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TRUMPETER SWAN SURVEY of the ROCKY MOUNTAIN POPULATION WINTER 2003

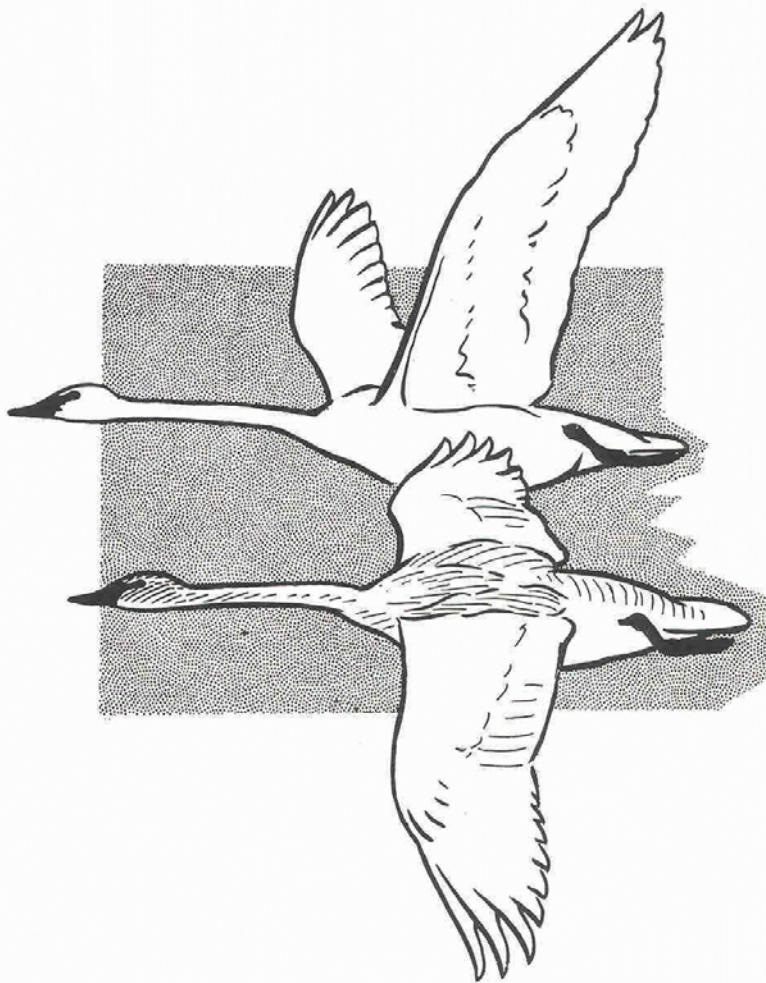
James A. Dubovsky
Migratory Birds and State Programs

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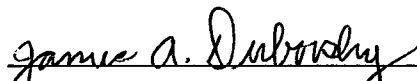
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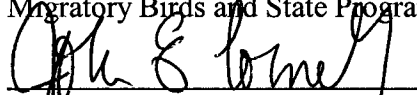
U.S. Fish and Wildlife Service
Migratory Birds and State Programs
Mountain-Prairie Region
Lakewood, Colorado

May 29, 2003


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Abstract.— Observers counted 3,974 swans (white birds and cygnets) in the Rocky Mountain Population of trumpeter swans during February 2003, a decrease of 10% from the 4,415 counted in February 2002. The number of white birds (3,427) declined 11% from that of last year, while the number of cygnets (547) was essentially unchanged from the count last year (553). In the tri-state area, the decline in total swans was much greater in Montana (-38%) than in Idaho (-4%) or Wyoming (-11%). The number of birds wintering in areas near restoration flocks was similar to counts in recent years. Drought conditions persisted in much of the tri-state area, and reservoir levels in early February were some of the lowest recorded during early February. Weather during winter 2002-03 was relatively mild throughout the region.

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).

The Mid-winter Trumpeter Swan Survey is conducted annually in 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. Survey coverage has changed over time as the number of swans increased and new areas were inhabited by both natural range expansion and efforts to translocate swans to new nesting and wintering areas. Also, due to weather or limited resources, not all areas are surveyed in some years. Thus, numbers for the entire time series are not directly comparable, but provide a good index to changes in population size. To be consistent with previous reports, only the data from 1972 to present 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 are used to count numbers of swans in the tri-state area and in the Summer Lake WMA and vicinity; ground surveys are used to count the number of swans at Malheur NWR, in Nevada, and in isolated pockets of habitat not covered by aerial surveys. During aerial surveys, data are collected



Fig. 1. Approximate ranges of trumpeter swans during summer (from Caithamer 2001).

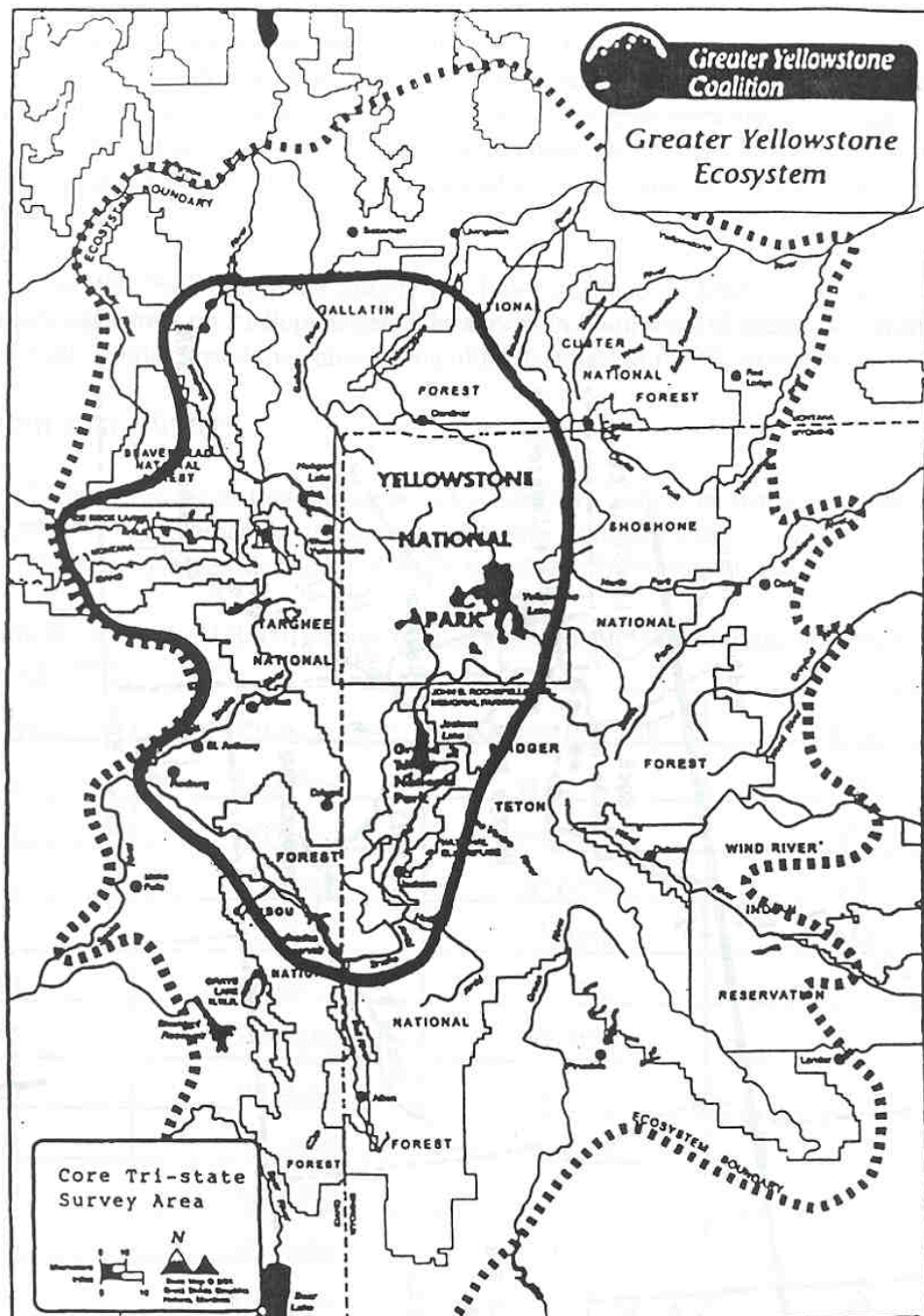


Fig. 2. Map showing the 'core' tri-state area of southeast Idaho, southwest Montana, and northwest Wyoming (provided by the Greater Yellowstone Coalition, Bozeman, Montana).

