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# TRUMPETER SWAN SURVEY of the ROCKY MOUNTAIN POPULATION, U.S. BREEDING SEGMENT FALL 2005

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*Migratory Birds and State Programs*

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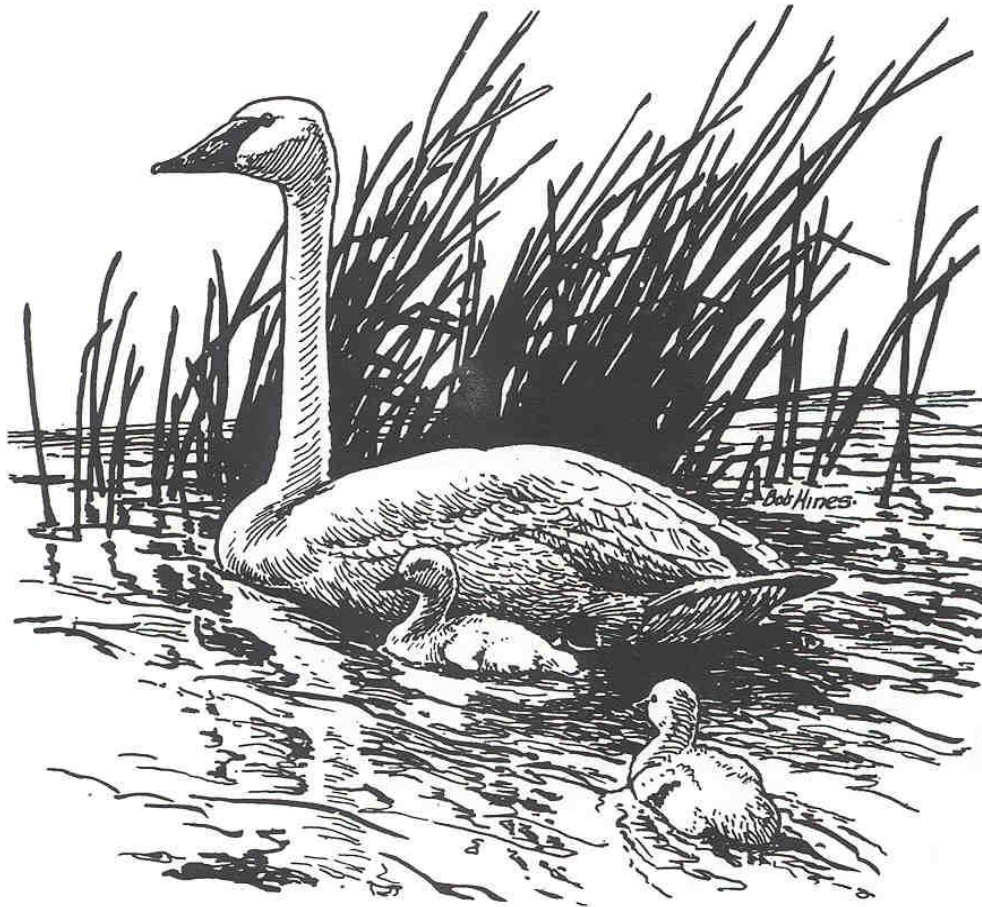
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U.S. Fish and Wildlife Service  
Migratory Birds and State Programs  
Mountain-Prairie Region  
Lakewood, Colorado

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*Abstract.*— Observers counted 510 swans (white birds and cygnets) in the U.S. Breeding Segment of the Rocky Mountain Population of trumpeter swans during fall of 2005, the highest count since 1992. The numbers of white birds and cygnets in the tri-state region increased 22% and 4%, respectively, compared to counts in 2004. The number of young produced in Montana was 25% higher than in 2004, whereas numbers of cygnets in Idaho and Wyoming essentially were unchanged. The number of white birds increased compared to 2004 for all three states in which the Tri-state Area Flocks nest. The number of birds at Malheur National Wildlife Refuge increased compared to last year, due to increased numbers of white birds. The count for Nevada was unchanged from that of 2004, and for the fifth consecutive year, swans at Ruby Lake fledged no young. The number of swans at Summer Lake Wildlife Management area and vicinity was similar to the count for 2001, the most recent year in which biologists conducted extensive surveys of the area. Although the area around Red Rock Lakes National Wildlife Refuge continued to experience drought conditions during summer 2005, Palmer Drought Indices for other areas within the tri-state region were much improved relative to recent years.

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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 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 RMP/Canadian and Tri-state Area flocks winter sympatrically primarily in the tri-state area. In addition, efforts have been made to establish several 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. This report contains information only from the Tri-state Area and restoration flocks, collectively referred to as the RMP/U.S. Breeding Segment. These terms for the various groups of swans are consistent with the RMP Trumpeter Swan Implementation Plan (Pacific Flyway Study Committee 2002).

The Fall Trumpeter Swan Survey is conducted annually in September. The survey is conducted cooperatively by several administrative entities and is intended to provide an accurate count of the number of RMP trumpeter swans that summer in the U.S. The history of the survey dates back to the 1930s, although methods and survey coverage have changed over time as the number of swans increased and new technologies became available. To be consistent with previous reports, only the data from 1967 to present were analyzed for this report. The data are used by managers to assess the annual status of the Tri-state Area Flocks and restoration flocks.



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



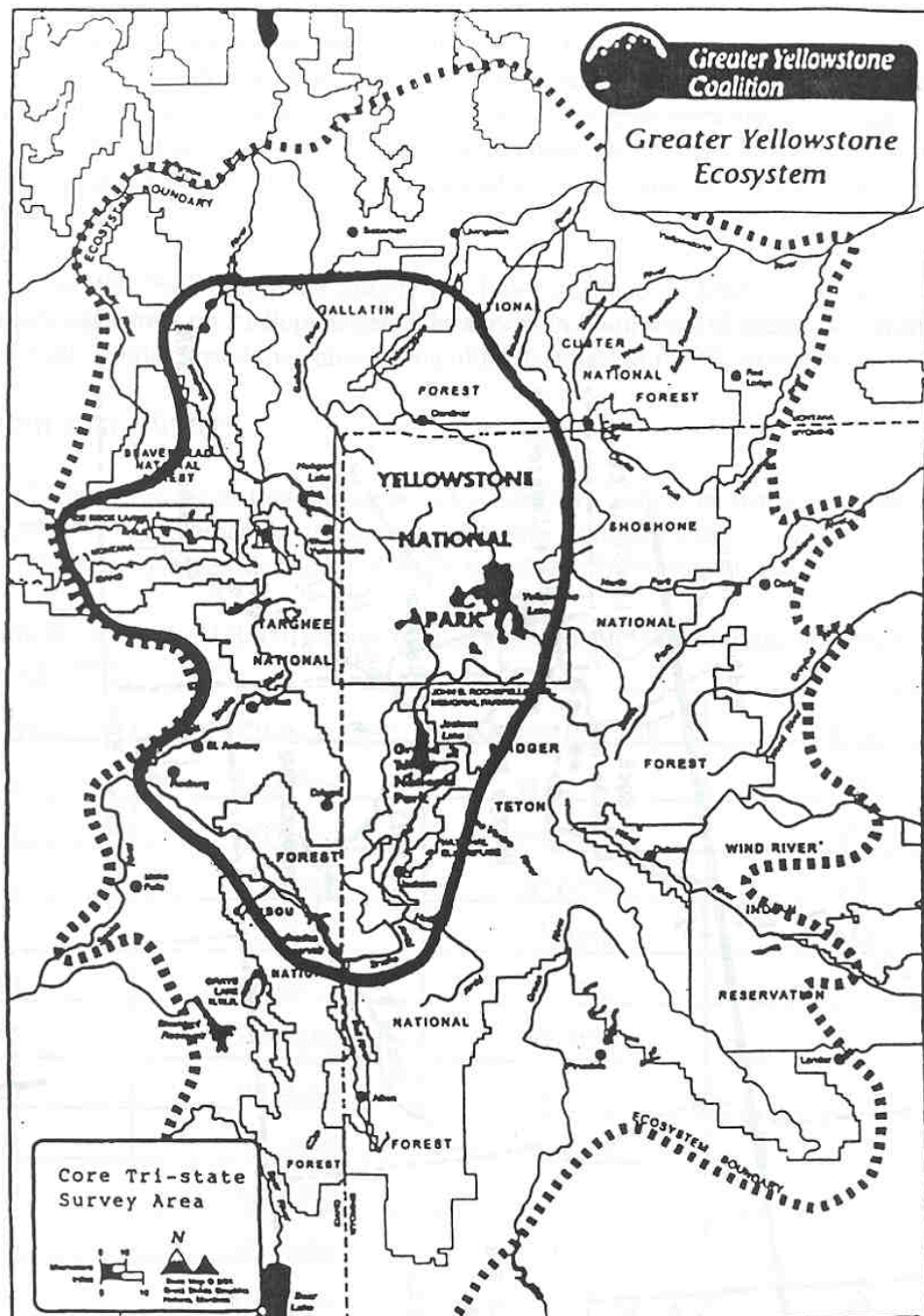


Fig. 2. Map showing the 'core' tri-state area of southeast Idaho, southwest Montana, and northwest Wyoming (provided by the Greater Yellowstone Coalition, Bozeman, Montana).

## METHODS

The survey is conducted within a relatively short time frame 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, in Nevada, and in the Summer Lake WMA and vicinity; ground surveys are used to count the number of swans 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 summer 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.

