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James A. Dubovsky

Migratory Birds and State Programs

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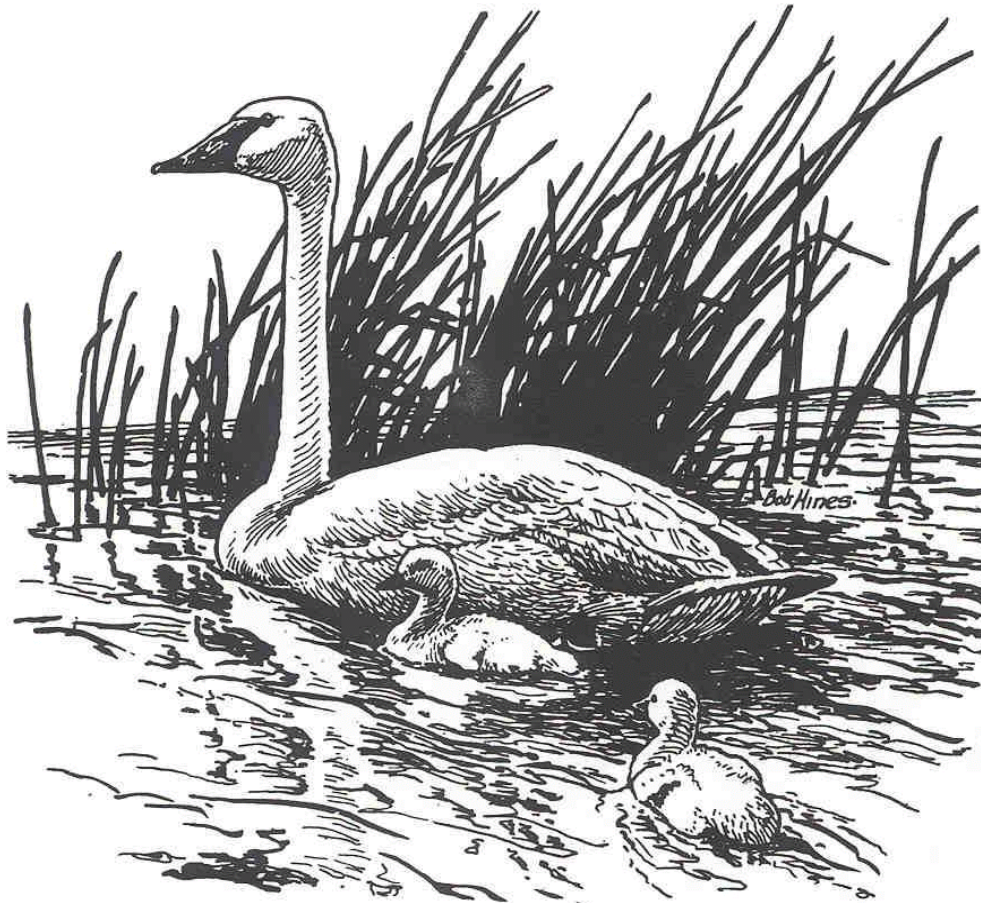
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U.S. Fish and Wildlife Service
Migratory Birds and State Programs
Mountain-Prairie Region
Lakewood, Colorado

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Abstract.— Observers counted 417 swans (white birds and cygnets) in the U.S. Breeding Segment of the Rocky Mountain Population of trumpeter swans during fall of 2003, an increase from 371 counted from comparable areas last year. The increase was attributable mostly to an increase in production (+60%) from that in 2002; the number of white birds (321) was slightly higher than that of last year (311). Increases occurred in all 3 states in which the Tri-state Area Flocks nest, and was greatest in Montana (+26%). Increases in Idaho and Wyoming were 9% and 23%, respectively. The number of birds in restoration flocks (Malheur and Ruby Lake National Wildlife Refuges only) decreased 31% compared to the count from last year, and the count for Malheur was the lowest since 1967. For the third consecutive year, swans at Ruby Lake produced no young. The tri-state area continues to experience severe drought conditions, with Palmer Drought Index values during early fall of 2003 the lowest recorded since swan surveys were initiated in the 1930s.