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.

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 2002a) 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. We believe the estimates provided in this report are reasonable indices to flock-specific abundances.

To assess production for the RMP, we calculated the percentage of annual total swan counts that were cygnets. However, surveys in Nevada did not separate counts into white birds and cygnets until 1992, and current data from Oregon suggest that they also did not separate total counts. 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 = 91%-99%, \bar{x} = 97%) of the total RMP counts during 1972-2002.

RESULTS AND DISCUSSION

The 2003 Mid-winter survey was conducted during 11-15 February, with most areas covered during 11-12 February. Approximately 33 h of flight time and additional ground survey time were required to complete the survey. Weather conditions during surveys in Montana, Idaho, and Yellowstone National Park (YNP) were warm and sunny. Survey conditions in Nevada were good with overcast skies. Heavy overcast conditions prevailed during the survey in Wyoming (outside of YNP). Most of the areas typically visited during the Mid-winter survey were surveyed this year. In Idaho, some areas west of Pocatello not surveyed since 1999 were not flown again this year.

Habitats continued to be quite dry during winter, and the tri-state area remained in a drought. Snowpack as of 1 February was about 70-89% of normal throughout much of the tri-state area (U.S. Department of Agriculture 2003). Water levels at 5 reservoirs (American Falls, Island Park, Jackson Lake, Palisades, and Minidoka Dam/Lake Walcott) cumulatively were at only 41% of storage capacity on February 1 (data from U.S. Bureau of Reclamation 2003a), only slightly higher

than last year (Fig. 3). Together, these reservoirs comprise about 98% of the reservoir capacity for reservoirs listed in the Snake River Basin in eastern Idaho and extreme western Wyoming (U.S. Bureau of Reclamation 2003*b*). Streamflow below Island Park Reservoir was only 106 cfs during late February, compared to average winter flows of about 300 cfs (Pacific Flyway Study Committee 2002). Flow rates in the Henry's Fork River at Harriman State Park in eastern Idaho during the past 2 winters have only been 1/3 to 1/2 of those in preceding winters (C. Whitman, pers. comm.) when precipitation and reservoir levels were nearer to average conditions. Despite relatively mild temperatures during winter (Fig. 4), many small wetlands were frozen throughout the tri-state area (Appendix A).

Historical Trends

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 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. Biologists currently conducting the surveys were asked to verify all numbers presented in the tables of this report from their data files. With the exception of counts for Oregon and the 1972 counts for Idaho, biologists concurred that the numbers are correct. We will continue to work with biologists over the next year to verify numbers that remain in question.

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 (2003) were compared to results from 1972-2002, a practice used in U.S. Fish and Wildlife Service survey reports for other waterfowl (e.g., Wilkins and Otto 2002, U.S. Fish and Wildlife Service 2002*b*). 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. Totals for the entire RMP provided in this report differ slightly from those in previous reports for 2 reasons. First, earlier reports included counts from some areas in California, Colorado, Utah, and Washington. These states do not conduct standardized, consistent annual surveys to detect the presence of trumpeter swans (pers. comm.). Because data from these states were not part of the survey design, their data were considered anecdotal and were deleted from tables. However, available information from these states will be compiled and placed in an appendix in future reports. Second, counts for 1972-present from surveys in Nevada have been included in this report; prior reports appeared to contain data since 1992 only.

The counts for total swans of the RMP suggested an increase ($P < 0.01$) of about 6.1% per year during 1972-2002 (Table 1, Fig. 5). The number of white birds (+5.9% per year) and cygnets

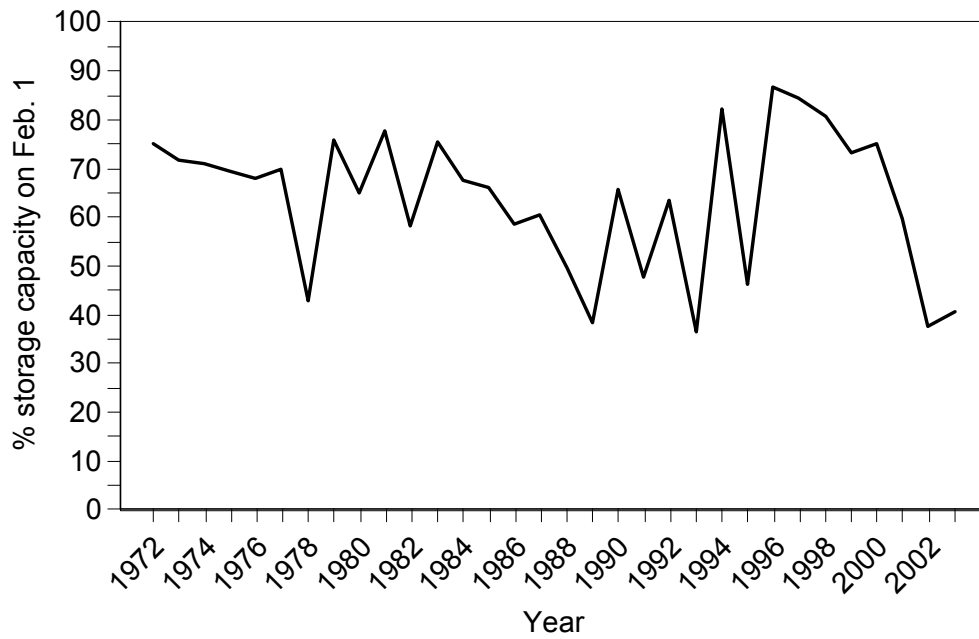


Fig. 3. Water storage for 5 reservoirs (see text) in the tri-state region on 1 February.

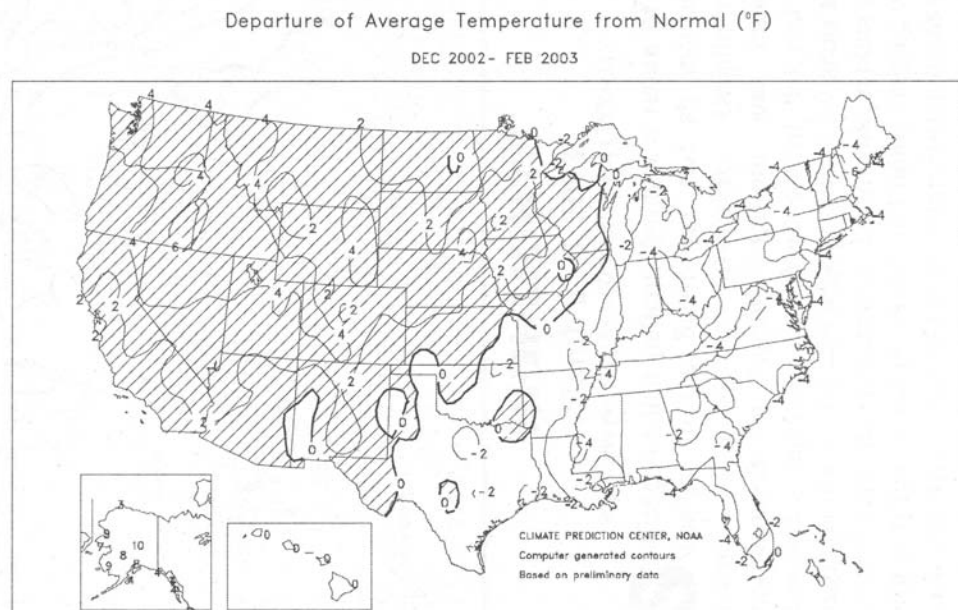


Fig. 4. Departure of temperatures from normal during winter 2002-03 (Joint Agricultural Weather Facility 2003).

Table 1. Counts of trumpeter swans of the Rocky Mountain Population during winter, 1972-2003.