During fall 2005, the survey was conducted during 13-29 September, with most areas surveyed during 13-17 September. Approximately 31 h of flight time and 5 h of ground survey time were required to complete the survey. Weather conditions during surveys generally consisted of clear or partly cloudy skies and light winds; however, conditions in Idaho were overcast and windy with scattered showers the second day of the survey. Nonetheless, conditions were adequate to complete all survey areas in Idaho.

We used least-squares regression on log-transformed counts to assess changes in growth rates for each of the swan flocks comprising the RMP/U.S. Breeding Segment. Counts from the current fall survey (2005) were compared to results from the earlier time frames, a practice used in U.S. Fish and Wildlife Service survey reports for other waterfowl (e.g., U.S. Fish and Wildlife Service 2005, Wilkins et al. 2005).

## RESULTS AND DISCUSSION

Habitats continued to be drier than average during winter 2004-05 throughout much of the nesting area of the RMP/U.S. Breeding Segment, and temperatures were average or slightly above average (Joint Agricultural Weather Facility 2005a). However, spring and summer precipitation improved wetland habitats in many areas. Precipitation amounts were variable throughout the tri-state region, but some areas received 100% - 125% of normal precipitation during June-August (Joint Agricultural Weather Facility 2005b). Temperatures generally were average or slightly below average during that period. During mid-June, portions of the summering range of RMP swans in the U.S. were in severe to extreme drought, whereas other areas experienced average or above-average moisture conditions (Fig. 3). Reports from biologists surveying sandhill cranes (*Grus canadensis*) at the same time and in the same areas as the fall trumpeter swan survey reported that wetland water levels were higher than in recent years, and that wetland habitat conditions were improved in many localities (Drewien and Thorpe 2005). However, Palmer Drought Indices for southwest Montana (near the north-central portion of the core tri-state area) remained very low, and indices were about the same as those during the summer of 2004 (Fig. 4).

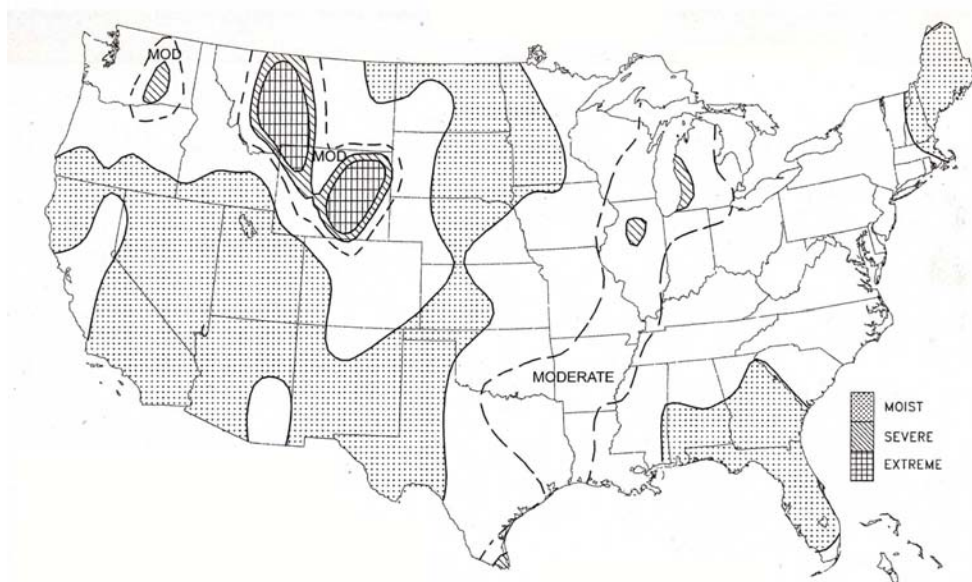


Fig. 3. Palmer Drought Index map for June 25, 2005 (Joint Agricultural Weather Facility 2005c).

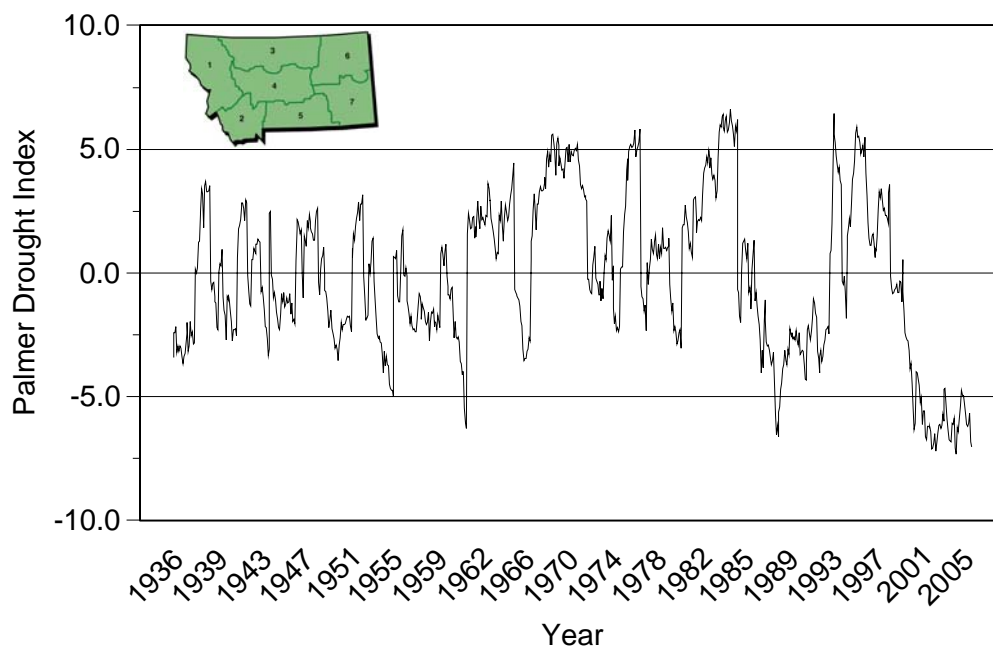


Fig. 4. Monthly Palmer Drought Indices for climate division 2 in southwest Montana (data from the National Climatic Data Center [<http://www1.ncdc.noaa.gov/pub/data/cirs/drd964x.pdsi.txt>]).



## Historical Trends

Historical (i.e., 1967 to the early 1990s) trends in abundance for the U.S. Breeding Segment of RMP trumpeter swans were described in a previous report (U.S. Fish and Wildlife Service 2003), and the details of those analyses will not be reiterated here. Briefly, regression analyses suggested that the growth rate for total swans of the entire U.S. Breeding Segment did not change ( $P = 0.27$ ) during 1967-88 (Table 1, Fig. 5). The rate for white birds appeared to decline slightly ( $-0.8\%$  per year,  $P$  [ $\beta < 0$ ] = 0.16), while that for cygnets showed no trend ( $P = 0.50$ ). Patterns for regression statistics for the Tri-state Area Flocks were similar to those for the RMP/U.S. Breeding Segment (Fig. 6), because the vast majority of birds comprising the RMP/U.S. Breeding Segment summer in the tri-state area (Table 1). However, the counts of white swans appeared to decline at a somewhat greater rate ( $-1.0\%$  per year,  $P = 0.09$ ) during 1967-88, compared to those for white birds in the entire RMP/U.S. Breeding Segment.

Birds summering in Montana (Table 2) had patterns of change relatively similar to that of the Tri-state Area Flocks as a whole, because historically the swans in Montana comprised the majority of birds in the Tri-state Area Flocks. Total swans in Montana appeared to decline slightly ( $-1.2\%$  per year) during 1967-88 (Fig. 7), although the value for the slope parameter was only marginally significant ( $P = 0.16$ ). The decline existed only for white birds; counts for cygnets suggested no trend ( $P = 0.95$ ). In Idaho, no trends in total or white swan counts were evident, but the counts for cygnets increased ( $P = 0.03$ ) (Fig. 8). No trends in swan counts were evident in Wyoming (Fig. 9).

For restoration flocks, we analyzed data only for Malheur NWR (Oregon flock) and Ruby Lake NWR. Swans were translocated to Summer Lake WMA (Oregon flock) beginning in winter 1991; therefore, data for that area prior to that time are not available. Plots of the swan counts for total birds and white birds at Malheur NWR suggested that a piecewise regression with a breakpoint at 1983 would fit the data better than a simple linear regression. For the period 1967-1983, no trend was evident in counts of total swans or white birds ( $P \geq 0.17$ ) (Fig. 10). During 1984-1991, rates for total birds and white birds were negative but not statistically significant ( $P \geq 0.15$ ). No trend in the rate for cygnets was evident for either time period ( $P \geq 0.45$ ). Counts for the Nevada flock ranged between 6 and 42 birds (Table 2), with no apparent long-term trends (Fig. 11).

Surveys of the Summer Lake WMA have not been conducted for the last 3 years. Therefore, analyses using post-1991 data for the RMP exclude counts for that area so that areas surveyed were comparable across years. As a consequence, some results may differ from previous reports.

During 1988-92, several significant management actions affecting the RMP/U.S. Breeding Segment occurred concurrently (e.g., termination of winter feeding, experimental translocations of swans [U.S. Fish and Wildlife Service 2003]), and may collectively have influenced the demographics of these birds. The number of swans in the RMP/U.S. Breeding Segment (excluding counts for Summer Lake WMA) declined markedly ( $-51\%$ ) between the falls of 1988 and 1993, and the 1993 count was 44% below the 1967-88 average (Fig. 5). No marked changes in abundance were apparent for restoration flocks (Figs. 10, 11).

Table 1. Counts of trumpeter swans of the Rocky Mountain Population U.S. Breeding Segment during fall, 1967-2005.