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.

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



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

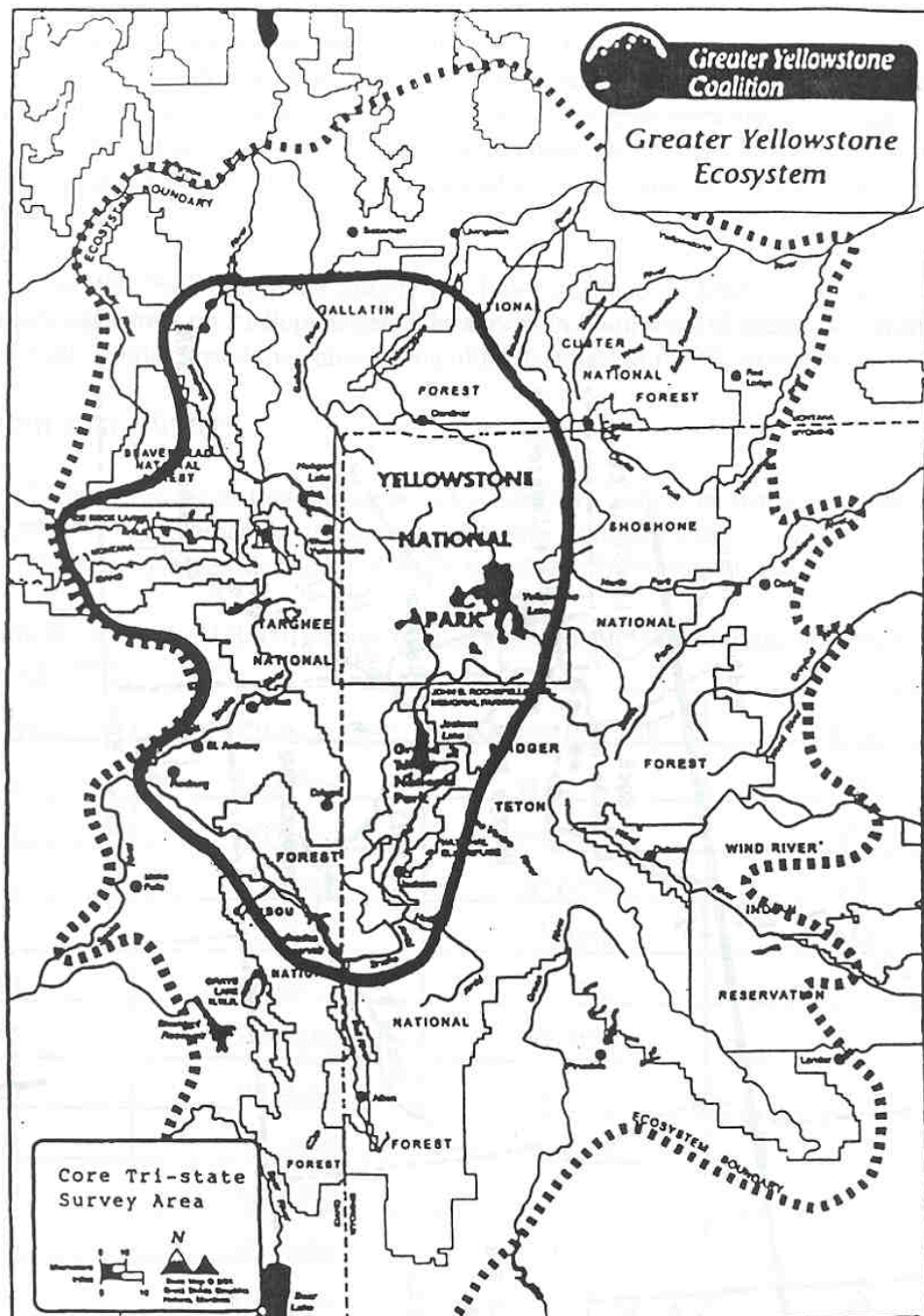


Fig. 2. Map showing the 'core' tri-state area of southeast Idaho, southwest Montana, and northwest Wyoming (provided by the Greater Yellowstone Coalition, Bozeman, Montana).