Year	Tri-state area			Oregon and Nevada ^a			Total RMP		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds ^b	Cygnets ^b	Total
1972	c	c	616			41			657
1973	c	c	581			28			609
1974	553	156	709			25			734
1975	595	128	723			25			748
1976 ^d	623	102	725			25			750
1977	839	178	1017			29			1046
1978	695	179	874			20			894
1979	743	123	866			21			887
1980	767	172	939			21			960
1981	1000	247	1247			21			1268
1982	952	266	1218			40			1258
1983	1025	207	1232			38			1270
1984	1128	332	1460			35			1495
1985	1326	190	1516			31			1547
1986	1304	299	1603			26			1629
1987	1196	386	1582			28			1610
1988	1314	408	1722			27			1749
1989	1452	291	1743			18			1761
1990	1591	416	2007			15			2022
1991	1589	342	1931			18			1949
1992	1642	397	2039	99	58	157	1741	455	2196
1993	1659	419	2078	121	36	157	1780	455	2235
1994	1753	543	2296	129	101	230	1882	644	2526
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 ^e	1756	307	2063	65	29	94	1821	336	2157
1999	2698	772	3470	45	10	55	2743	782	3525
2000	2694	746	3440	50	15	65	2744	761	3505
2001	3198	719	3917	47	11	58	3245	730	3975
2002	3814	546	4360	48	7	55	3862	553	4415
2003	3365	532	3897	62	15	77	3427	547	3974

^a Total counts not separated into white birds and cygnets prior to 1992; total counts prior to 1992 are for Nevada only.

^b Not calculated prior to 1992 because of no counts for Oregon and Nevada.

^c Not provided because counts for Yellowstone National Park not separated into white birds and cygnets.

^d In Wyoming only Yellowstone National Park surveyed.

^e 1998 counts for the tri-state area are biased low because Yellowstone National Park not surveyed due to hazardous weather.

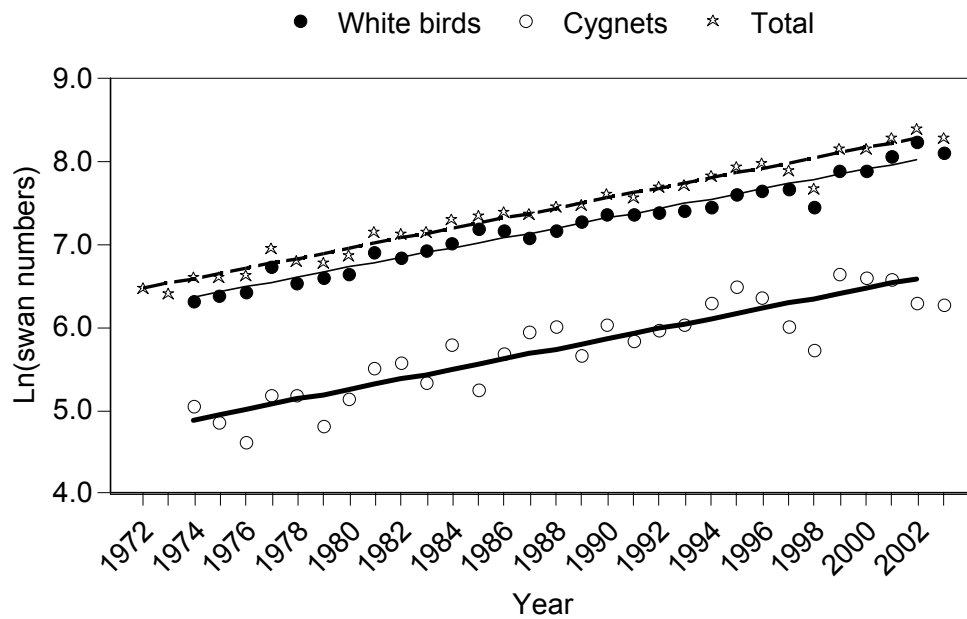


Fig. 5. Rates of change for counts of swans in the RMP during the Mid-winter Trumpeter Swan Survey, 1972-2003 (thin and thick lines depict trends for white birds and cygnets, respectively, for swans counted in the tri-state region [see text]; dashed line depicts total RMP swans).

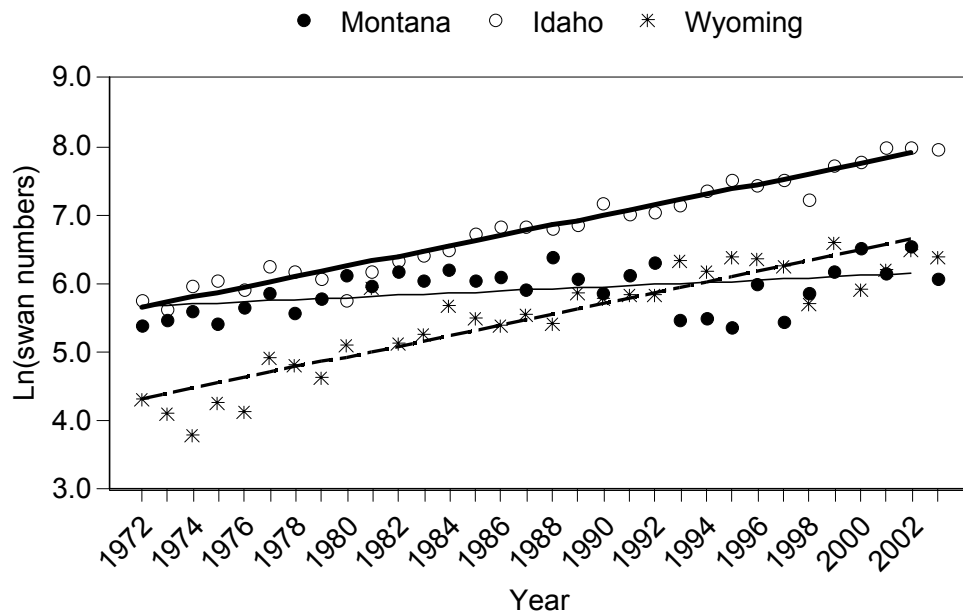


Fig. 6. Rates of change for counts of total swans in states of the tri-state region during the Mid-winter Trumpeter Swan Survey, 1972-2003.

(+6.1% per year) counted in the tri-state region increased ($P < 0.01$) at similar rates. Counts of birds in Montana (white birds + cygnets) increased slightly (+1.6% per year, $P [\beta > 0] = 0.03$), whereas rates of growth for birds wintering in Idaho and Wyoming were much higher (+7.5% and +7.8% per year, respectively)(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 a marginally significant increase ($P = 0.12$) of about 1.2% per year during 1972-2002 (Table 2, Fig. 8). Counts in Nevada during recent winters have been near historic highs. Counts of swans in Oregon depicted in Table 2 and Fig. 8 cannot be verified from original data at this time. The counts are what were available from data files used to produce reports in previous years; thus, we have used those numbers for this report. However, biologists are working to verify the historic counts, so results for Oregon may change somewhat in the future. Using the current data, counts suggest that the number of total swans wintering in Oregon has decreased at a rate of almost 28% per year from 1992 to 2002. However, as described in a previous report (U.S. Fish and Wildlife Service 2002a:7), many birds were translocated to this state during the early 1990s. Perhaps some or most of these translocated birds either did not survive, or did not remain in the area during winters, resulting in the steep rate of decline for this area.

The percentage of the entire RMP estimated to be comprised of Canadian Flocks increased from about 13% during February of 1972 to about 89% during February 2002 (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 throughout the time period, and approached 4,000 birds in 2002 (Table 3, Fig. 9).

Results from the 2003 survey

During February 2003, observers counted 3,974 trumpeter swans in the RMP, a decrease of 10% from the count (4,415) of last February (Table 1). The number of white birds decreased 11%, whereas the count of cygnets (547) was essentially unchanged from that of last year (553). Decreases were noted throughout the tri-state area. The largest decline in total swans from 2002 counts occurred in Montana (-38%), followed by Wyoming (-11%) and Idaho (-4%) (Table 2). The persistent drought conditions may be influencing the distribution and behaviors of swans wintering in Idaho. During the past two years, more birds have wintered in areas south and west of historic concentrations. Notably, the Island Park area was not used by large numbers of swans again this year. Also, the below-average snowpack may be allowing swans to feed in harvested crop fields to a larger extent than in years with normal amounts of precipitation, due to availability of

Table 2. Counts of trumpeter swans of the Rocky Mountain Population in individual states during winter, 1972-2003.