Year	Tri-state Area Flocks			Restoration flocks			RMP/U.S. Breeding Segment		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1967	520	45	565	60	13	73	580	58	638
1968	431	154	585	58	20	78	489	174	663
1969	a			69	23	92			
1970				45	16	61			
1971	431	68	499	46	27	73	477	95	572
1972				42	16	58			
1973				42	7	49			
1974	457	80	537	35	9	44	492	89	581
1975				41	9	50			
1976				31	9	40			
1977	403	86	489	51	4	55	454	90	544
1978				39	15	54			
1979				41	42	83			
1980	462	23	485	71	26	97	533	49	582
1981				77	14	91			
1982				56	20	76			
1983	398	54	452	73	22	95	471	76	547
1984	431	58	489	65	9	74	496	67	563
1985	368	139	507	63	5	68	431	144	575
1986	331	61	392	34	26	60	365	87	452
1987	365	175	540	52	19	71	417	194	611
1988	464	137	601	49	9	58	513	146	659
1989	505	60	565	30	3	33	535	63	598
1990	432	147	579	36	11	47	468	158	626
1991	414	91	505	32	18	50	446	109	555
1992	390	92	482	75	6	81	465	98	563
1993	248	29	277	55	22	77	303	51	354
1994	239	130	369	63	22	85	302	152	454
1995	307	55	362	58	7	65	365	62	427
1996	316	63	379	64	15	79	380	78	458
1997	310	54	364	48	15	63	358	69	427
1998	304	90	394	60	15	75	364	105	469
1999	312	56	368	35	14	49	347	70	417
2000	324	102	426	48	7	55	372	109	481
2001	362	59	421	54	12	66	416	71	487
2002	273	53	326	38b	7b	45b	311b	60b	371b
2003	291	95	386	30b	1b	31b	321b	96b	417b
2004	291	94	385	27b	5b	32b	318b	99b	417b
2005	355	98	453	49	8	57	404	106	510

<sup>a</sup> Blank denotes value not calculated because of incomplete survey.

<sup>b</sup> Data for only Malheur NWR and the Nevada flock included; Summer Lake WMA survey not completed.

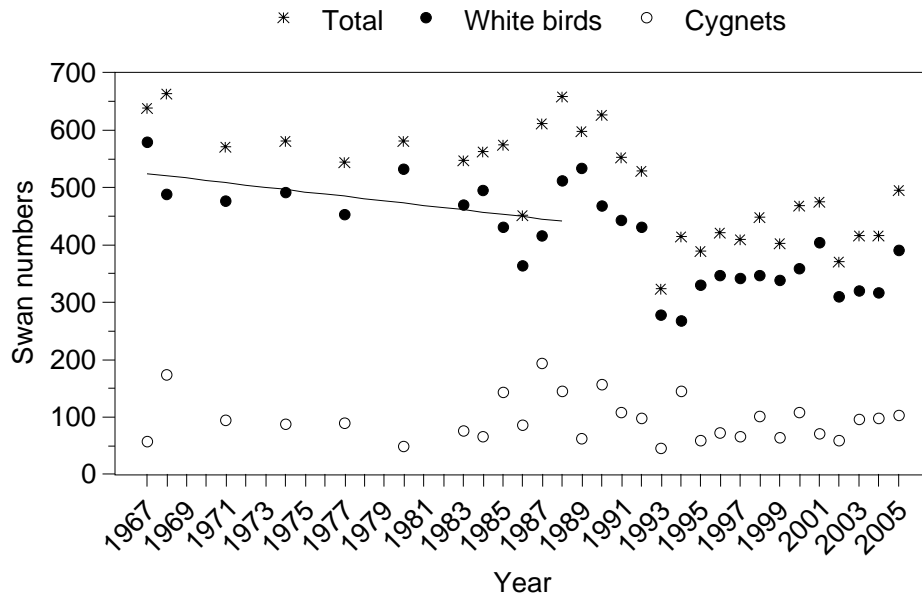


Fig. 5. Counts of swans in the RMP/U.S. Breeding Segment during the Fall Trumpeter Swan Survey, 1967-2005 (line depicts trend for white birds). The counts do not include those for the Summer Lake WMA (see text).

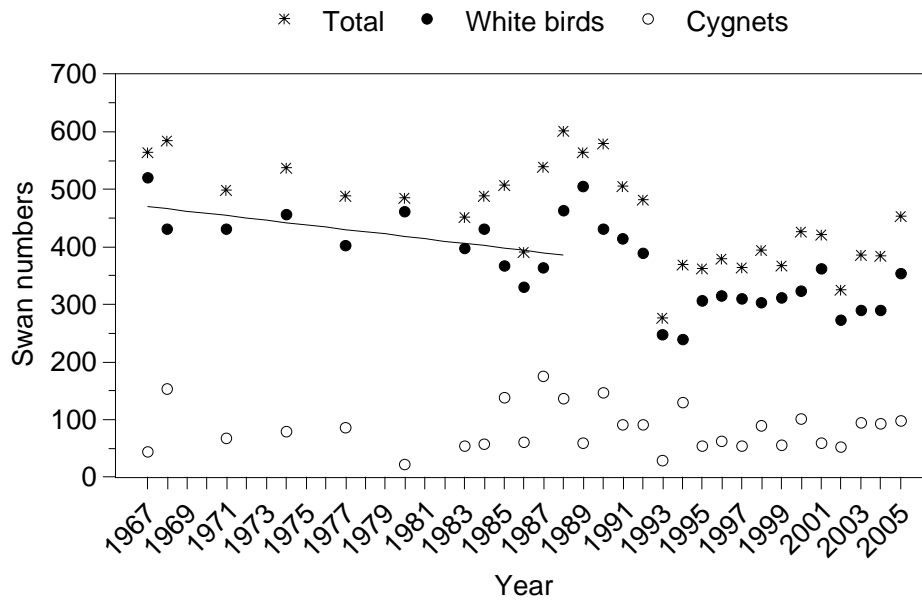


Fig. 6. Counts of swans in the Tri-state Area Flocks during the Fall Trumpeter Swan Survey, 1967-2005 (line depicts trend for white birds).

Table 2. Counts of trumpeter swans of the Rocky Mountain Population U.S. Breeding Segment during fall, 1967-2005.

Year	Montana			Idaho			Wyoming			Malheur NWR			Summer Lake WMA			Nevada		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1967	334	25	359	87	8	95	99	12	111	33	12	45	a			27	1	28
1968	242	123	365	88	6	94	101	25	126	34	11	45				24	9	33
1969	b									36	14	50				33	9	42
1970										37	13	50				8	3	11
1971	297	49	346	60	6	66	74	13	87	38	22	60				8	5	13
1972										32	13	45				10	3	13
1973										36	4	40				6	3	9
1974	296	49	345	71	17	88	90	14	104	29	9	38				6	0	6
1975										33	7	40				8	2	10
1976										23	8	31				8	1	9
1977	267	64	331	60	7	67	76	15	91	33	0	33				18	4	22
1978										24	13	37				15	2	17
1979	324	63	387							31	33	64				10	9	19
1980	315	6	321	73	11	84	74	6	80	53	15	68				18	11	29
1981										53	9	62				24	5	29
1982										38	17	55				18	3	21
1983	228	32	260	92	6	98	78	16	94	55	17	72				18	5	23
1984	268	22	290	80	21	101	83	15	98	40	6	46				25	3	28
1985	212	87	299	83	27	110	73	25	98	38	2	40				25	3	28
1986	174	28	202	83	14	97	74	19	93	19	24	43				15	2	17
1987	210	133	343	63	15	78	92	27	119	38	14	52				14	5	19
1988	268	77	345	87	28	115	109	32	141	33	8	41				16	1	17
1989	294	23	317	101	16	117	110	21	131	20	3	23				10	0	10
1990	245	108	353	92	28	120	95	11	106	27	7	34				9	4	13
1991	176	60	236	138	26	164	100	5	105	22	14	36	2	0	2	8	4	12
1992	156	74	230	109	8	117	125	10	135	28	6	34	34	0	34	13	0	13
1993	60	16	76	94	6	100	94	7	101	22	12	34	25	5	30	8	5	13
1994	70	48	118	79	49	128	90	33	123	15	7	22	33	6	39	15	9	24
1995	84	17	101	118	21	139	105	17	122	11	3	14	34	3	37	13	1	14
1996	95	36	131	127	20	147	94	7	101	17	5	22	32	5	37	15	5	20
1997	88	18	106	112	19	131	110	17	127	16	7	23	15	2	17	17	6	23
1998	105	35	140	110	37	147	89	18	107	22	5	27	17	3	20	21	7	28
1999	120	21	141	103	23	126	89	12	101	11	3	14	8	6	14	16	5	21
2000	127	24	151	102	40	142	95	38	133	10	5	15	12	0	12	26	2	28
2001	140	9	149	124	23	147	98	27	125	11	12	23	12	0	12	31	0	31
2002	76	18	94	103	14	117	94	21	115	14	7	21	2 <sup>c</sup>	0 <sup>c</sup>	2 <sup>c</sup>	24	0	24
2003	89	29	118	100	27	127	102	39	141	11	1	12	2 <sup>c</sup>	0 <sup>c</sup>	2 <sup>c</sup>	19	0	19
2004	89	32	121	112	23	135	90	39	129	10	5	15	b			17	0	17
2005	112	40	152	136	22	158	107	36	143	20	5	25	12	3	15	17	0	17

<sup>a</sup>Swans translocated to Summer Lake WMA beginning in winter 1991; count from 1991 not used in analyses.