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 2003, the survey was conducted during 14-22 September. Approximately 32 h of flight time and 5 h of ground survey time were required to complete the survey. Weather conditions during this time generally consisted of clear skies and light winds, although some biologists noted overcast skies and turbulence during the latter portions of their surveys. Many areas near the Summer Lake WMA where most swans of the Oregon flock are counted were not surveyed for the second consecutive year. Oregon will attempt to conduct these surveys in the future, but funding constraints and their ability to contract with suitable charter aircraft may preclude them from doing so in some years (B. Bales and M. St. Louis, Oregon Dept. of Fish and Wildlife, personal communication).

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 (2003) 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 2003a, Wilkins and Otto 2003).

RESULTS AND DISCUSSION

Habitats continued to be extremely dry during summer and early fall. Similar to last year, during mid-June much of the summering range of RMP swans in the U.S. was in severe to extreme drought (Fig. 3). Last year, Palmer Drought Indices for southwest Montana (near the north-central portion of the core tri-state area) reached their lowest levels in almost 70 years, and indices were about the same during the summer of 2003. The drought intensified further as summer progressed, and the drought index reached new lows during July and August (Fig. 4). Survey biologists again reported that many wetland areas were dry in September (Appendix A).

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 2003b), 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),

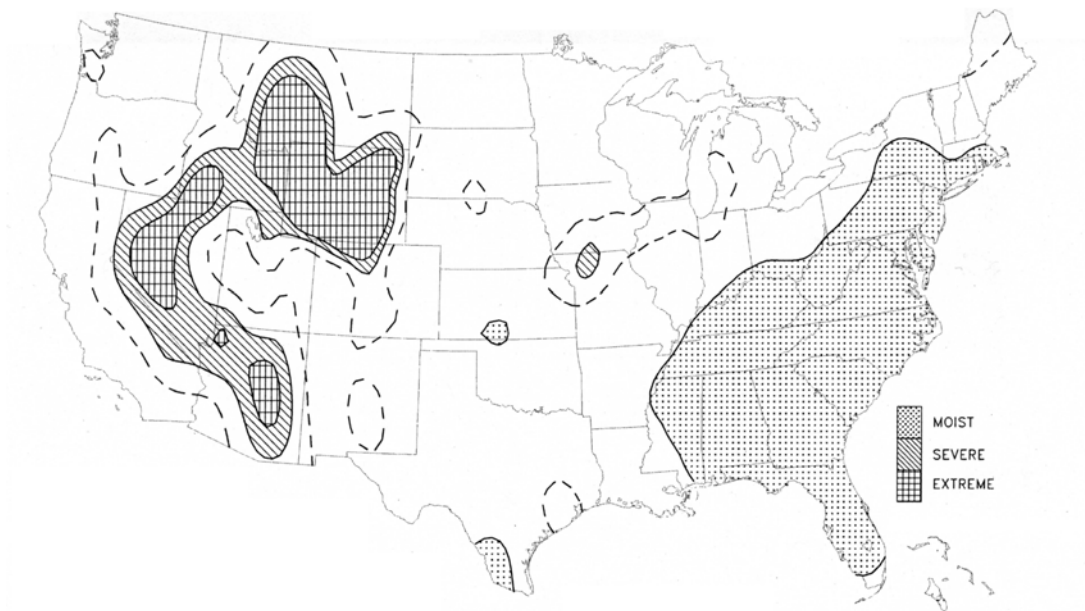


Fig. 3. Palmer Drought Index map for June 21, 2003 (Joint Agricultural Weather Facility 2003a).

