                     |         | 15    |
| 1991 | 61               | 14              | 75               |                          |         | 31    |                              |                |                 |                     |         | 18    |
| 1992 | 108              | 4               | 112              | 25                       | 13      | 38    | 42                           | 43             | 85              | 32                  | 2       | 34    |
| 1993 | 178              | 39              | 217              | 44                       | 15      | 59    | 47                           | 21             | 68              | 30                  | 0       | 30    |
| 1994 | 137              | 24              | 161              | 30                       | 7       | 37    | 84                           | 87             | 171             | 13                  | 7       | 20    |
| 1995 | 141              | 41              | 182              | 9                        | 1       | 10    | 63                           | 26             | 89              | 21                  | 3       | 24    |
| 1996 | 130              | 24              | 154              | 11                       | 3       | 14    | 129                          | 46             | 175             | 23                  | 15      | 38    |
| 1997 | 74               | 3               | 77               | 11                       | 5       | 16    | 35                           | 4              | 39              | 31                  | 9       | 40    |
| 1998 | 157 <sup>d</sup> | 24 <sup>d</sup> | 181 <sup>d</sup> | 13                       | 6       | 19    | 18                           | 1              | 19              | 33                  | 22      | 55    |
| 1999 | 292              | 48              | 340              | a                        | a       | 16    | 16                           | 2              | 18              | 29                  | 8       | 37    |
| 2000 | 87               | 13              | 100              | a                        | a       | 19    | 15                           | 6              | 21              | 35                  | 9       | 44    |
| 2001 | 53               | 11              | 64               | a                        | a       | 32    | 16                           | 7              | 23              | 31                  | 4       | 35    |
| 2002 | 131              | 13              | 144              | a                        | a       | 12    | 7 <sup>e</sup>               | 5 <sup>e</sup> | 12 <sup>e</sup> | 41                  | 2       | 43    |
| 2003 | 146              | 34              | 180              | 19                       | 5       | 24    | 9 <sup>e</sup>               | 3 <sup>e</sup> | 12 <sup>e</sup> | 34                  | 7       | 41    |
| 2004 | 149              | 33              | 182              | 8                        | 0       | 8     | a                            | a              | a               | 38                  | 7       | 45    |
| 2005 | 124              | 30              | 154              | 8                        | 0       | 8     | 19                           | 10             | 29              | 32                  | 2       | 34    |
| 2006 | 121              | 14              | 135              | 15                       | 5       | 20    | 21                           | 9              | 30              | 22                  | 0       | 22    |

<sup>a</sup> Counts not available.

<sup>b</sup> Total counts not separated into white birds and cygnets prior to 1992.

<sup>c</sup> Swans first translocated to Summer Lake WMA in 1992.

<sup>d</sup> Count biased low because aerial survey not conducted due to hazardous weather; snowmobile count with incomplete coverage only.

<sup>e</sup> Count biased low due to incomplete survey coverage.

Appendix B. Site-specific counts of trumpeter swans of the Rocky Mountain Population during the Mid-winter Trumpeter Swan Survey, 2006.