<sup>b</sup>Blank denotes survey was not conducted.

<sup>c</sup>Incomplete count; data not used in analyses.

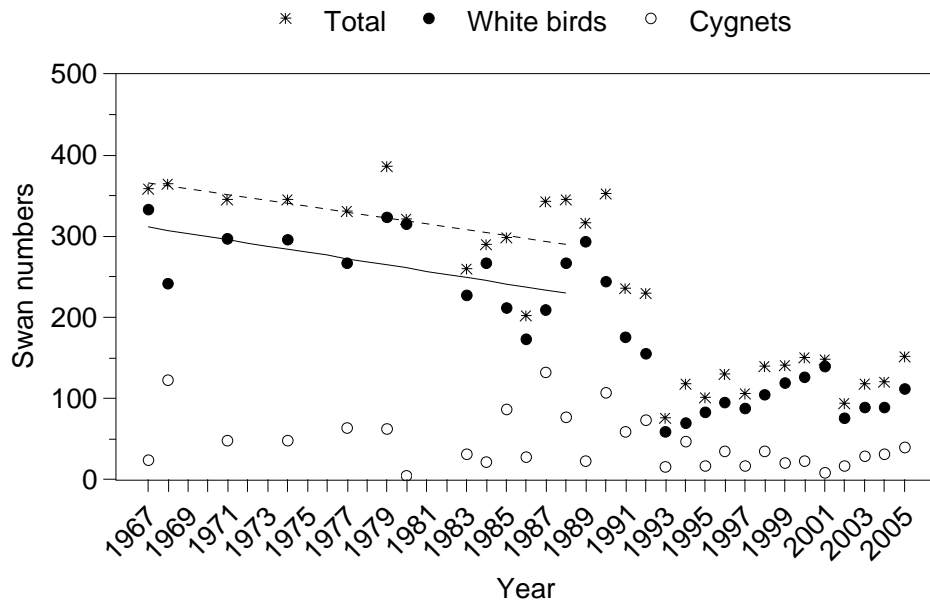


Fig. 7. Numbers of swans counted in Montana during the Fall Trumpeter Swan Survey, 1967-2005 (dashed and solid lines depict trends for total swans and white birds, respectively).

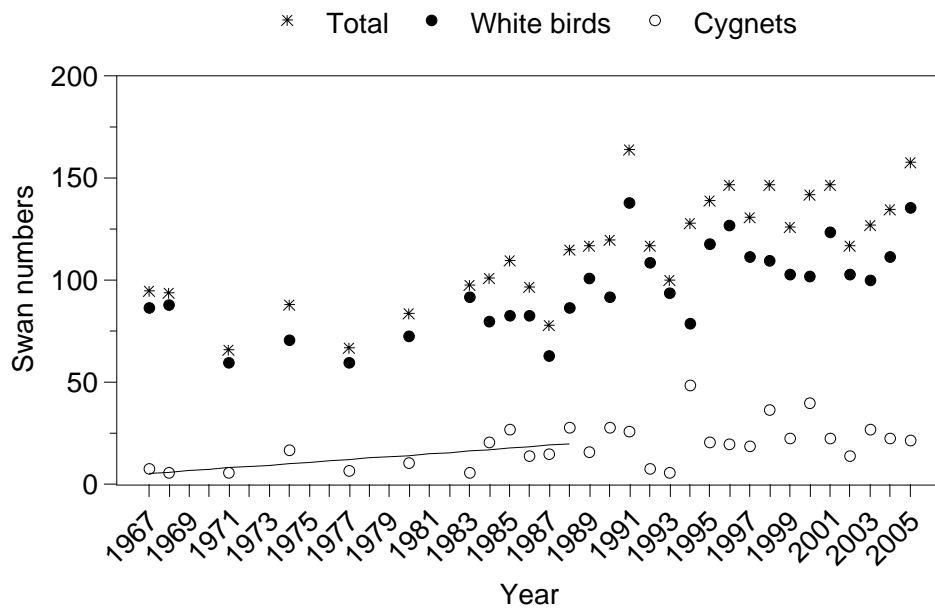


Fig. 8. Numbers of swans counted in Idaho during the Fall Trumpeter Swan Survey, 1967-2005 (line depicts trend for cygnets).



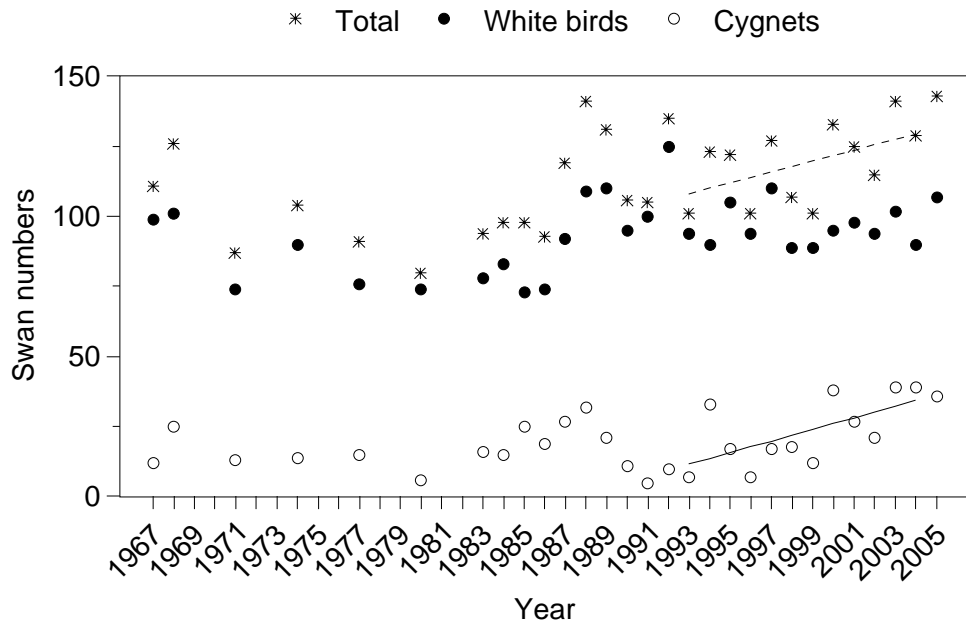


Fig. 9. Numbers of swans counted in Wyoming during the Fall Trumpeter Swan Survey, 1967-2005 (dashed and solid lines depict trends for total birds and cygnets, respectively).

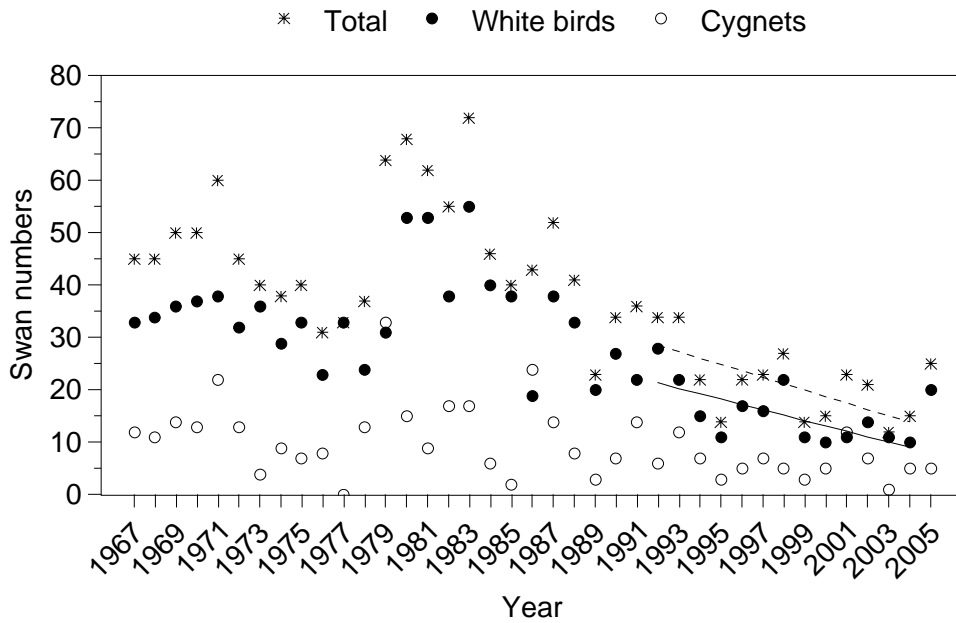


Fig. 10. Numbers of swans counted at Malheur NWR during the Fall Trumpeter Swan Survey, 1967-2005 (dashed and solid lines depict trends for total and white birds, respectively).