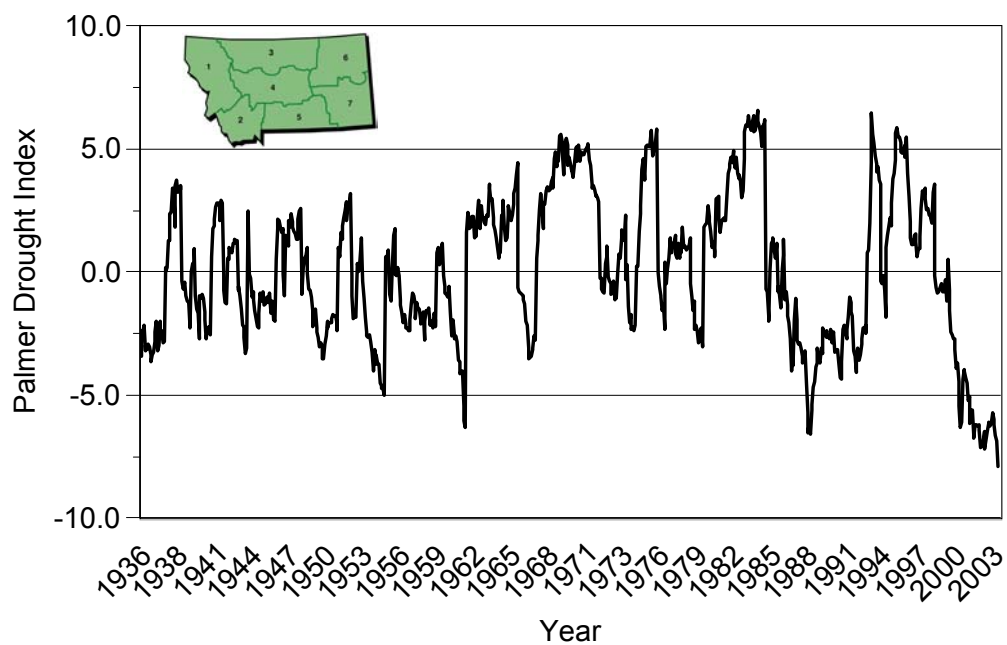


Fig. 4. Monthly Palmer Drought Indices for climate division 2 in southwest Montana (data from the National Climatic Data Center [<http://www.ncdc.noaa.gov/oa/climate/onlineprod/drought/main.html>]).

Table 1. Counts of trumpeter swans of the Rocky Mountain Population U.S. Breeding Segment during fall, 1967-2003.

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

^a Blank denotes value not calculated because of incomplete survey.

^b Data for only Malheur NWR and the Nevada flock included; Summer Lake WMA survey not completed.

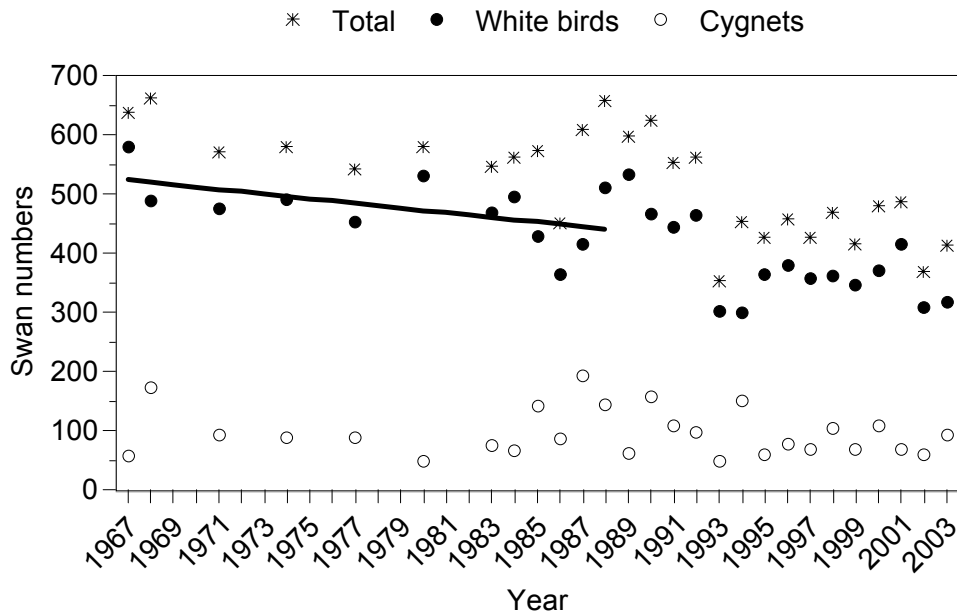


Fig. 5. Counts of swans in the RMP/U.S. Breeding Segment during the Fall Trumpeter Swan Survey, 1967-2003 (line depicts trend for white birds). The counts for 2002 and 2003 are from incomplete surveys, and are not directly comparable to prior years.