| State or Area                               | White birds | Cygnets    | Total      | Pilot/observer/notes                    |
|---|-------------|------------|------------|---|
| <b>Montana</b>                              |             |            |            |   |
| <i>Hebgen Lake area</i>                     |             |            |            | P:R. Stradley; O:T. McEneaney (2/11/06) |
| Cougar Creek                                | 0           | 0          | 0          |   |
| Between Quake Lake and Hebgen Lake          | 0           | 0          | 0          |   |
| Madison River Arm                           | 416         | 116        | 532        |   |
| North Spring (Grayling Arm)                 | 26          | 17         | 43         |   |
| South Fork Arm                              | 61          | 20         | 81         |   |
| <b>Subtotal</b>                             | <b>503</b>  | <b>153</b> | <b>656</b> |   |
|   |             |            |            |   |
| <i>Madison River Valley</i>                 |             |            |            | P: D. Chapman; O: J. Warren (2/7/06)    |
| Odell Creek Area                            | 21          | 15         | 36         |   |
| Walsh Ponds (south)1                        | 0           | 0          | 0          |   |
| Walsh Ponds (north)1                        | 4           | 0          | 4          |   |
| Madison River, south of Ennis               | 0           | 0          | 0          |   |
| Madison River, north of Ennis               | 17          | 13         | 30         |   |
| Ennis Lake                                  | 102         | 20         | 122        |   |
| <b>Subtotal</b>                             | <b>144</b>  | <b>48</b>  | <b>192</b> |   |
|   |             |            |            |   |
| <i>Chain of Lakes</i>                       |             |            |            |   |
| Cliff Lake                                  | 1           | 0          | 1          |   |
| Wade Lake                                   | 0           | 0          | 0          |   |
| Goose Lake                                  | 0           | 0          | 0          |   |
| Smith Creek (Hidden Lake outlet)            | 0           | 0          | 0          |   |
| <b>Subtotal</b>                             | <b>1</b>    | <b>0</b>   | <b>1</b>   |   |
|   |             |            |            |   |
| <i>Centennial Valley/Red Rock Lakes NWR</i> |             |            |            |   |
| Red Rock River below Lower Lake Dam         | 0           | 0          | 0          |   |
| MacDonald Pond                              | 30          | 3          | 33         |   |
| Culver Pond                                 | 6           | 2          | 8          |   |
| Elk Springs Creek                           | 0           | 0          | 0          |   |
| Swan Lake                                   | 0           | 0          | 0          |   |
| Shambow Pond                                | 0           | 0          | 0          |   |
| Red Rock River, Lima                        | 0           | 0          | 0          |   |
| <b>Subtotal</b>                             | <b>36</b>   | <b>5</b>   | <b>41</b>  |   |
|   |             |            |            |   |
| <i>Paradise Valley</i>                      |             |            |            | P:R. Stradley; O:T. McEneaney (2/11/06) |
| Armstrong's Spring Creek                    | 3           | 2          | 5          |   |
| Bailey's                                    | 0           | 0          | 0          |   |
| Brockway                                    | 0           | 0          | 0          |   |
| DePuys                                      | 7           | 0          | 7          |   |
| Brandis                                     | 2           | 0          | 2          |   |
|   |             |            |            |   |
| Nelson's Spring Creek                       | 0           | 0          | 0          |   |