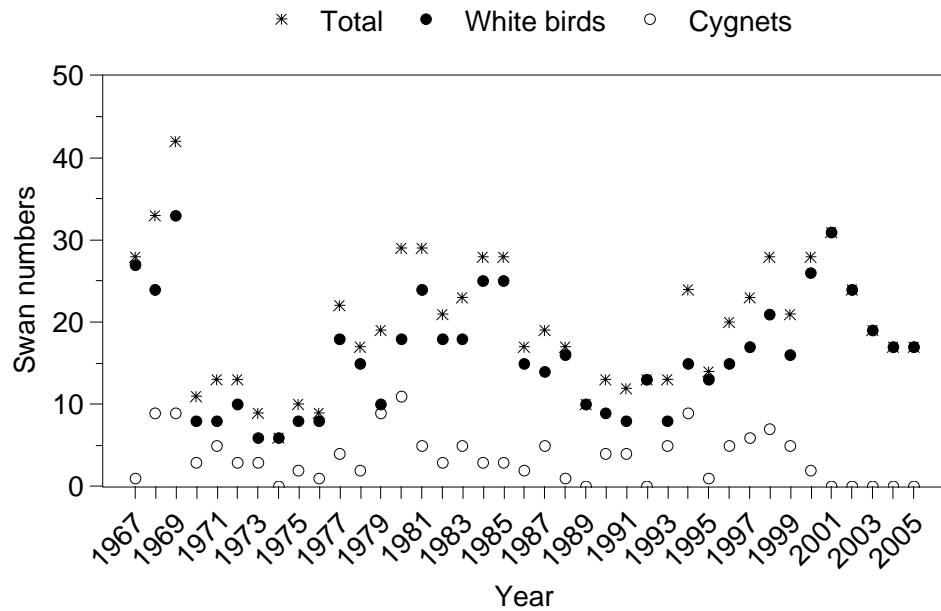


Fig. 11. Numbers of swans counted in the Nevada flock during the Fall Trumpeter Swan Survey, 1967-2005.

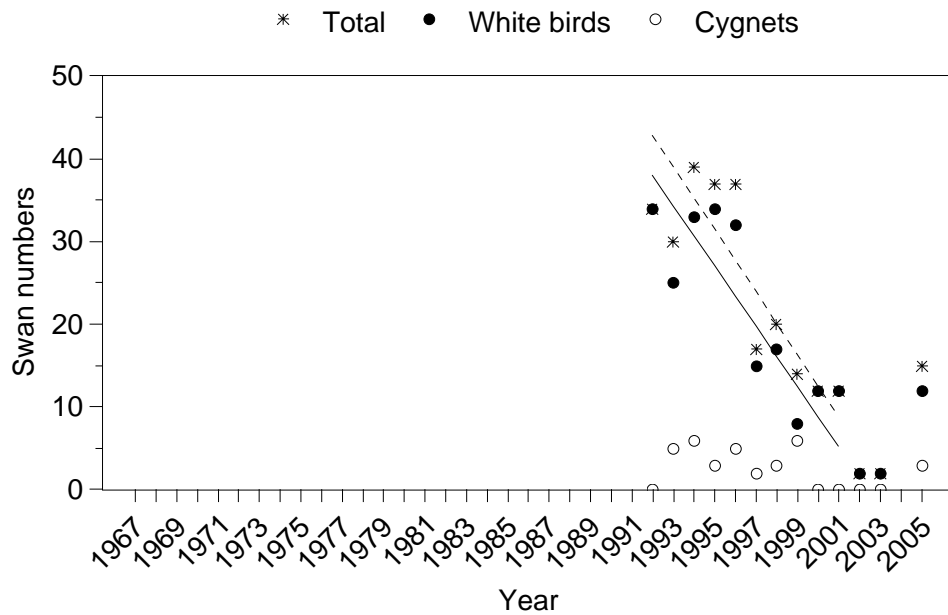


Fig. 12. Numbers of swans counted at Summer Lake WMA during the Fall Trumpeter Swan Survey, 1992-2005 (dashed and solid lines depict trends for total swans and white birds, respectively).

## Recent Trends

During 1993-2004, no trend in the growth rate for any portion of the RMP/U.S. Breeding Segment was evident ( $P \geq 0.18$ ), although rates were positive for both cohorts and total birds (range for regression slopes = 1.2% - 2.0%) (Fig. 5). Similar results were evident for swans in the Tri-state Area Flocks ( $P \geq 0.13$ ) during the same period (Fig. 6).

The rate of growth for total swans in Montana did not change during the 1993-2004 period ( $P = 0.21$ , Fig. 7). Although the average rate of growth for white birds (3.1%) increased, the change was not statistically significant ( $P = 0.14$ ); the data for cygnets also suggested no trend ( $P = 0.79$ ). In Idaho, although slopes for all regressions (i.e., total birds [+0.7%], white birds [+0.9%], cygnets [+3.2%]) were positive, none were statistically significant ( $P \geq 0.42$ ) (Fig. 8). For Wyoming during 1993-2004, total swans (+1.6% per year,  $P = 0.09$ ) and cygnets (+10.7% per year,  $P = 0.03$ ) increased, but no trend was evident for white birds ( $P = 0.84$ ) (Fig. 9).

Because the Summer Lake WMA was not surveyed during 2002-2004, we analyzed data for the Oregon flock by region (i.e., Malheur NWR, Summer Lake WMA). As mentioned above, the data for total birds and white birds at Malheur NWR suggested a piecewise regression with a breakpoint at 1983 would fit the data better than a simple linear regression. The decline of swans that occurred from 1984-91 (see above) continued during 1992-2004. However, declines for total swans (-5.5% per year) and white birds (-7.0% per year) were not statistically significant ( $P \geq 0.15$ ) (Fig. 10). The rate for cygnets was unchanged ( $P = 0.65$ ). At Summer Lake WMA, swans were translocated to the area beginning in winter 1991, so data from fall 1992-2001 are available. Regression analyses indicated substantial negative rates of growth for total birds (-15.7% per year,  $P = 0.03$ ) and white birds (-19.9% per year,  $P = 0.03$ ) (Fig. 12). No trend in the rate of cygnets produced was evident ( $P = 0.62$ ), but few cygnets ever have been produced at this location (0-6 per year,  $\bar{x} = 3.0$ ). However, we remind readers that most birds were translocated to Summer Lake WMA during winter, primarily to alleviate potential negative impacts of high swan concentrations on habitats in the Harriman State Park area of eastern Idaho. Most swans remained in the area for only a few months after being translocated (M. St. Louis, personal communication). Thus, the steep decrease in the number of swans at Summer Lake WMA does not reflect the decline of an established nesting flock, but rather suggests only that few of the >600 swans translocated to this area during the early 1990s (Shea and Drewien 1999) survived, or that most moved elsewhere over time.

Counts for the entire time frame were used for analyses of the Nevada flock (see U.S. Fish and Wildlife Service 2003:7). No linear trends ( $P \geq 0.13$ ) were evident for any component of the Nevada flock (Fig. 11), although a cyclic pattern may exist.

## Results from the 2005 survey

During fall 2005, observers counted 510 trumpeter swans in the RMP/U.S. Breeding Segment, the largest estimate since 1992 (Table 1, Fig. 5). Excluding 2005 counts of Summer Lake WMA birds

(because survey was not conducted for that area during 2004), the numbers of white birds (392) and cygnets (103) were 23% and 4% higher than counts from 2004 (318 and 99, respectively).

The number of swans in the Tri-state Area Flocks was 18% higher than the count from last year. The number counted in Wyoming was a record-high count, whereas that for Idaho was the second-highest recorded, and the count for Montana was the highest since 1992. The number of white birds increased in all 3 states encompassing the Tri-state Area Flocks (Montana: +26%; Idaho: +17%; Wyoming: +11%), and collectively increased 22% compared to the count from 2004.

The counts for restoration flocks varied. The count at Malheur NWR was higher than in 2004, due to more white birds in the area. The total-swan count was the highest since 1998. The count for Nevada was the same as that for last year (17), tied with the lowest count since 1995. For the first time since 2001, biologists conducted a relatively complete survey of the Summer Lake WMA and vicinity. The count of total swans (15) was comparable to that in 2001.

Overall production of cygnets in the tri-state region (98) was the nearly same as that of last year (94). An index<sup>1</sup> to production rate (i.e., cygnets/white birds) for Montana (0.357) and Wyoming (0.336) were higher than their long-term (i.e., 1967-2004) averages (0.270 and 0.210, respectively), while that for Idaho (0.162) was below the long-term average (0.208). The count of cygnets in Montana was 25% higher than in 2004, but counts were similar to those of last year in Idaho and Wyoming. Five cygnets were counted at Malheur NWR this year, the same number as last year, but still relatively low compared to the long-term average (9.8). For the fifth consecutive year, the Nevada flock fledged no cygnets; the reason for the lack of production from the Nevada flock is unknown (Jeff Mackay, personal communication). The number of cygnets fledged at Summer Lake WMA (3) was comparable to historic numbers.

In addition to counts from the official survey areas, the Blackfoot Challenge (a private, non-profit conservation-oriented organization), working cooperatively with the U.S. Fish and Wildlife Service and the Montana Department of Fish, Wildlife and Parks, released 10 trumpeter swans on a wetland west of Helena, Montana during June 2005. These swans were captive stock of tri-state origin, and were reared at facilities operated by the Wyoming Wetland Society. In mid-September, all 10 birds were alive and inhabiting wetlands near the release area, but by mid-October one bird was confirmed dead. The birds from this reintroduction effort are not included in the tables and figures in this report. In the future, if the reintroduction effort succeeds in establishing a nesting flock in the area, the birds will be included in the official counts.

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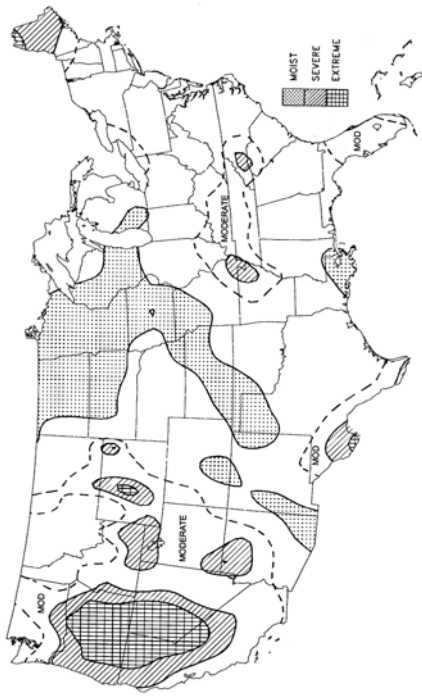
<sup>1</sup>A better method to assess annual productivity is to estimate the number of young produced per breeding pair, because a proportion of white birds each year are subadults or adults that did not nest. Traditionally, such information was provided in this report. However, those data are not collected as part of the Fall Trumpeter Swan Survey. In past reports, methods describing how the data are collected, areas covered, and effort expended have not been reported. Further, issues regarding proprietary rights to those data have been raised. For these reasons the data have not been included in this report.