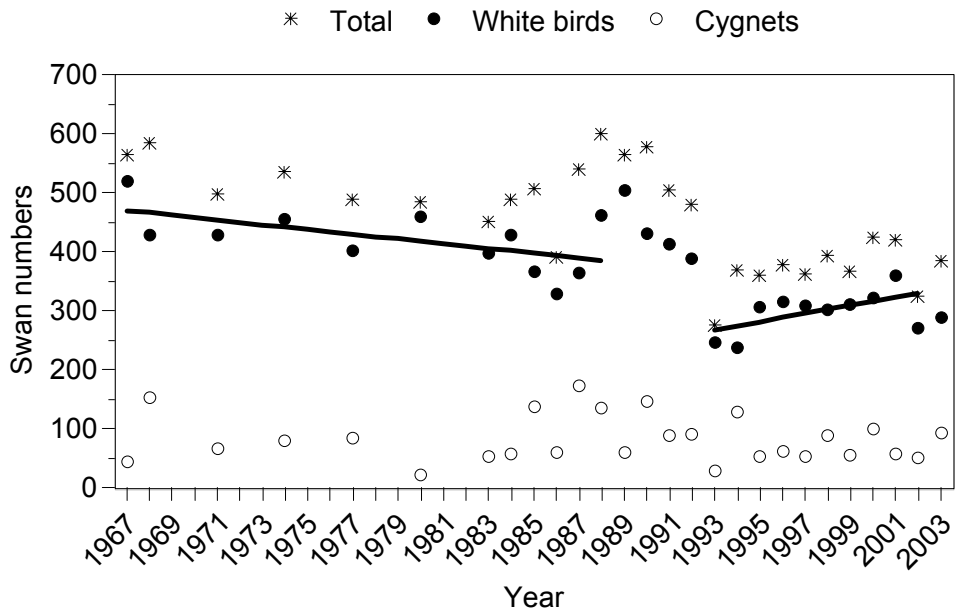


Fig. 6. Counts of swans in the Tri-state Area Flocks during the Fall Trumpeter Swan Survey, 1967-2003 (lines depict trends for white birds).

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, so no data for that area prior to that time are 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).

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 2003b]), and may collectively have influenced the demographics of these birds. The number of swans in the RMP/U.S. Breeding Segment declined markedly (-46%) between the falls of 1988 and 1993, and the 1993 count was 39% below the 1967-88 average (Fig. 5). No marked changes in abundance were apparent for restoration flocks (Figs. 10, 11).

Recent Trends

During 1993-2002, no trend in the growth rate for any portion of the RMP/U.S. Breeding Segment was evident (total count: $P = 0.53$; white birds: $P = 0.25$; cygnets: $P = 0.88$) (Fig. 5). This result is different from that provided last year, where the data suggested a positive growth rate during 1993-2001 (U.S. Fish and Wildlife Service 2003b). Influence diagnostics (Rawlings 1988) indicated that the count for 2002 was very influential in determining the slopes of the regressions for both total counts and white birds this year. No trend was evident for the growth rate of total swans in the Tri-state Area Flocks ($P = 0.17$). Although the count of white birds in 2002 was the lowest since 1998, the regression suggested an increase (+2.4% per year) during 1993-2002 ($P [\beta > 0] = 0.16$).

The rate of growth for total swans in Montana was unchanged during the 1993-2002 period ($P = 0.15$, Fig. 7). Similar to results for the RMP/U.S. Breeding Segment, the count of total swans for

Table 2. Counts of trumpeter swans of the Rocky Mountain Population U.S. Breeding Segment in individual states during fall, 1967-2003.