Year	Montana			Idaho			Wyoming			Oregon ^a			Nevada ^b		
	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	c	c	76						41
1973	212	28	240	222	58	280	c	c	61						28
1974	233	40	273	282	109	391	38	7	45						25
1975	192	32	224	333	94	427	70	2	72						25
1976	253	34	287	308	67	375	62 ^d	1 ^d	63 ^d						25
1977	315	43	358	395	126	521	129	9	138						29
1978	194	68	262	392	96	488	109	15	124						20
1979	304	26	330	353	81	434	86	16	102						21
1980	374	80	454	250	70	320	143	22	165						21
1981	352	36	388	370	110	480	278	101	379						21
1982	390	90	480	429	137	566	133	39	172						40
1983	363	59	422	493	122	615	169	26	195						38
1984	389	109	498	503	162	665	236	61	297						35
1985	393	31	424	701	144	845	232	15	247						31
1986	380	73	453	744	183	927	180	43	223						26
1987	314	63	377	690	255	945	192	68	260						28
1988	438	153	591	694	209	903	182	46	228						27
1989	342	90	432	817	141	958	293	60	353						18
1990	319	38	357	1025	300	1325	247	78	325						15
1991	385	70	455	918	211	1129	286	61	347						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	116	94	210	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 ^e	39 ^e	305 ^e	32	7	39	33	22	55
1999	335	153	488	1754	500	2254	609	119	728	16	2	18	29	8	37
2000	519	155	674	1881	513	2394	294	78	372	15	6	21	35	9	44
2001	373	96	469	2404	549	2953	421	74	495	16	7	23	31	4	35
2002	600	104	704	2636	357	2993	578	85	663	7	5	12	41	2	43
2003	375	58	433	2490	382	2872	500	92	592	28	8	36	34	7	41

^a Counts for Oregon prior to 1992 were not available.

^b Counts for Nevada were not separated into white birds and cygnets until 1992.

^c Not provided because counts for Yellowstone National Park not separated into white birds and cygnets.

^d Counts for Yellowstone National Park only; remainder of Wyoming not surveyed.

^e Counts for Wyoming biased low because Yellowstone National Park not surveyed due to hazardous weather.

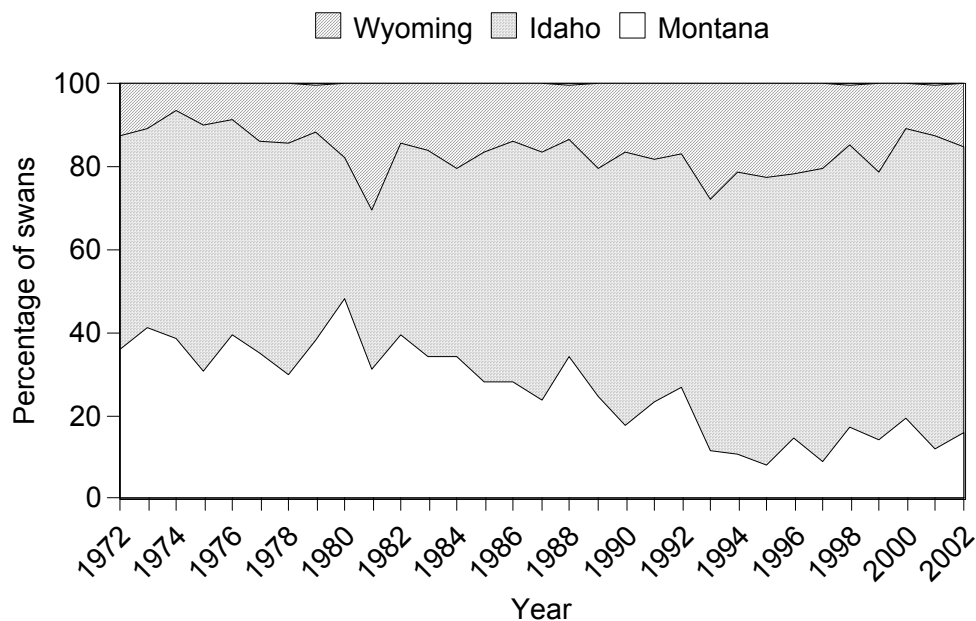


Fig. 7. Proportions of total swans counted in each of the states comprising the tri-state region during the Mid-winter Trumpeter Swan Survey, 1972-2002.

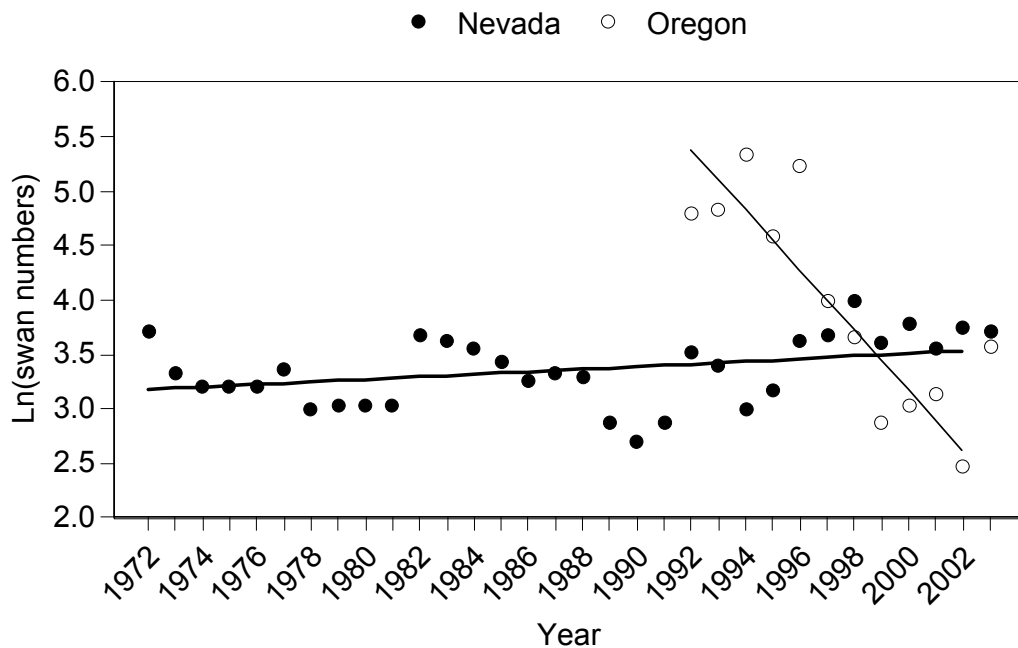


Fig. 8. Rates of change in counts of total swans in Nevada and Oregon during the Mid-winter Trumpeter Swan Survey, 1972-2003.

Table 3. Estimates of swan abundance for flocks comprising the Rocky Mountain Population of Trumpeter swans, 1972-2003.

Year	Mid-winter count	U.S. Breeding Segment ^a	Canadian Flocks	Percent Canadian Flocks
1972	657	572	85	12.9
1975	748	581	167	22.3
1978	894	544	350	39.1
1981	1268	582	686	54.1
1984	1495	547	948	63.4
1985	1547	563	984	63.6
1986	1629	575	1054	64.7
1987	1610	452	1158	71.9
1988	1749	611	1138	65.1
1989	1761	659	1102	62.6
1990	2022	598	1424	70.4
1991	1949	626	1323	67.9
1992	2196	555	1641	74.7
1993	2235	563	1672	74.8
1994	2526	354	2172	86.0
1995	2803	454	2349	83.8
1996	2936	427	2509	85.5
1997	2681	458	2223	82.9
1998	2157	427	1730	80.2
1999	3525	469	3056	86.7
2000	3505	417	3088	88.1
2001	3975	481	3494	87.9
2002	4415	487	3928	89.0
2003	3974	371	3603	90.7

^a From U.S. Fish and Wildlife Service 2002*a*. Counts are from the previous calendar year (i.e., the 2003 value is from the Fall 2000 survey).