Changes in point counts of animals can be influenced by several factors (i.e., mortality, animal movements, survey problems). As a result, attributing annual changes in abundance to a specific factor or even a suite of factors is inherently difficult. The Fall Trumpeter Swan Survey provides a good index to abundance, because managers and biologists have strived over the years to maintain consistency in areas surveyed and personnel who conduct the survey. Nonetheless, issues inherent in monitoring migratory birds can potentially affect the accuracy of a count. Also, no systematic surveys to detect swan mortality are conducted, nor are operational programs (e.g., banding, neck collaring) in place to estimate annual survival. Therefore, unless monitoring of these birds is increased, or well-designed research is conducted to examine their demographics, isolating causes for changes in annual counts will remain elusive.

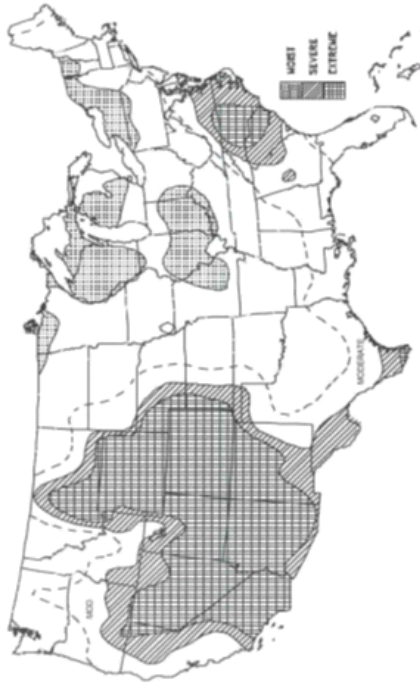
The number of swans in the entire RMP/U.S. Breeding Segment this fall increased 19% from that of last year, and the count for the Tri-state Area Flocks increased 18%. These counts were the highest since 1992, and much higher than the counts from the last 3 fall surveys, which experienced some of the worst drought conditions since the initiation of surveys in the 1930s (at least in some areas of the tri-state region). Palmer Drought Indices suggest that June 2005 moisture conditions in the tri-state area were the best since June 2001 (Fig.13, maps from the Joint Agricultural Weather Facility). The increase in swans observed this year occurred coincidentally with these improved wetland conditions, consistent with the hypothesis that birds did not die at a higher rate during the drought years, but rather may have moved out of the survey area during the drought. However, with current monitoring programs, we cannot definitively ascribe the increase in swans to these changes in habitat conditions. Nonetheless, we are encouraged that the counts improved this year, and are slightly higher than those from the few years immediately preceding the drought. Although the increase in birds this fall was substantial, it remains below objectives stated in the management plan for this group of birds (Pacific Flyway Study Committee 2002).



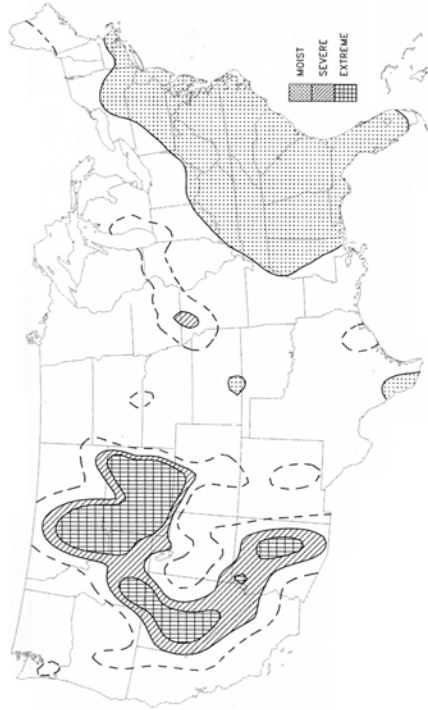
2001



2002



2003



2004

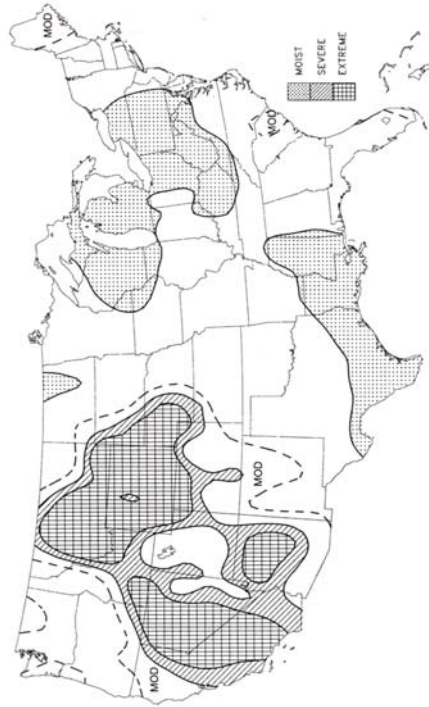


Fig. 13. Palmer Drought Index maps for the United States during late June, 2001-2004.

## 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. A. Araya, J. Cornely, T. McEneaney, C. Mitchell, S. Patla, J. Mackay, R. Roy, M. St. Louis, and J. Warren reviewed a previous draft of this document.

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Appendix A. Site-specific counts of trumpeter swans of the Rocky Mountain Population/U.S. Breeding Segment during the Fall Trumpeter Swan Survey, 2005.

<b>Montana</b>	White birds	Cygnets	Total	Pilot/observer/notes
<i>Red Rock Lakes NWR</i>				O: M. Parker; P: D. Chapman (9/27)
Upper Red Rock Lake	21	3	24	
Upper Lake Outlet to River Marsh	0	0	0	
Swan Lake	8	5	13	
Shambo Pond	0	0	0	
River Marsh	9	9	18	
Lower Red Rock Lake	6	4	10	
West Pintail Ditch	16	4	20	
Widgeon Pond	10	0	10	
Sparrow Slough	0	0	0	
Sparrow Pond	0	0	0	
Culver Pond	0	0	0	
MacDonald Pond	0	0	0	
ElkSprings Creek	0	0	0	
Tucks Slough	0	0	0	
Red Rock Creek	0	0	0	
Antelope Pond	0	0	0	
Sora Pond	0	0	0	
<b>Subtotal</b>	<b>70</b>	<b>25</b>	<b>95</b>	
<i>Centennial Valley (CV)</i>				
Red Rock River	21	7	28	
Lima Reservoir	0	0	0	
Blake Slough	0	0	0	
Twin Forks wetland	2	0	2	
Conklin Lake	2	1	3	
Elk Lake	0	0	0	
7L Wetland	0	0	0	
Mud Lake	0	0	0	
Stibal Pond	0	0	0	
Huntsman Pond	0	0	0	
Scheid Stock Pond	0	0	0	
Jones Pond	0	0	0	
Winslow Pond	0	0	0	
Winslow Creek	0	0	0	
Bean Creek Pond (tooth pond)	0	0	0	
<b>Subtotal</b>	<b>25</b>	<b>8</b>	<b>33</b>	
<i>Madison Valley</i>				
Ennis Lake	0	0	0	
Walsh Ponds	0	0	0	
Madison River	0	0	0	
Hidden Lake	0	0	0	

Appendix A. (cont.)

Otter & Goose Lake	0	0	0	
Cliff Lake	0	0	0	
Wade Lake	0	0	0	
Tributary to Odell Creek	0	0	0	
Quake Lake	0	0	0	
Hebgen Lake (Madison Arm)	0	0	0	
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<i>Paradise Valley</i>				O: T. McEneaney; P: R. Stradley (9/14)
Sacagawea Park	1	0	1	
DePuy's-South	4	0	4	
Beaver Creek	0	0	0	
DePuy's-Main Lake	2	3	5	
DePuy's-North	2	0	2	
Armstrong's	0	0	0	
Bailey's	3	4	7	
Brandis'	1	0	1	
Brandis' North Fish Ponds Slough	4	0	4	
Diamond B	0	0	0	
Dana's	0	0	0	
Emigrant Pond	0	0	0	
<b>Subtotal</b>	<b>17</b>	<b>7</b>	<b>24</b>	
<b>Idaho</b>				
<i>Island Park/Upper Henry's Fork</i>				O: C. Mitchell; P: G. Lust (9/16-17)
Henry's Lake	0	0	0	
Henry's Lake Flat	0	0	0	
Big Springs to Mack's Inn	0	0	0	
Henry's Fork	0	0	0	
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<i>Shotgun Valley</i>				
South Shore Island Park Reservoir	0	0	0	
Sheep Creek Reservoir	0	0	0	
Icehouse Reservoir	0	0	0	
Shotgun Reservoir	0	0	0	
North shoreline Island Park Reservoir	17	0	17	
Sheridan Reservoir	0	0	0	
Sheridan Creek (cabin with pond)	0	0	0	
<b>Subtotal</b>	<b>17</b>	<b>0</b>	<b>17</b>	



Appendix A. (cont.)