Year	Montana			Idaho			Wyoming			Oregon			Nevada		
	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	27	1	28
1968	242	123	365	88	6	94	101	25	126	34	11	45	24	9	33
1969	a									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	24	14	38	8	4	12
1992	156	74	230	109	8	117	125	10	135	62	6	68	13	0	13
1993	60	16	76	94	6	100	94	7	101	47	17	64	8	5	13
1994	70	48	118	79	49	128	90	33	123	48	13	61	15	9	24
1995	84	17	101	118	21	139	105	17	122	45	6	51	13	1	14
1996	95	36	131	127	20	147	94	7	101	49	10	59	15	5	20
1997	88	18	106	112	19	131	110	17	127	31	9	40	17	6	23
1998	105	35	140	110	37	147	89	18	107	39	8	47	21	7	28
1999	120	21	141	103	23	126	89	12	101	19	9	28	16	5	21
2000	127	24	151	102	40	142	95	38	133	22	5	27	26	2	28
2001	140	9	149	124	23	147	98	27	125	23	12	35	31	0	31
2002	76	18	94	103	14	117	94	21	115	14b	7b	21b	24	0	24
2003	89	29	118	100	27	127	102	39	141	11b	1b	12b	19	0	19

^a Blank denotes survey was not conducted.

^b Counts for Malheur NWR only; Summer Lake WMA survey not completed.

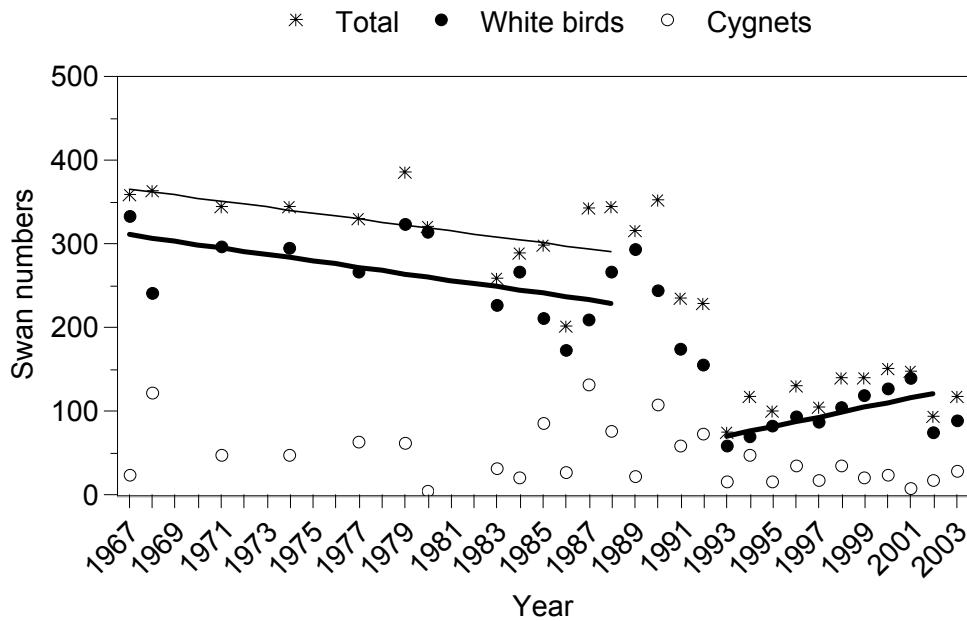


Fig. 7. Numbers of swans counted in Montana during the Fall Trumpeter Swan Survey, 1967-2003 (thin and thick lines depict trends for total swans and white birds, respectively).