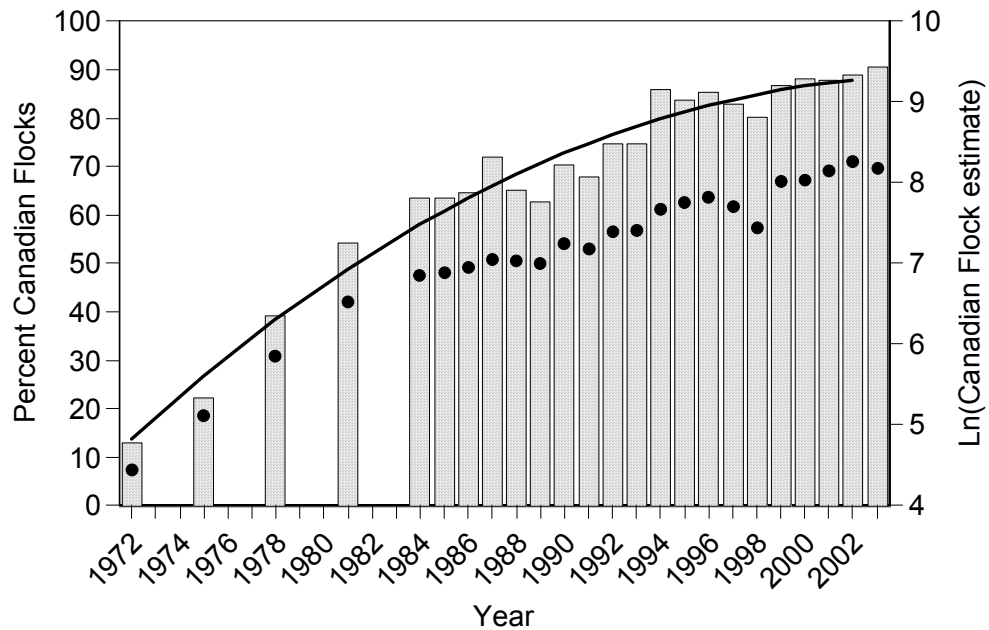


Fig. 9. Percent (bars and solid line) and counts (solid dots) of the entire RMP estimated to be comprised of Canadian Flocks during the Mid-winter Trumpeter Swan Survey, 1972-2003.

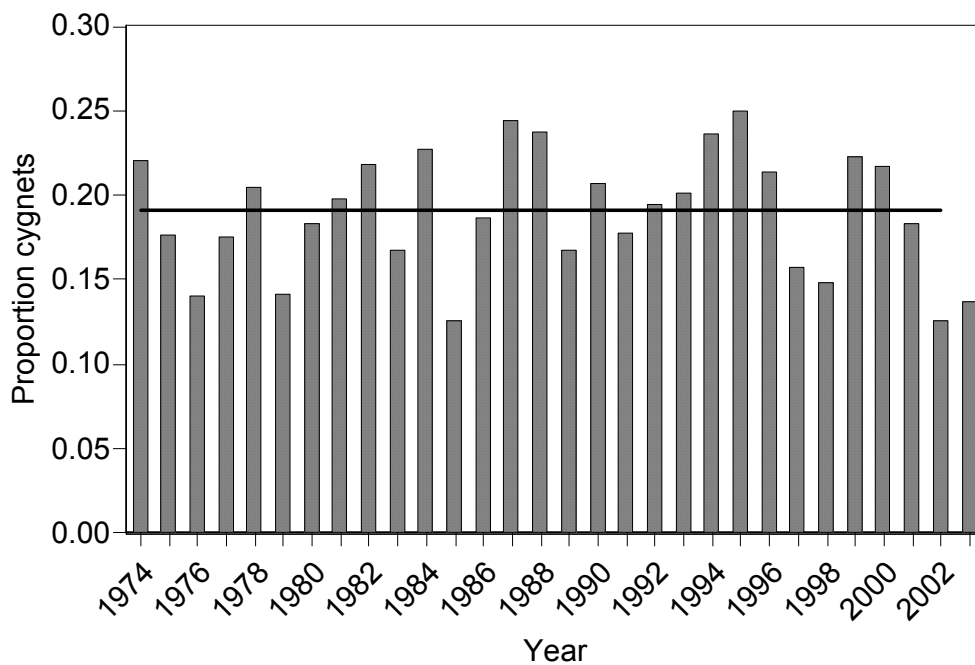


Fig. 10. Proportion of cygnets counted in the tri-state region during the Mid-winter Trumpeter Swan Survey, 1974-2003. The solid line depicts the 1974-2002 average.

snow-free croplands. Although a few (5-10) field-feeding swans have been observed during the last couple of winters, this winter a peak of 785 swans were seen feeding in harvested croplands.

The number of swans in Nevada (41) was very similar to counts in recent winters (Table 2). However, warm temperatures in mid-January resulted in a complete thaw of the Ruby Lake marshes. A survey for swans in December resulted in a count of 53 trumpeter swans, so some birds may have moved out of the Nevada survey area by the time of the Mid-winter survey. The number of swans counted in Oregon was far below counts from the early 1990s when swans were being translocated to the state. However, the February 2003 count was somewhat higher compared to those since the winter of 1998 (Table 2).

Our index suggested about 91% of the RMP counted in February 2003 was comprised of swans from Canadian Flocks (Table 3, Fig. 9). This value is essentially the same as those from the last few years (~88%). The estimated number of swans from Canadian Flocks was 3,603 birds, a value 8% lower than that of 2002.

The proportion of cygnets for swans counted in the tri-state region during February 2003 was 0.1365. This value was slightly above the value for February 2002, but was 29% below the 1974-2002 average (0.1914) (Fig. 10). The 2003 Mid-winter count was the third consecutive year suggesting below-average production for the RMP.

In summary, RMP trumpeter swans appeared to increase by about 6% annually between 1972 and 2002. Most of the increase over that time was attributable to increases in the number of birds in the Canadian Flocks, which now comprise about 90% of the population. The number of RMP swans appeared to have declined (-10%) between the winters of 2002 and 2003. Production during spring and summer 2002 appeared similar to that in 2001, but was below the long-term average for the third consecutive year. The distribution of birds appeared somewhat altered this winter relative to recent years. Coincidentally, drought conditions were prevalent throughout the survey area, perhaps influencing availability of habitats. Also, the below-average precipitation, resulting in agricultural fields unseasonably bare of snow, may have afforded swans additional feeding opportunities not largely available during years of normal temperatures and precipitation.

ACKNOWLEDGMENTS

We would like to especially thank the personnel who conducted the surveys, a list of whom is provided in Appendix B. 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. S. Comeau compiled the data. J. Cornely, P. Gertler, T. McEneaney, S. Patla, M. St. Louis, and C. Whitman provided comments on previous drafts of this document.

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Appendix A. Site-specific counts of trumpeter swans of the Rocky Mountain Population during the Mid-winter Trumpeter Swan Survey, 2003.

Montana	White birds	Cygnets	Total	Pilot/observer/notes
<i>Hebgen Lake area</i>				P: B. Twist, O: S. Comeau 2/11/2003
Cougar Creek	0	0	0	East of Highway 287
Between Quake Lake and Hebgen Lake	0	0	0	
Madison River Arm	158	20	178	Open water
North Spring (Grayling Arm)	25	10	35	Open water
South Fork Arm	51	9	60	Open water
Subtotal	234	39	273	
<i>Madison River Valley</i>				
Odell Creek Area	39	4	43	100% open water
Walsh Ponds (south)1	16	0	16	25% open water
Walsh Ponds (north)1	0	0	0	Frozen
Madison River, south of Ennis	7	4	11	
Ennis Lake	20	0	20	10% open water
Subtotal	82	8	90	
<i>Chain of Lakes</i>				
Cliff Lake	6	3	9	10% open water
Wade Lake	6	0	6	15% open water
Goose Lake	0	0	0	10% open water
Smith Creek (Hidden L outlet)	0	0	0	
Subtotal	12	3	15	
<i>Centennial Valley/Red Rock Lakes NWR</i>				
Red Rock River below Lower Lake Dam	2	0	2	Pockets of open water
MacDonald Pond	12	0	12	90% open water
Culver Pond	4	0	4	25% open water
Elk Springs Creek	2	0	2	100% open water
Swan Lake	0	0	0	Frozen
Shambow Pond	4	3	7	10% open water
Red Rock River, Lima	0	0	0	Frozen
Subtotal	24	3	27	
<i>Paradise Valley</i>				P: R. Stradley, O: T. McEneaney 2/11/2003
Armstrong's	4	2	6	
Bailey's	0	0	0	
Brockway	0	0	0	
DePuys	3	0	3	
Brandis	5	2	7	
Sacagawea Park	0	0	0	
Emigrant	0	0	0	
Beaver Creek	4	0	4	
Yellowstone River - 6 mile	0	0	0	

Appendix A. (cont.)