<i>Harriman State Park</i>				
Henry's Fork above Osbourne Bridge	5	0	5	
Henry's Fork below Osbourne Bridge	0	0	0	
Silver Lake	4	2	6	
Golden Lake	2	0	2	
Pond east-northeast of Golden Lake	3	0	3	
Thurman Creek	2	0	2	
Fish Pond	0	0	0	
<b>Subtotal</b>	<b>16</b>	<b>2</b>	<b>18</b>	
<i>Upper Henry's Fork Area</i>				
Buffalo River	0	0	0	
Henrys Fork-Box Canyon to Harriman State Park	0	0	0	Island Park Dam to Harriman State Park
Trude Siding-Pond/Elk Creek complex	1	0	1	
Tom's Creek	0	0	0	
Blue Spring	0	0	0	
Last Chance Pond-north	0	0	0	
Last Chance Pond-south	0	0	0	
Henry's Fork below Pine Haven	0	0	0	
Boy Scout (Boundary) Pond	0	0	0	Old Eccles #3
Boy Scout swimming lake	0	0	0	
Eccles Butte Northeast	0	0	0	Old Eccles East
Eccles wetland #1	0	0	0	Pond mostly dry
Eccles wetland #2	0	0	0	Dry
Eccles wetland #4	5	0	5	State section pond
Eccles wetland #5	0	0	0	
Swan Lake (west)	0	0	0	
Hatchery Butte Road ponds	0	0	0	
Lilypad Lake (Pineview)	0	0	0	
Hatchery Butte	0	0	0	Dry
North of Hatchery Butte	0	0	0	
Beaver Pond (Gerrit)	2	0	2	
Railroad Pond	0	0	0	
Pond northeast of Gerrit	2	0	2	
Mesa Marsh	2	0	2	
Northwest of Mesa Marsh	2	0	2	
Bear Lake and Cub Lake	2	0	2	
Twin Lakes	2	0	2	
Porcupine Lake	0	0	0	
Beaver Lake	0	0	0	Dry
Rock Creek and adjacent pond	0	0	0	
Lower Goose Lake	0	0	0	
Upper Goose Lake	2	0	2	
Long Meadows	0	0	0	
Swan Lake (east-Falls River)	0	0	0	
Steele Lake	0	0	0	

Appendix A. (cont.)

Putney Meadows	0	0	0	
Falls River Ridge complex-4 ponds	0	0	0	
Thompson's Hole	2	0	2	
Pond west of Thompson's Hole	0	0	0	
Chain Lakes	0	0	0	
Fall River Canyon	0	0	0	
Horseshoe Lake	0	0	0	
Tule Lake and adjacent ponds	0	0	0	
<b>Subtotal</b>	<b>22</b>	<b>0</b>	<b>22</b>	
<i>Teton Basin</i>				
McReynolds Reservoir	0	0	0	
Teton Basin	0	0	0	
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<i>Lower Henry's Fork</i>				
Upper Arcadia Reservoir	0	0	0	
Lower Arcadia Reservoir	0	0	0	
Marsh northwest of Upper Arcadia Reservoir	0	0	0	
Mikesell Reservoir 1	0	0	0	
Mikesell Reservoir 2	0	0	0	
Sand Creek Wildlife Management Area	4	1	5	
Wetlands west of Ashton	2	3	5	On Hossner's pond
Willow Creek ponds	0	0	0	
Chester Reservoir	0	0	0	
West of Chester Dam	0	0	0	
Singleton Ponds	3	0	3	
Lemon Lake	0	0	0	
Mackerts Pond	0	0	0	
Pond +/- 1 mile north of St. Anthony	0	0	0	
Deer Park Wildlife Management Area	0	0	0	
Cartier Slough Wildlife Management Area	0	0	0	
Davis Lake	2	0	2	
Egin Lakes	0	0	0	
Quayle's Lake	0	0	0	
Lower Henry's Fork to east of Market Lake	0	0	0	
Snake River	0	0	0	
<b>Subtotal</b>	<b>11</b>	<b>4</b>	<b>15</b>	
<i>Camas NWR</i>				Excellent water conditions
Toomey Pond	2	4	6	
2-Way Pond	0	0	0	
Rays Lake	0	0	0	
Center Pond	0	0	0	
Big Pond	2	4	6	
First pond north of Sandhole Lake	0	0	0	

Appendix A. (cont.)

Avocet Pond	0	0	0	
Redhead Pond	0	0	0	
Mud Lake Wildlife Management Area	2	0	2	
Market Lake Wildlife Management Area	2	4	6	
Pond southeast of Market Lake	6	0	6	
<b>Subtotal</b>	<b>14</b>	<b>12</b>	<b>26</b>	
<i>Grays Lake NWR</i>				
Shorty's Cabin	2	0	2	
Buck Lake (west of Bear Island)	0	0	0	
Big Springs Area	2	0	2	
Bishop Island	2	0	2	
B Riley Point (northwest of Bear Island)	0	0	0	
Outlet (main)	0	0	0	
Big Bend Marsh	4	3	7	
Brockman Creek	2	1	3	Off refuge
Outlet Creek (north of road)	0	0	0	
North Canal	0	0	0	
South Canal	0	0	0	
Lakefront ponds (west of Headquarters)	0	0	0	Mostly dry
Kackley/Gravel Creek	0	0	0	Dry
Beavertail	0	0	0	
Crane Reservoir (Little Valley)	4	0	4	Off refuge
Chubb Springs	0	0	0	Off refuge
<b>Subtotal</b>	<b>16</b>	<b>4</b>	<b>20</b>	
<i>Soda Springs Area</i>				
5-Mile Meadow	0	0	0	
Miller Pond	0	0	0	
Soda Creek - Miller > Cellan Reservoir	0	0	0	
Cellan Reservoir	0	0	0	
Soda Creek-spring creek west of Soda Springs	0	0	0	
Chester Basin	0	0	0	
Alexander Reservoir	0	0	0	
Alexander Siding	0	0	0	
Woodall Springs	0	0	0	
Blackfoot Reservoir	11	0	11	
Chicken Creek wetlands	0	0	0	
Wetlands southwest of Chesterfield Reservoir	0	0	0	
<b>Subtotal</b>	<b>11</b>	<b>0</b>	<b>11</b>	

Appendix A. (cont.)

<i>Bear Lake NWR</i>				
Rainbow Unit	13	0	13	
Rainbow Subunit	2	0	2	
Alder Unit	0	0	0	
Mud Lake Unit	4	0	4	
Salt Meadow Unit	0	0	0	
Dingle Unit	0	0	0	
West Canal Unit	0	0	0	
Bloomington Unit	2	0	2	
Private wetland-off refuge	1	0	1	
<b>Subtotal</b>	<b>22</b>	<b>0</b>	<b>22</b>	
<i>Fort Hall Bottoms</i>				
Head of Clear Creek	0	0	0	
American Falls Reservoir-northwest corner	0	0	0	
Kinney Creek	0	0	0	
Clear Creek above Sheepskin Road	0	0	0	
Clear Creek below Sheepskin Road	0	0	0	
Mouth of Portneuf River	0	0	0	
Slough west of Flying Y	0	0	0	
Sloughs along Broncho Road	2	0	2	
Diggie Creek	0	0	0	
Big Jimmy Creek	0	0	0	
Springfield Reservoir	0	0	0	
Sterling Wildlife Management Area	0	0	0	
<b>Subtotal</b>	<b>2</b>	<b>0</b>	<b>2</b>	
<i>Lower Snake River</i>				
American Falls Reservoir - Minidoka NWR	0	0	0	
C. J. Strike Reservoir	a			
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<i>Minidoka NWR</i>	<b>0</b>	<b>0</b>	<b>0</b>	
<i>Other Idaho</i>				
Pond near Bear River southwest of Grace	3	0	3	
Chesterfield Reservoir	2	0	2	
Wetland on Toponce Creek	0	0	0	
Wetlands east of Blackfoot	0	0	0	High water
<b>Subtotal</b>	<b>5</b>	<b>0</b>	<b>5</b>	

## Appendix A. (cont.)

<i>Central and Western Idaho</i>				
White Arrow Ponds (Bliss)				
Fairfield Gravel Pit				
Silver Creek (Picabo)				
Oxford Slough Waterfowl Production Area	0	0	0	
Swan Lake (Bannock County)	0	0	0	
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>Wyoming</b>				
<i>Yellowstone National Park</i>				O: T. McEneaney; P: R. Stradley (9/14)
Geode Lake	1	0	1	
Crescent Pond	0	0	0	
Slough Creek	0	0	0	
Tern Lake	0	0	0	
Yellowstone Lake west-northwest of Molly Island	0	0	0	
Yellowstone Lake south arm	0	0	0	
Beach Springs	0	0	0	
Heart Lake	0	0	0	
Yellowstone River, Alum-Grizzly Overlook	0	0	0	
Yellowstone River, north of Fishing Bridge	0	0	0	
Yellowstone River, Hayden Valley	0	0	0	
Boundary Creek	0	0	0	
Boundary Creek Pond	0	0	0	
Buela Meadow (Lake)	1	0	1	
Lillypad Lake	0	0	0	
Junco Lake	0	0	0	
Riddle Lake	1	1	2	
Falls River	0	0	0	
Upper Boundary Lake	0	0	0	
7-Mile Bridge	5	0	5	
Swan Lake	2	0	2	
Robinson Lake	2	0	2	
Little Robinson	0	0	0	
West Robinson Lake	0	0	0	
Bechler River	0	0	0	
Lower Madison River	0	0	0	
Nymph Lake	0	0	0	
Grizzly Lake	0	0	0	

Appendix A. (cont.)