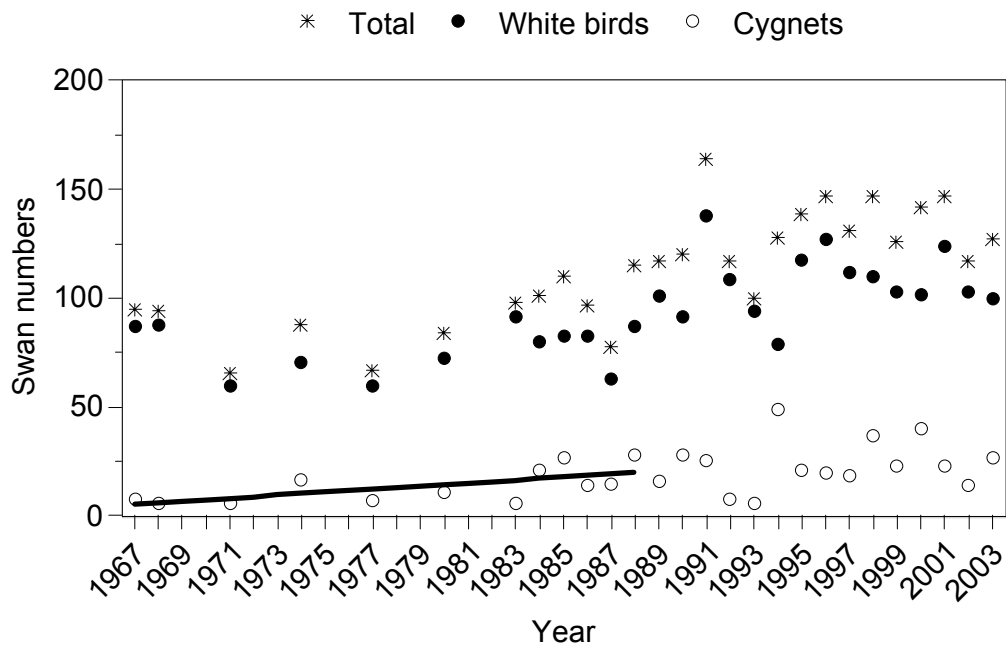


Fig. 8. Numbers of swans counted in Idaho during the Fall Trumpeter Swan Survey, 1967-2003 (line depicts trend for cygnets).

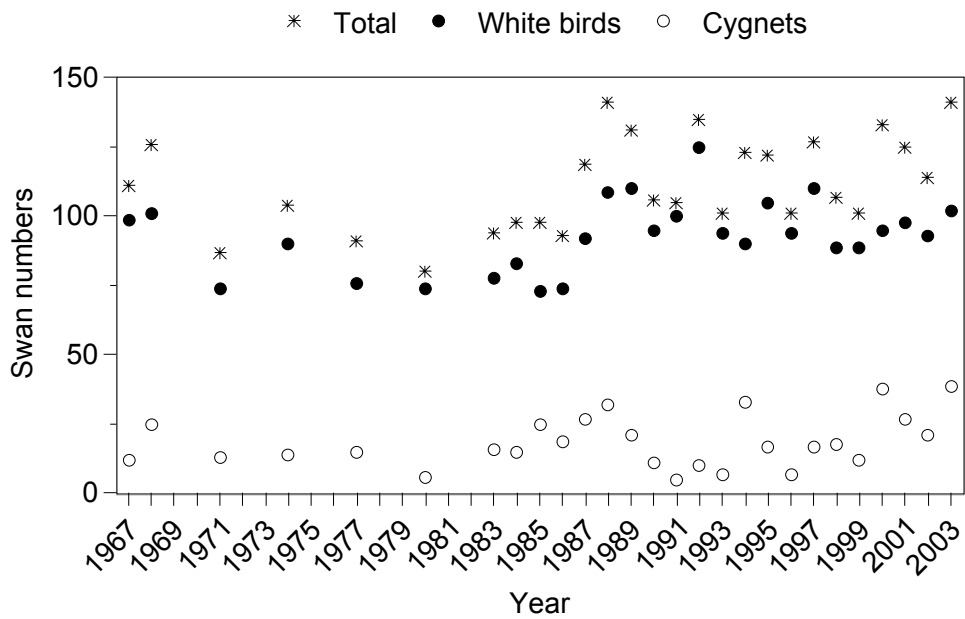


Fig. 9. Numbers of swans counted in Wyoming during the Fall Trumpeter Swan Survey, 1967-2003.