Yellowstone River - Pray	0	0	0	
Dana's	7	1	8	
Subtotal	23	5	28	
Wyoming				
<i>Upper Snake River (Flagg Ranch to Wilson Bridge)</i>				P: G. Lust, O: B. Oakleaf 2/15/2003
Polecat Creek	0	0	0	Heavy overcast
Flagg Ranch to Jackson Lake	2	0	2	
Jackson Lake	0	0	0	Frozen
Jackson Lake to Moran Junction	19	0	19	
Moran Junction to Deadman's	3	0	3	
Deadman's to Moose	2	0	2	
Moose to Gros Ventre Junction	2	0	2	
Gros Ventre Junction area	12	0	12	
Snake River to Wilson Bridge	6	0	6	
Subtotal	46	0	46	
<i>Gros Ventre River/Kelly</i>				
Gros Ventre River Kelly to Snake River	22	1	23	
Kelly Springs, Teton Valley Ranch	0	0	0	
Kelly Warm Springs, GTNP	0	0	0	
Lower Slide Lake	a			
Upper Gros Ventre				
Subtotal	22	1	23	
<i>Lower Snake River (Wilson Bridge to Alpine)</i>				
Wilson Bridge to South Park Bridge	11	0	11	
Evan's Gravel pit ponds	42	11	53	
South Park Bridge to Hoback	0	0	0	
Fish Creek, Wilson to Snake River	51	4	55	Numbers down from January
Boyles Hill area	3	5	8	
Ford's	0	0	0	
Spring Creek	11	3	14	
Crane Creek	2	0	2	
Lower Flat Creek	11	8	19	
Rafter J Ponds	0	0	0	
Valley Springs, Captive Swan Pond/Pen Highway 89	23	0	23	Counted on ground
Hoback to Astoria Bridge	0	0	0	
Astoria Bridge-Elbow	4	0	4	
Elbow to Alpine/Palisades Reservoir	0	0	0	
Subtotal	158	31	189	
<i>National Elk Refuge</i>				
Gros Ventre River, reclamation ponds	0	0	0	

Appendix A. (cont.)

Flat Creek main marsh	28	13	41	All areas combined
Romney pond area	0	0	0	
Subtotal	28	13	41	
<i>Salt River (Alpine to Afton)</i>				
Palisades Reservoir, WY Alpine	0	0	0	
Palisades Reservoir to Freedom Road	7	0	7	
Freedom Road to Narrows	3	2	5	
Thayne	0	0	0	Did not see pond
Narrows to Grover/Auburn Highway	9	4	13	
Grover/Auburn Highway to Swift Creek	14	1	15	
Swift Creek to Headwaters	0	0	0	
Crow Creek Ranch, Idaho	2	0	2	Birds actually counted in Idaho
Subtotal	35	7	42	
<i>Pinedale</i>				
New Fork Boulder to Pinedale				Frozen by Pinedale
Daniel Fish Hatchery/Forty Rod Creek	4	0	4	
Subtotal	4	0	4	
<i>Green River (Fontenelle Dam to Big Sandy)</i>				Frozen above dam
Fontenelle Dam-CCC Bridge	0	0	0	
CCC Bridge to Pilot Farm	11	4	15	
Pilot Farm-Refuge Headquarters	12	0	12	
Refuge to Big Sandy	22	0	22	
Seedskadee NWR	0	0	0	
Green at Big Sandy junction	0	0	0	
Subtotal	45	4	49	
<i>Dinwoody Lake, Dubois area</i>	16	2	18	Counted on ground
<i>Flaming Gorge Reservoir</i>				Frozen below Big Sandy; did not fly
<i>Green River, Utah (dam to Colorado border)</i>				
<i>Yellowstone National Park</i>				P: R. Stradley, O: T. McEneaney 2/11/2003
White Lake	2	0	2	
Tern Lake	2	2	4	
Buela Lake	4	0	4	
Yellowstone River	98	23	121	
Shoshone Geyser Basin	8	3	11	
Lewis - Shoshone Channel	6	0	6	
Shoshone Lake	0	0	0	
Bechler Lake	12	1	13	
Firehole River	7	0	7	
Madison River	6	4	10	
Gibbon Meadow	1	1	2	
Upper Gibbon River	0	0	0	

Appendix A. (cont.)

North Twin Lake	0	0	0	
Subtotal	146	34	180	
Idaho				
<i>Island Park Area</i>				P: G. Lust, O: C. Whitman 2/11/2003
<i>Henry's Lake and Flats</i>				
Raynolds Pass Pond	0	0	0	100 sq. yards open, 90% frozen
Targhee Pass Pond	0	0	0	1/4 acre open, 40% frozen
Staley Springs	0	0	0	1/10 acre open at Staley Springs
Henry's Lake Outlet: dam to mouth	0	0	0	Lower 1/4 open, upper 3/4 frozen
Garner Creek mouth to head spring	0	0	0	Upper 1/2 open, lower 1/2 frozen
Subtotal	0	0	0	
<i>Henry's Fork</i>				
Big Springs to Macks Inn Bridge	5	0	5	River open; heavy snowmobile traffic above bridge
Macks Inn Bridge to McCrae Bridge	15	0	15	River open
McCrae Bridge to Island Park Reservoir inlet	26	8	34	River frozen 1.5 mi below McCrae Bridge
Subtotal	46	8	54	
<i>Island Park Reservoir and Ponds</i>				
Island Park Reservoir and Ponds	0	0	0	100% frozen
Blue Creek Pond (Jacobs IP Ranch)	0	0	0	100% frozen
Trude Ranch Pond	0	0	0	100% frozen, low flow in springs
Ice House Pond	0	0	0	100% frozen
Sheridan Creek IPR to Sheridan Reservoir	5	0	5	Creek open to old lake shore
Sheridan Reservoir	14	3	17	1.5 acres open water, 90% frozen; heavy snowmobile traffic
Sheridan Creek Reservoir to upper ponds	0	0	0	Creek and spring pond open
Subtotal	19	3	22	
<i>Buffalo River</i>				
Buffalo River mouth to Highway 20 Bridge	5	3	8	River open
Highway 20 Bridge to headwaters	6	1	7	River open
Toms Creek, mouth to headwaters	0	0	0	Creek open
Elk Creek, mouth to Elk Creek Lake	2	0	2	Creek open
Elk Creek Lake	9	0	9	3/4 acre open water, 80% frozen
Subtotal	22	4	26	
<i>Henry's Fork</i>				
Island Park Dam to Buffalo River mouth	0	0	0	River open
Buffalo River to upper Last Chance	5	3	8	River open
Subtotal	5	3	8	
<i>Harriman State Park (HSP)</i>				
Last Chance to HSP north Park Boundary	13	3	16	River open; 1 tundra cygnet
HSP north Park Boundary to Osborne Bridge	82	4	86	River 75% frozen

Appendix A. (cont.)