Obsidian Lake	0	0	0	
Floating Island Lake	0	0	0	
LittleTrumpeter Lake	2	0	2	
North Kidney Lake	0	0	0	
Grebe Lake	1	0	1	
Yellowstone Delta	1	0	1	
South Arm - Grouse	0	0	0	
East end of Mary Bay	0	0	0	
Delusion Pond	0	0	0	
Northwest of Winegar Lake	2	0	2	
Fern Lake	0	0	0	
Tanager Lake	0	0	0	
<b>Subtotal</b>	<b>18</b>	<b>1</b>	<b>19</b>	
<i>Upper Snake River/Targhee National Forest</i>				O: S. Patla; P: G. Lust (9/15)
Ernest Lake	0	0	0	
Bergman Reservoir	0	0	0	Dry; marshes to east still retain water
Indian Lake	2	0	2	
Squirrel Meadows	2	0	2	
Widget Lake	0	0	0	
Junco Lake	0	0	0	
Moose Lake	0	0	0	
Loon Lake	0	0	0	
Rock Lake	0	0	0	Dry; no standing water
Fish Lake	0	0	0	
Grassy Lake Reservoir	0	0	0	
<b>Subtotal</b>	<b>4</b>	<b>0</b>	<b>4</b>	
<i>Bridger-Teton National Forest-Jackson</i>				
Arizona Lake	0	0	0	
Blackrock Ranger Station pond/sloughs	0	0	0	
Enos Lake	0	0	0	No pair this year
Bridger Lake	0	0	0	
Atlantic Creek	0	0	0	
Lily Lake	0	0	0	No pair this year
Pinto Pond	2	5	7	Only 1 adult seen on flight; both observed later with young
Half Moon Lake	2	0	2	Buffalo Valley; added 2005
Tracy Lake	0	0	0	
Burnt Fork Potholes	0	0	0	
Upper Slide Lake	2	2	4	

Appendix A. (cont.)

Goose Lake	0	0	0	
Grizzly Pond	0	0	0	
Lower Slide Lake	0	0	0	
Soda Lake	0	0	0	Fishermen on lake
<b>Subtotal</b>	<b>6</b>	<b>7</b>	<b>13</b>	
<i>Grand Teton National Park</i>				
Polecat Slough	0	0	0	
Flagg Ranch gravel pits	2	0	2	
Elk Ranch Reservoir	0	0	0	Pair gone; water drawn down last month
Hedrick Pond	0	0	0	
Swan Lake	2	0	2	Back slough
Christian Pond	0	0	0	
Glade Creek north	0	0	0	Pair gone from Meat Pond
Glade Creek south	1	2	3	Only 1 adult seen
Steamboat Mountain	0	0	0	Pair gone
Jackson Lake north	0	0	0	
Jackson Lake south	8	0	8	Appeared to be 4 pairs in group at edge of lake
Two Ocean Lake	2	0	2	
Emma Matilda Lake	0	0	0	
Dam to Moran, Snake River	0	0	0	
Moran to Moose, Snake River	0	0	0	
<b>Subtotal</b>	<b>15</b>	<b>2</b>	<b>17</b>	
<i>National Elk Refuge</i>				
Southwest Main Marsh	2	4	6	
Northwest Main Marsh (near overlook)	8	0	8	Adult and subadult birds (3 pairs + 2 yearlings)
Southeast Main Marsh	0	0	0	
Northeast Main Marsh	0	0	0	
Miller Springs	0	0	0	
Pierre Pond east	0	0	0	
Pierre Pond west	0	0	0	
Romney Pond #1	2	0	2	
Nowlin Ponds	0	0	0	
Flat Creek north	0	0	0	
<b>Subtotal</b>	<b>12</b>	<b>4</b>	<b>16</b>	
<i>Jackson Area</i>				
Tucker Pits	0	0	0	
Skyline Pond (Puzzleface Ranch)	0	0	0	
Boyles Hill area	3	0	3	1 with captive flock; pair on private pond
Highway 89 winter pen	1	0	1	In nearby Christian Center wetland
South Park Unit, Wyoming Game & Fish Dept.	1	0	1	Solitary yearling

Appendix A. (cont.)

Treatment Plant ponds	0	0	0	
<b>Subtotal</b>	<b>5</b>	<b>0</b>	<b>5</b>	
<i>Upper Green River (north of Warren Bridge)</i>				
Mosquito Lake	2	0	2	
Wagon Creek Lake	0	0	0	Fishermen on lake
Rock Crib Lake	0	0	0	
Mud Lake	0	0	0	
Roaring Fork Pond	0	0	0	
Dollar Lakes	0	0	0	
Upper Green River above Big Bend	4	0	4	2 separate pairs
Green River Big Bend to Black Butte	5	2	7	Pair with 2 young; separate group of 3
Green River Black Butte to Warren Bridge	0	0	0	
Spade Slough	0	0	0	
New Fork Potholes/Marsh Creek	0	0	0	
Kendal Wetland	0	0	0	
New Fork River (north of highway 191)	1	0	1	Private ranch pond Willow Creek
Kitchen Reservoir north	2	0	2	
Kitchen Ranch Reservoir main	2	2	4	
Soda Lake area	0	0	0	
Fayette Ranch ponds	2	0	2	
<b>Subtotal</b>	<b>18</b>	<b>4</b>	<b>22</b>	
<i>New Fork River &amp; Big Sandy to Farson area</i>				
New Fork River Pinedale to Boulder	3	0	3	1 on pond; pair on river slough
Boulder Sloughs	0	0	0	
Oliver Slough (Barden)	2	0	2	Did not nest this year
Swift Reservoir	0	0	0	
New Fork to confluence with Green	1	0	1	River slough
Big Sandy/Big Bend	0	0	0	Checked by FWS crane survey crew 9/13
Big Sandy/Eden reservoirs	0	0	0	Checked by FWS crane survey crew 9/13
Farson area	0	0	0	Checked by FWS crane survey crew 9/13
<b>Subtotal</b>	<b>6</b>	<b>0</b>	<b>6</b>	
<i>Seedskadee NWR (SNWR) and lower Green River</i>				
Main Marsh Hawley Unit, Pool 6, SNWR	2	3	5	
Main Marsh Hawley, Pool 1, SNWR	2	5	7	
Main Marsh Hawley, Pool 2, SNWR	2	0	2	
Main Marsh Hawley, Pool 3, SNWR	0	0	0	
Main Marsh Hawley, Pool 4, SNWR	2	7	9	
Main Marsh Hawley, Pool 7, SNWR	1	3	4	
North Marsh Hamp, SNWR	1	0	1	
Sagebrush Wetland, SNWR	2	0	2	
Dunkle Wetland, SNWR	0	0	0	



## Appendix A. (cont.)

Green River south of Highway 28, SNWR	4	0	4	2 separate pairs
Green River Highway 28 to dam, SNWR	0	0	0	
Fontenelle Reservoir	0	0	0	
Big Piney cutoff, Green River	0	0	0	
Dry Piney Creek area, Green River	0	0	0	
La Barge pond (private)	6	0	6	On river south of La Barge
Daniel, Cottonwood Creek area	0	0	0	
McNaughton Reservoir, Hamm's Fork	0	0	0	
Hamm's Fork north of Kemmerer	0	0	0	Checked by FWS crane survey crew 9/13
<b>Subtotal</b>	<b>22</b>	<b>18</b>	<b>40</b>	
<i>Salt River</i>				
Palisades Reservoir, Targhee NF	1	0	1	
Kibby wetland, Alpine	0	0	0	Subdivision development
Salt River, Alpine to Freedom	0	0	0	
Salt River, Freedom to Afton	0	0	0	
<b>Subtotal</b>	<b>1</b>	<b>0</b>	<b>1</b>	
<i>Other Wyoming</i>				
Swamp Lake, Sunlight Basin				No reports 2005
Colony Site, eastern Wyoming				No reports 2005
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>Nevada</b>				O: J. Mackay; P: R. Cassinelli (9/14)
Ruby Lake NWR	14	0	14	
Franklin Lake	3	0	3	
<b>Oregon</b>				
Malheur NWR	20	5	25	R. Roy (9/13)
Summer Lake Wildlife Management Area	3	0	3	O: M. St. Louis; P: D. Price (9/25)
Merwin Reservoir #3	1	0	1	O: C. Carey; P: A. Menlow (9/29); AO: G. Ivey
Sycan Marsh	2	3	5	O: C. Carey; P: A. Menlow (9/29); AO: G. Ivey
Deschutes River	6	0	6	O: C. Carey; P: A. Menlow (9/29); AO: G. Ivey

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

Appendix B. Personnel who conducted the 2005 Fall Trumpeter Swan Survey in the U.S.

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

Observer: M. Parker (Red Rock Lakes NWR)  
Pilot: D. Chapman (Montana Aircraft, Inc.)

Montana (Paradise Valley)

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

Idaho

Observer: C. Mitchell (Gray's Lake NWR)  
Pilot: G. Lust (Mountain Air Research)

Wyoming

Observer: S. Patla (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

Observers: J. Mackay and M. Collins (Ruby Lake NWR)  
Pilot: R. Cassinelli (El Aero Services)

Malheur NWR

R. Roy (Malheur NWR)

Summer Lake WMA and vicinity

Observers: M. St. Louis and C. Carey (Oregon Department of Fish and Wildlife)  
Pilot: D. Price and A. Menlow (Oregon State Police)  
Additional Observer: G. Ivey

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