## Appendix B. (cont.)

|   |            |          |            |   |
|---|------------|----------|------------|---|
| Sacagawea Park  | 0          | 0        | 0          |   |
| Yellowstone River 1 mile north of Emigrant              | 0          | 0        | 0          |   |
| Beaver Creek  | 16         | 3        | 19         |   |
| Yellowstone River - 6 mile                              | 0          | 0        | 0          |   |
| Yellowstone River - Pray                                | 0          | 0        | 0          |   |
| Dana's  | 1          | 0        | 1          |   |
| <b>Subtotal</b>   | <b>29</b>  | <b>5</b> | <b>34</b>  |   |
|   |            |          |            |   |
|   |            |          |            |   |
| <b>Wyoming</b>  |            |          |            |   |
| <i>Upper Snake River (Flagg Ranch to Wilson Bridge)</i> |            |          |            | P: D. Stinson; O: S. Patla (2/6-7/06)           |
| Polecat Creek   | 1          | 0        | 1          |   |
| Flagg Ranch to Jackson Lake                             | 0          | 0        | 0          |   |
| Jackson Lake  | 0          | 0        | 0          | Frozen  |
| Jackson Lake to Moran Junction                          | 24         | 1        | 25         | Pancake ice down from Oxbow; 16 swans downriver |
| Moran Junction to Deadman's                             | 2          | 0        | 2          | Pancake ice                                     |
| Deadman's to Moose                                      | 28         | 0        | 28         | Swans mostly in side channels                   |
| Moose to Gros Ventre Junction                           | 9          | 1        | 10         |   |
| Gros Ventre Junction area                               | 30         | 2        | 32         |   |
| Gros Ventre Junction to Wilson Bridge                   | 16         | 2        | 18         |   |
| Gros Ventre River, Highway 89 to Snake River            | 0          | 0        | 0          | Much ice; restricted flow                       |
| <b>Subtotal</b>   | <b>110</b> | <b>6</b> | <b>116</b> |   |
|   |            |          |            |   |
|   |            |          |            |   |
| <i>Gros Ventre River upriver of Kelly</i>               |            |          |            |   |
| Kelly Warm Springs, Grand Teton National Park           | 0          | 0        | 0          |   |
| Lower Slide Lake  | 0          | 0        | 0          |   |
| Upper Gros Ventre                                       | 0          | 0        | 0          |   |
| <b>Subtotal</b>   | <b>0</b>   | <b>0</b> | <b>0</b>   |   |
|   |            |          |            |   |
|   |            |          |            |   |
| <i>Lower Snake River (Wilson Bridge to Alpine)</i>      |            |          |            |   |
| Wilson Bridge to South Park Bridge                      | 13         | 0        | 13         |   |
| Evan's Gravel pit ponds                                 | 58         | 14       | 72         |   |
| South Park Bridge to Hoback                             | 0          | 0        | 0          |   |
| North Wilson  | 20         | 2        | 22         |   |
| Fish Creek, Wilson to Snake River                       | 54         | 5        | 59         |   |
| Boyles Hill area  | 4          | 1        | 5          |   |
| Spring Creek  | 40         | 12       | 52         |   |
| Crane Creek   | 14         | 2        | 16         |   |
| Lower Flat Creek, Snake River to Jackson                | 17         | 5        | 22         |   |
| Rafter J Ponds  | 0          | 0        | 0          |   |
| Valley Springs, Captive Swan Pond/Pen Highway 89        | 0          | 0        | 0          |   |
| Hoback to Astoria Bridge                                | 0          | 0        | 0          |   |
| Astoria Bridge-Elbow                                    | 20         | 2        | 22         | Golf club development                           |
| Elbow to Alpine/Palisades Reservoir                     | 4          | 0        | 4          |   |

Appendix B. (cont.)

|   |            |           |            |  |
|---|------------|-----------|------------|--|
| Bailey Lake   | a          |           |            | Not flown  |
| Kelly Swan Facility                                     | 2          | 1         | 3          |  |
| Bondurant pond near Hoback River                        | 0          | 0         | 0          | 4 swans reported this winter but none seen at survey |
| <b>Subtotal</b>   | <b>246</b> | <b>44</b> | <b>290</b> |  |
|   |            |           |            |  |
| <i>National Elk Refuge</i>                              |            |           |            |  |
| Flat Creek main marsh                                   | 30         | 0         | 30         | Includes wetland ponds                               |
| Gros Ventre River, Kelly to Highway 89                  | 14         | 5         | 19         | All on Bill's Bayou                                  |
| Romney pond area  | 0          | 0         | 0          |  |
| Lost Spring   | 13         | 3         | 16         |  |
| <b>Subtotal</b>   | <b>57</b>  | <b>8</b>  | <b>65</b>  |  |
|   |            |           |            |  |
| <i>Salt River (Alpine to Afton)</i>                     |            |           |            |  |
| Palisades Reservoir, WY Alpine                          | 6          | 0         | 6          |  |
| Palisades Reservoir to Freedom Road                     | 14         | 10        | 24         | 3 adults with green collars                          |
| Freedom Road to Narrows                                 | 13         | 8         | 21         |  |
| Thayne area   | 3          | 0         | 3          | Flat Creek pond                                      |
| Narrows to Grover/Auburn Highway                        | 22         | 6         | 28         |  |
| Grover/Auburn Highway to Swift Creek                    | 66         | 13        | 79         |  |
| Swift Creek to Headwaters                               | 0          | 0         | 0          |  |
| <b>Subtotal</b>   | <b>124</b> | <b>37</b> | <b>161</b> |  |
|   |            |           |            |  |
| <i>Pinedale</i>   |            |           |            |  |
| New Fork Boulder to Pinedale                            |            |           |            |  |
| Boulder Fish Hatchery                                   | 4          | 0         | 4          | Observed Feb. 9 by Sky Aviation                      |
| Daniel Fish Hatchery/Forty Rod Creek                    | 18         | 6         | 24         |  |
| <b>Subtotal</b>   | <b>22</b>  | <b>6</b>  | <b>28</b>  | One green collar J38                                 |
|   |            |           |            |  |
| <i>Green River (Warren Bridge to Highway 28 Bridge)</i> |            |           |            |  |
| Fontenelle Dam-CCC Bridge                               | 2          | 0         | 28         | Open water   |
| CCC Bridge to Pilot Farm                                | 56         | 6         | 62         | Not much ice   |
| Pilot Farm-Refuge Headquarters                          | 14         | 0         | 14         | Ice increasing                                       |
| Refuge to Big Sandy                                     | 2          | 0         | 2          | Much pancake ice; river frozen by Dunkle wetlands    |
| Big Sandy to Big Island                                 | 0          | 0         | 0          | River >50% frozen except open pools                  |
| Big Island to Green River, WY                           | 4          | 0         | 4          | River frozen; open water near large plant            |
| Flaming Gorge Reservoir                                 | 0          | 1         | 1          | With 1 tundra swan; lower 1/3 of reservoir open      |
| <b>Subtotal</b>   | <b>78</b>  | <b>7</b>  | <b>85</b>  |  |
|   |            |           |            |  |
| <i>Dubois area</i>                                      |            |           |            |  |
| Wind River and spring ponds, Dubois                     | 0          | 0         | 0          | Flown by Sky Aviation                                |
| Dinwoody Lake   | 18         | 3         | 21         | Ground count, P. Hnilicka, USFWS                     |
| Bull Lake   | 0          | 0         | 0          |  |
| Wind River, Crowhart to Burris                          | 0          | 0         | 0          | Not flown  |
| <b>Subtotal</b>   | <b>18</b>  | <b>3</b>  | <b>21</b>  |  |
|   |            |           |            |  |