Golden Lake	16	0	16	1/4 acre open water, 95% frozen
Thurmon Creek	15	1	16	Creek 20% frozen between lakes
Silver Lake	4	4	8	1/10 acre open water, 98% frozen
Osborne Bridge to south Park Boundary	29	3	32	River 50% frozen; moderate snowmobile traffic below Bridge
HSP south Park Boundary to Lower Pine Haven	88	4	92	River 50% frozen
Fish Pond	0	0	0	100% frozen
Subtotal	247	19	266	
<i>Henrys Fork</i>				
Lower Pine Haven to Warm River confluence	13	1	14	Upper 40% frozen; lower 15% frozen
Subtotal	13	1	14	
<i>Lower Henrys Fork</i>				
<i>Henrys Fork</i>				
Warm River confluence to Highway 20 Bridge	2	0	2	<5% frozen; skim ice at river edge
Ashton Dam Highway 20 to breast	0	0	0	Frozen 1.25 mile below bridge; 10 acres open
Breast of Ashton Dam Breast to Ora Bridge	0	0	0	River open
Ora Bridge to Verna Bridge	110	14	124	<5% frozen; skim ice at river edge
Verna Bridge to head of Chester Dam	32	8	40	<5% frozen; skim ice at river edge
Chester Dam	57	14	71	2.5 acres open; 50% frozen
Chester Dam: security sites in fields	0	0	0	5 inches of snow in fields
Chester Dam Breast to Twin Grove Bridge	12	7	19	River <5% frozen; small amount of flow ice
Twin Grove Bridge to Del Rio Bridge	12	5	17	30% frozen at dam
Del Rio Bridge to St. Anthony Bridge	0	0	0	River <5% frozen; small amount of flow ice
St. Anthony Bridge to Breast of St. Anthony Dam	13	0	13	River <5% frozen; small amount of flow ice
St. Anthony Dam to Highway 33 Bridge	70	12	82	River 20% frozen; moderate flow ice; no flooding or snow
Highway 33 Bridge to Menan Butte Bridge	21	5	26	River 10% frozen; moderate flow ice; no snow
Subtotal	329	65	394	
<i>Lower Henrys Fork Tributaries</i>				
Ponds and Sloughs	0	0	0	
Warm River mouth to upper narrows	0	0	0	River open
Ashton Ponds (Reid Richey)	0	0	0	100% frozen
Willow Creek Pond (Seeley)	10	0	10	1/2 acre open water, 75% frozen
Lemon Lake	0	0	0	100% frozen
Mikesell Reservoir #1	0	0	0	100% frozen
Mikesell Reservoir #2	0	0	0	100% frozen
Arcadia Reservoir Lower	0	0	0	100% frozen
Arcadia Reservoir Upper	0	0	0	100% frozen
Swan Pond (Sand Creek WMA)	2	2	4	1/4 acre open
Sand Creek WMA Pond #4	9	0	9	200 sq. yards open, 90% frozen
Sand Creek WMA Pond #3	0	0	0	100% frozen
Sand Creek WMA Pond #2	0	0	0	100% frozen
Sand Creek WMA Pond #1	0	0	0	100% frozen
Sand Creek WMA Beaver Pond	0	0	0	1/2 acre open water, no ice

Appendix A. (cont.)

Blue Creek Reservoir (Sand Creek WMA)	0	0	0	100% frozen
Fall River, mouth to Highway 20 Bridge	0	0	0	75% frozen
Singleton Ponds (Chester Wetlands WMA)	0	0	0	100% frozen
Cartier Slough WMA	0	0	0	100% frozen
Texas Slough (fields)	20	0	20	No snow
Texas Slough (water)	26	9	35	No ice
Bannock Jim Slough	0	0	0	No snow
Crystal Ponds Rexburg	0	0	0	100% frozen
Deer Parks Slough WMA (W. Menan Buttes)	0	0	0	100% frozen
Subtotal	67	11	78	
<i>Market Lake WMA</i>				
East Springs Pond (north unit)	0	0	0	100% frozen; low water levels
East Springs Pond (spring and main pool)	0	0	0	100% frozen; water levels down 2 feet
East Springs Pond (south unit)	0	0	0	Dry
Marsh Unit #1	0	0	0	100% frozen; good water levels
Marsh Unit #2	0	0	0	100 sq. yards open, 99% frozen
Marsh Unit #3	0	0	0	100% frozen
Marsh Unit #4	0	0	0	Mostly dry
Marsh Unit west of access road	0	0	0	Dry
Subtotal	0	0	0	
<i>Mud Lake WMA</i>				
Main body of lake	0	0	0	100% frozen
Camas Creek inlet	0	0	0	100% frozen
Subtotal	0	0	0	
<i>Camas Creek</i>				
Mud Lake inlet to 1800 N Road	0	0	0	Mostly dry
1800 N Road to Camas NWR Boundary	0	0	0	Dry
Independent Ditch	0	0	0	Dry
Subtotal	0	0	0	
<i>Camas NWR</i>				
Rays Lake	0	0	0	Dry
Sand Hole Pond	0	0	0	1/2 acre frozen; mostly dry
Two Way Pond	0	0	0	Dry
Big Pond	0	0	0	1/4 acre frozen; mostly dry
Center Pond	0	0	0	Dry
Red Head Pond	0	0	0	Dry
Spring Pond	0	0	0	Dry
Subtotal	0	0	0	
<i>Teton River</i>				
<i>Teton Basin</i>				
Paradise Springs Pond	5	1	6	No ice

Appendix A. (cont.)

Teton Headwaters to White Bridge	2	0	2	No ice
White Bridge to South Bates Bridge	10	1	11	No ice; one fisherman
Fox Creek	0	0	0	No ice
Klausman Wetland (newly constructed)	0	0	0	100% frozen
South Bates Bridge to North Bates Bridge	76	12	88	Upper 50% frozen; lower 100% frozen
North Bates Bridge to Cache Bridge	13	15	28	Upper 80% frozen; lower 75% frozen
Cache Bridge to Highway 33 Bridge	11	2	13	River 50% frozen
Highway 33 Bridge to Bitch Creek	18	8	26	River 15% frozen
Subtotal	135	39	174	
<i>Teton Canyon</i>				
Bitch Creek to Linderman Dam Site	9	4	13	River 5% frozen
Linderman Dam Site to Teton Dam Site	42	4	46	River 5% frozen; 80% frozen at Teton Dam site
Teton Dam Site to Beaver Dicks Grave	2	1	3	River 5% frozen
Subtotal	53	9	62	
<i>Hog Hollow & Wilford Diversion</i>				
Beaver Dicks Grave to Hog Hollow Bridge	2	0	2	Pool above bridge 50% frozen
Hog Hollow Bridge to Head Wilford Diversion	0	0	0	River 5% frozen
Fields south of Hog Hollow Bridge (grain)	100	17	117	No snow
Fields north of Wilford Diversion (potatoes)	454	32	486	No snow
Wilford Diversion	0	0	0	75% frozen
Breast of Wilford Diversion to Teton Bridge	0	0	0	River 5% frozen
Subtotal	556	49	605	
<i>South Fork Teton River</i>				
Teton Bridge to Highway 20 Bridge	3	0	3	River 10% frozen; Secret Pond 95% frozen
Fields west of Teton (town)	152	3	155	
Highway 20 Bridge to Mouth	0	0	0	River 10% frozen
Subtotal	155	3	158	
<i>North Fork Teton River</i>				
Teton Bridge to Highway 20 Bridge	0	0	0	River 10% frozen; no snow
Fields northwest of Teton (town)	13	14	27	No snow
Highway 20 Bridge to Mouth	24	1	25	River 50% frozen; all swans at mouth
Subtotal	37	15	52	
<i>South Fork of the Snake River</i>				
Palisades Dam to Swan Valley Bridge	227	34	261	No ice
Rainey Creek, mouth to Swan Valley (town)	0	0	0	No ice; 12 white geese
Rainey Creek pond at Swan Valley (town)	0	0	0	1/10 acre open; 75% frozen
Snow Roost Site SW of Swan Valley	0	0	0	4 inches snow on fields
Swan Valley Bridge to end of Conant Valley	39	6	45	No ice
West end Conant Valley to Black Canyon	12	5	17	No ice
Black Canyon to Burns Canyon	0	0	0	No ice
Black Canyon Spring Ponds	8	5	13	No ice; good water levels
Burns Canyon to Table Rock Canyon	10	11	21	No ice

Appendix A. (cont.)