Appendix B. (cont.)

|   |            |           |            |   |
|---|------------|-----------|------------|---|
| <i>Yellowstone National Park</i>            |            |           |            | P:R. Stradley; O:T. McEneaney (2/11/06)             |
| Slough Creek                                | 0          | 0         | 0          |   |
| Tern Lake                                   | 6          | 0         | 6          |   |
| White Lake                                  | 2          | 1         | 3          |   |
| Beach Springs Lagoon                        | 0          | 0         | 0          |   |
| Shoshone Geyser Basin                       | 1          | 0         | 1          |   |
| Lewis River                                 | 0          | 0         | 0          |   |
| Buela Lake                                  | 4          | 0         | 4          |   |
| Yellowstone River                           | 46         | 5         | 51         |   |
| Lewis - Shoshone Channel                    | 4          | 0         | 4          |   |
| Lewis Lake                                  | 2          | 0         | 2          |   |
| Falls River                                 | 1          | 0         | 1          |   |
| Shoshone Lake                               | 0          | 0         | 0          |   |
| Bechler Lake                                | 4          | 0         | 4          |   |
| Firehole River                              | 3          | 0         | 3          |   |
| Madison River                               | 44         | 8         | 52         |   |
| Gibbon Meadow                               | 2          | 0         | 2          |   |
| Nymph Lake                                  | 2          | 0         | 2          |   |
| Elk Park                                    | 0          | 0         | 0          |   |
| North Twin Lake                             | 0          | 0         | 0          |   |
| <b>Subtotal</b>                             | <b>121</b> | <b>14</b> | <b>135</b> |   |
| <b>Idaho</b>                                |            |           |            | P: C. Anderson, A. Issac; O: M. Fisher, C. Mitchell |
| <i>Island Park Area</i>                     |            |           |            | (1/30-31/06, 2/3/06)                                |
| Warm Springs (west side of Henrys Lake)     |            |           |            |   |
| Henrys Lake flats                           | 1          | 1         | 2          |   |
| Big Springs, North Fork, Mack's Inn Area    | 8          | 0         | 8          |   |
| Mack's Inn to Island Park Reservoir         | 38         | 10        | 48         |   |
| Island Park Reservoir                       | 0          | 0         | 0          |   |
| Island Park Reservoir inlet                 | 7          | 0         | 7          |   |
| Trude Ranch Pond                            |            |           |            | Counted on Buffalo River Area                       |
| Icehouse Reservoir                          | 2          | 0         | 2          |   |
| Sheridan Creek, mouth to Sheridan Reservoir |            |           |            | Not flown; 11/10 observed on 2/6/06                 |
| Sheridan Reservoir                          | 16         | 7         | 23         |   |
| Sheridan Creek cabin and pond               | 0          | 0         | 0          |   |
| <b>Subtotal</b>                             | <b>72</b>  | <b>18</b> | <b>90</b>  |   |
| <i>Buffalo River Area</i>                   |            |           |            |   |
| Buffalo River                               | 2          | 0         | 2          |   |
| Tom's Creek                                 | 5          | 0         | 5          |   |
| Elk Creek/Trudes Siding pond                | 21         | 1         | 22         |   |
| <b>Subtotal</b>                             | <b>28</b>  | <b>1</b>  | <b>29</b>  |   |
| <i>Harriman State Park (HSP) Area</i>       |            |           |            |   |
| Island Park Dam through Box Canyon          | 10         | 5         | 15         |   |