Table Rock Canyon to Juniper Point	14	11	25	No ice
Juniper Point to Heise Bridge	0	0	0	No ice
Heise Bridge to Twin Bridges	2	0	2	No ice
Twin Bridges to Highway 20 Bridge (Lorenzo)	0	0	0	<5% frozen; skim ice at river edge
Lorenzo Pond and Bear World Pond	0	0	0	Mostly dry
Highway 20 Bridge to Mouth	0	0	0	<5% frozen; skim ice at river edge
Subtotal	312	72	384	
<i>Main Stem of the Snake River</i>				P: G. Lust, O: C. Whitman 2/12/2003
<i>Emigrant Creek Slough</i>				
Head spring to mouth	0	0	0	1/2 acre open
<i>Spring Creek Slough</i>				
Head spring to mouth	17	1	18	1/4 acre open; 80% frozen
<i>Dry Bed of the Snake River</i>				
Dry Bed Mouth to Lewisville Bridge	4	2	6	50% frozen
<i>Roberts Sloughs</i>				
Slough east of Roberts	0	0	0	100 sq. yards open; 99% frozen
Slough northeast of Roberts Bridge	6	4	10	1/4 acre open; 99% frozen
Subtotal	6	4	10	
<i>SNAKE RIVER</i>				
Menan Buttes Bridge to Roberts	15	5	20	Upper 10% frozen; lower 80% frozen
Roberts Bridge to Idaho Falls Highway 20 Bridge	208	32	240	River 75% frozen
Idaho Falls Highway 20 Bridge to Blackfoot Bridge	0	0	0	Standing water frozen; flowing water open
Blackfoot Marsh Equalizing Ponds	0	0	0	Dry
Lower Blackfoot River	0	0	0	No ice
Blackfoot Bridge to Ferry Butte Bridge	0	0	0	No ice
Ferry Butte Bridge to mouth American Falls Reserv.	0	0	0	
American Falls to CJ Strike Reservoir				
Subtotal	223	37	260	
<i>Fort Hall Bottoms</i>				
Springfield Bird Preserve	0	0	0	Lake 30% frozen; 3 acres open
Crystal Springs Creek and pond	0	0	0	No ice
Danielson Creek	82	12	94	No ice; shelf ice at creek edge
Caldwell Lane Ponds	0	0	0	No ice
Spring Creek, head spring to mouth	18	6	24	No ice
Clear Creek, head springs to mouth	0	0	0	No ice
Jimmy Creek	0	0	0	No ice
Diggie Creek	0	0	0	No ice
Flying Y Sloughs	2	0	2	1/4 acre open; 80% frozen
Kenny Creek	37	1	38	No ice
Ross Fork	20	3	23	No ice; water turbid

Appendix A. (cont.)

Portneuf Mouth Area	17	6	23	
Subtotal	176	28	204	
<i>Grays Lake and Soda Springs</i>				
<i>Grays Lake</i>				
Big Bend Marsh	0	0	0	100% frozen
Big Springs	0	0	0	100% frozen
Shorty's Homestead	0	0	0	50 sq. yards open
Southeast Corner ponds	0	0	0	100% frozen
Chub Springs	0	0	0	1/4 acre open at springs; creeks frozen
Subtotal	0	0	0	
<i>Blackfoot Reservoir</i>				
Goose Lake Creek inlet (Utah Beach)	16	0	16	20 acres open; reservoir water levels down 12 feet
Warm Springs	0	0	0	Creek leads to 1/2 acre open water
Bay south of Warm Springs	0	0	0	Dry
Little Blackfoot River	0	0	0	Lower 1/2 mile open
Chicken Point	0	0	0	1/10 acre open
Poison Creek, Wilson Flats area	0	0	0	3/4 acre open
Subtotal	16	0	16	
<i>Soda Springs Area</i>				
Woodall Springs	0	0	0	2 acres open
Five Mile Meadows	0	0	0	3/4 acre open; outlet creek frozen
Miller Ponds	16	3	19	3 acres open
Government Dam	0	0	0	1/4 acre open; 95% frozen
Monsanto Colling Pond (near Hooper Spring)	0	0	0	1/4 acre open
Soda Springs Creek, Government Dam to mouth	0	0	0	No ice
Soda Springs Canal	0	0	0	Mostly open near inlet
Barker Pond (west of Soda Springs)	0	0	0	1/10 acre open; 80% frozen
Chesterfield Reservoir	0	0	0	100% frozen; 60% dry
Subtotal	16	3	19	
<i>Bear River Drainage</i>				
<i>Bear Lake</i>				
Big Springs Utah	14	0	14	Upper ponds no ice; lower 90% frozen
West side of Bear Lake	0	0	0	Shelf ice northwest corner of lake; rest of lake open
East side of Bear Lake				Lake open
North shore of Bear Lake (outlet)	7	2	9	Shelf ice northwest corner of lake; rest of lake open
Subtotal	21	2	23	
<i>Bear River Refuge</i>				
Bear Lake canal	0	0	0	100% frozen
Bloomington Unit	0	0	0	100% frozen
Mud Lake Unit	0	0	0	100% frozen

Appendix A. (cont.)

Rainbow Unit	0	0	0	100% frozen
Salt Meadow Unit	0	0	0	100% frozen
Dingle Unit	0	0	0	100% frozen
Alder Unit	0	0	0	100% frozen
Spring Creek west of refuge	0	0	0	No ice
Subtotal	0	0	0	
<i>Bear Lake Valley</i>				
Bear Lake NWR to Georgetown Bridge	0	0	0	River frozen
Georgetown Bridge to head of Alexander Reservoir	0	0	0	River 50% frozen
Alexander Reservoir	8	0	8	3/4 acre open Soda Creek inlet; 1/10 acre open Golf Course
Alexander Dam to head of Last Chance Dam	1	2	3	No ice
Last Chance Dams	3	0	3	Upper dam open; lower dam 75% frozen
Subtotal	12	2	14	
<i>Black Canyon</i>				
Last Chance Dam to Grace Cove Power Plant	0	0	0	95% frozen; 4 white geese
Grace Cove Power Plant Pond	0	0	0	3/4 acre open; 15% frozen
Subtotal	0	0	0	
<i>Gentle Valley</i>				
Grace Cove Pond to Cheese Factory Bridge	0	0	0	No ice; 1 fisherman
Cheese Factory Bridge to Centennial Bridge	0	0	0	No ice
Centennial Bridge to Thatcher Bridge	0	0	0	No ice
Subtotal	0	0	0	
<i>Mound Valley</i>				
Thatcher Bridge to Highway 34 Bridge	0	0	0	No ice
Highway 34 Bridge to head of Oneida Narrows Dam	0	0	0	No ice
Subtotal	0	0	0	
<i>Oneida Narrows</i>				
Head Oneida Narrows Dam to Maple Grove Hot Spring	3	2	5	No ice
Maple Grove Hot Springs to breast Oneida Narrows Dam	0	0	0	100% frozen
Breast Oneida Narrows Dam to canyon mouth	0	0	0	No ice
Treasureton Reservoir	0	0	0	100% frozen
Strong Arm Reservoir	0	0	0	100% frozen
Condie Reservoir	0	0	0	100% frozen
Winder Reservoir	0	0	0	100% frozen
Twin Lakes Reservoir	0	0	0	100% frozen
Subtotal	3	2	5	
<i>Lower Bear River</i>				
Canyon mouth to Highway 34 Bridge (Riverdale)	0	0	0	No ice
Highway 34 Bridge (Riverdale) to Highway 91 Bridge	0	0	0	No ice

Appendix A. (cont.)

Gravel pit ponds	0	0	0	100% frozen
Highway 91 Bridge to Highway 36 Bridge (Preston)	0	0	0	No ice
Highway 36 Bridge to Utah State Line	0	0	0	No ice
Subtotal	0	0	0	
Nevada				
Ruby Lake NWR	34	7	41	J. Mackay 2/12/2003
Oregon				
Malheur NWR	19	5	24	R. Roy 2/11/2003
Summer Lake Wildlife Management Area	9	3	12	M. St. Louis

^aBlank denotes area not surveyed.

Appendix B. Personnel who conducted the 2003 Mid-winter Trumpeter Swan Survey.

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

Observers: S. Comeau (Red Rock Lakes NWR)
Pilot: B. Twist (Western Montana Aviation)

Montana (Paradise Valley)

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

Idaho

Observer: C. Whitman (Southeast Idaho Refuge Complex)
Pilot: G. Lust (Mountain Air Research)

Wyoming

Observer: B. Oakleaf (Wyoming Game and Fish Department)
Pilot: G. Lust (Mountain Air Research)

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)