Appendix B. (cont.)

|  |            |            |            |  |
|--|------------|------------|------------|--|
| Box Canyon - HSP north boundary                    | 80         | 14         | 94         |  |
| HSP north bounday - Osborne bridge                 | 234        | 56         | 290        |  |
| Golden Lake  | 17         | 6          | 23         |  |
| Thurmon Creek                                      | 0          | 0          | 0          |  |
| Silver Lake  | 0          | 0          | 0          |  |
| Osborne Bridge - Pinehaven                         | 123        | 28         | 151        |  |
| Pinehaven  | 46         | 5          | 51         |  |
| Fish Pond  | 0          | 0          | 0          |  |
| Henrys Fork below Pinehave - Forest boundary       | 18         | 7          | 25         |  |
| <b>Subtotal</b>                                    | <b>528</b> | <b>121</b> | <b>649</b> |  |
|  |            |            |            |  |
| <i>Henrys Fork, HSP to Warm River</i>              |            |            |            |  |
| Warm River   | 0          | 0          | 0          |  |
| <b>Subtotal</b>                                    | <b>0</b>   | <b>0</b>   | <b>0</b>   |  |
|  |            |            |            |  |
| <i>Lower Henrys Fork Area</i>                      |            |            |            |  |
| Forest boundary to Ashton Dam                      | 0          | 0          | 0          |  |
| Ashton Dam to Chester Dam                          | 85         | 37         | 122        |  |
| Chester Dam to Highway 33                          | 0          | 0          | 0          |  |
| Highway 33 - Menan Buttes                          | 212        | 81         | 293        |  |
| Ashton Ponds                                       | 0          | 0          | 0          |  |
| Willow Creek Area farmstead ponds                  | 24         | 8          | 32         |  |
| Mikesell Reservoir 1 & 2                           | 0          | 0          | 0          |  |
| Arcadia Reservoir, Upper                           | 0          | 0          | 0          |  |
| Arcadia Reservoir, Lower                           | 0          | 0          | 0          |  |
| Sand Creek WMA and area                            | 0          | 0          | 0          |  |
| Singleton Ponds                                    | 0          | 0          | 0          |  |
| Texas Slough                                       | 0          | 0          | 0          |  |
| Bannock Jim Slough                                 | 0          | 0          | 0          |  |
| Mud Lake WMA                                       | 0          | 0          | 0          |  |
| Camas NWR  | 0          | 0          | 0          |  |
| Camas Creek  | 0          | 0          | 0          |  |
| <b>Subtotal</b>                                    | <b>321</b> | <b>126</b> | <b>447</b> |  |
|  |            |            |            |  |
| <i>Teton River Basin</i>                           |            |            |            |  |
| Teton River to Wilford Dam                         | 142        | 60         | 202        |  |
| Wilford Dam to Newdale Bridge                      | 157        | 28         | 185        |  |
| Newdale Bridge to Teton Dam site                   | 90         | 19         | 109        |  |
| Teton River Canyon                                 | 82         | 22         | 104        |  |
| Teton Basin  | 125        | 50         | 175        |  |
| North Fork Teton River                             | 0          | 0          | 0          |  |
| South Fork Teton River                             | 0          | 0          | 0          |  |
| <b>Subtotal</b>                                    | <b>596</b> | <b>179</b> | <b>775</b> |  |
|  |            |            |            |  |
| <i>South Fork of the Snake River</i>               |            |            |            |  |
| Swan Valley (Palisades Reservoir to Conant Valley) | 278        | 128        | 406        |  |
| Canyon (Conant to Heise)                           | 51         | 30         | 81         |  |



Appendix B. (cont.)

|  |            |            |            |        |
|--|------------|------------|------------|--------|
| Delta (Heise to Menan Buttes)                        | 8          | 10         | 18         |        |
| Dry bed (Heise to Menan)                             | 0          | 0          | 0          |        |
| <b>Subtotal</b>                                      | <b>337</b> | <b>168</b> | <b>505</b> |        |
|  |            |            |            |        |
| <i>Main Stem of the Snake River</i>                  |            |            |            |        |
| Menan Buttes to Idaho Falls                          | 334        | 124        | 458        |        |
| Dry Bed  | 0          | 0          | 0          |        |
| Idaho Falls to Fort Hall (Ferry Butte)               | 10         | 7          | 17         |        |
| Blackfoot Marsh                                      | 0          | 0          | 0          | Frozen |
| <b>Subtotal</b>                                      | <b>344</b> | <b>131</b> | <b>475</b> |        |
|  |            |            |            |        |
| <i>Fort Hall Bottoms to American Falls Reservoir</i> |            |            |            |        |
| American Falls Reservoir shoreline                   | 220        | 70         | 290        |        |
| Kinney Creek   | 0          | 0          | 0          |        |
| Mouth of Portneuf River                              | 120        | 21         | 141        |        |
| Spring Creek to American Falls Reservoir             | 35         | 16         | 51         |        |
| Snake River - Tilden Bridge                          | 0          | 0          | 0          |        |
| Clear Creek and Ross Fork                            | 10         | 8          | 18         |        |
| Diggie Creek   | 0          | 0          | 0          |        |
| Flying Y oxbows                                      | 0          | 0          | 0          |        |
| <b>Subtotal</b>                                      | <b>385</b> | <b>115</b> | <b>500</b> |        |
|  |            |            |            |        |
| <i>Snake River below American Falls Dam</i>          |            |            |            |        |
| Springfield Reservoir                                | 6          | 5          | 11         |        |
| American Falls Reservoir (except Fort Hall)          | 0          | 0          | 0          |        |
| American Falls Dam - Minidoka NWR                    | 6          | 0          | 6          |        |
| Minidoka Dam - C.J. Strike Reservoir                 |            |            |            |        |
| Bruneau Dunes State Park                             |            |            |            |        |
| Bruneau Dunes - C.J. Stike Reservoir                 |            |            |            |        |
| Faulkner Pond  |            |            |            |        |
| White Arrow Pond (Bliss)                             |            |            |            |        |
| Pioneer Reservoir (King Hill)                        |            |            |            |        |
| Silver Creek (Picabo area)                           | 0          | 0          | 0          |        |
| <b>Subtotal</b>                                      | <b>12</b>  | <b>5</b>   | <b>17</b>  |        |
|  |            |            |            |        |
| <i>Grays Lake NWR Area</i>                           |            |            |            |        |
| Big Springs  | 0          | 0          | 0          |        |
| Shorty's Homestead                                   | 0          | 0          | 0          |        |
| Blackfoot Reservoir                                  | 20         | 0          | 20         |        |
| Chub Springs, southwest of refuge                    | 0          | 0          | 0          |        |
| Chesterfield Reservoir                               |            |            |            |        |
| <b>Subtotal</b>                                      | <b>20</b>  | <b>0</b>   | <b>20</b>  |        |
|  |            |            |            |        |
| <i>Soda Springs Area</i>                             |            |            |            |        |
| Woodall Springs                                      | 6          | 0          | 6          |        |

Appendix B. (cont.)

|   |           |          |           |  |
|---|-----------|----------|-----------|--|
| Alexander Reservoir and Siding              | 0         | 0        | 0         |  |
| Miller Ponds                                | 0         | 0        | 0         |  |
| Government Dam                              | 9         | 1        | 10        |  |
| Soda Creek                                  | 0         | 0        | 0         |  |
| Soda Canal                                  |           |          |           |  |
| <b>Subtotal</b>                             | <b>15</b> | <b>1</b> | <b>16</b> |  |
|   |           |          |           |  |
| <i>Bear River Reaches</i>                   |           |          |           |  |
| Alexander Reservoir - Bear Lake NWR         | 0         | 0        | 0         |  |
| Alexander Reservoir - Gentile Valley Bridge | 10        | 0        | 10        |  |
| Gentile Valley Bridge - old cheese factory  | 0         | 0        | 0         |  |
| Gentile Valley Bridge to Oneida Dam         | 31        | 4        | 35        |  |
| Oneida Narrows                              | 0         | 0        | 0         |  |
| Oneida Narrows to Riverdale Bridge          | 0         | 0        | 0         |  |
| Riverdale Bridge to Utah border             | 4         | 0        | 4         |  |
| <b>Subtotal</b>                             | <b>45</b> | <b>4</b> | <b>49</b> |  |
|   |           |          |           |  |
| <i>Bear Lake National Wildlife Refuge</i>   |           |          |           |  |
| West Canal Unit                             | 11        | 4        | 15        | Total for all three areas                |
| Rainbow Unit                                | 0         | 0        | 0         |  |
| Outlet Canal                                | 0         | 0        | 0         |  |
| <b>Subtotal</b>                             | <b>11</b> | <b>4</b> | <b>15</b> |  |
|   |           |          |           |  |
| <b>Nevada</b>                               |           |          |           | J. Mackay (2/8/06)                       |
| Ruby Lake NWR                               | 22        | 0        | 22        |  |
|   |           |          |           |  |
| <b>Oregon</b>                               |           |          |           |  |
| <i>Malheur NWR</i>                          |           |          |           | R. Roy (1/30-31/06, 2/1-3/06)            |
| Benson Pond                                 | 15        | 5        | 20        | Total for Refuge, not this specific area |
| Knox Swamp                                  |           |          |           |  |
| Mud Creek Pond                              |           |          |           |  |
|   |           |          |           |  |
| <i>Summer Lake Wildlife Management Area</i> |           |          |           | M. St. Louis (1/25/06)                   |
| Summer Lake WMA                             | 21        | 9        | 30        |  |

<sup>a</sup>Blank denotes area not surveyed.

Appendix C. Personnel who conducted the 2005 Mid-winter Trumpeter Swan Survey.

---

Montana (Red Rock Lakes NWR, Centennial Valley, Madison Valley)

Observers: J. Warren (Red Rock Lakes NWR)  
Pilot: D. Chapman (Montana Aircraft, Inc.)

Montana (Hebgen Lake Area and Paradise Valley)

Observer: T. McEneaney (Yellowstone National Park)  
Pilot: R. Stradley (Yellowstone National Park)

Idaho

Observer: M. Fisher, C. Mitchell (Southeast Idaho Refuge Complex)  
Pilot: C. Anderson, A. Issac (AvCenter)

Wyoming

Observer: S. Patla (Wyoming Game and Fish Department)  
Pilot: D. Stinson (Sky Aviation)

Wyoming (Yellowstone National Park)

Observer: T. McEneaney (Yellowstone National Park)  
Pilot: R. Stradley (Yellowstone National Park)

Ruby Lake NWR and vicinity

J. Mackay (Ruby Lake NWR)

Malheur NWR

R. Roy (Malheur NWR)

Summer Lake WMA

M. St. Louis, (Oregon Department of Fish and Wildlife)

---