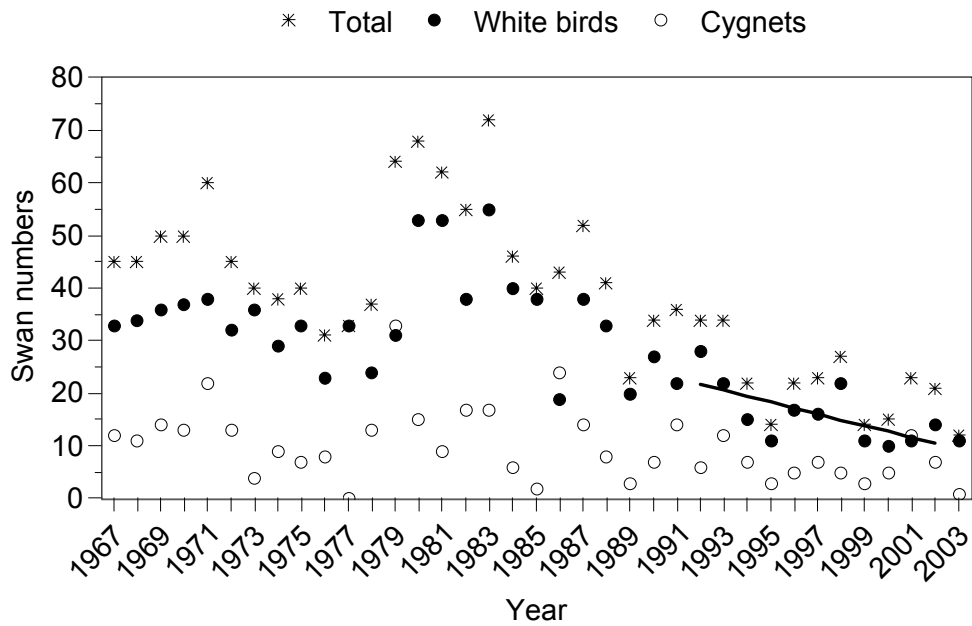


Fig. 10. Numbers of swans counted at Malheur NWR during the Fall Trumpeter Swan Survey, 1967-2003 (line depicts trend for white birds).

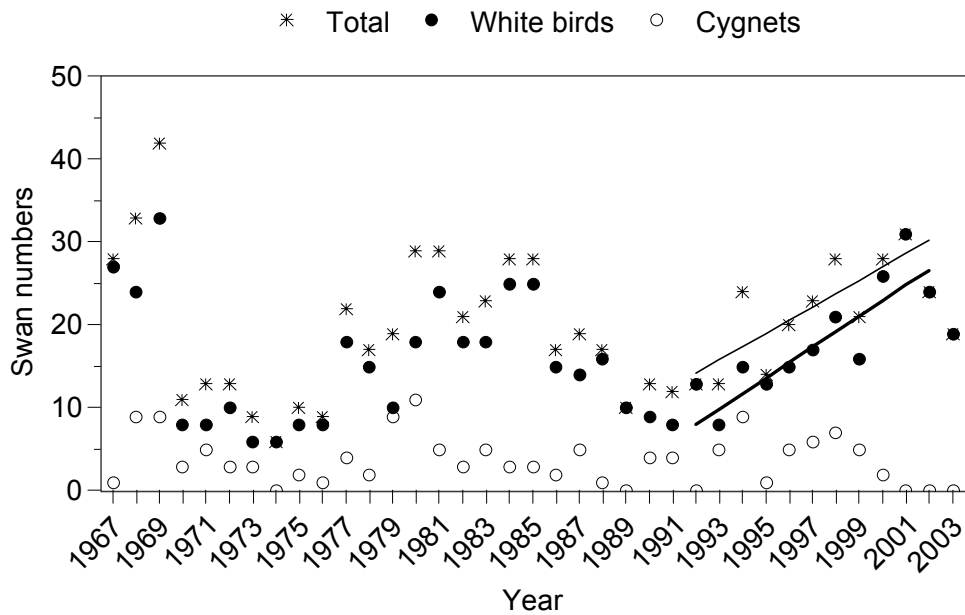


Fig. 11. Numbers of swans counted in the Nevada flock during the Fall Trumpeter Swan Survey, 1967-2003 (thin and thick lines depict trends for total swans and white birds, respectively).

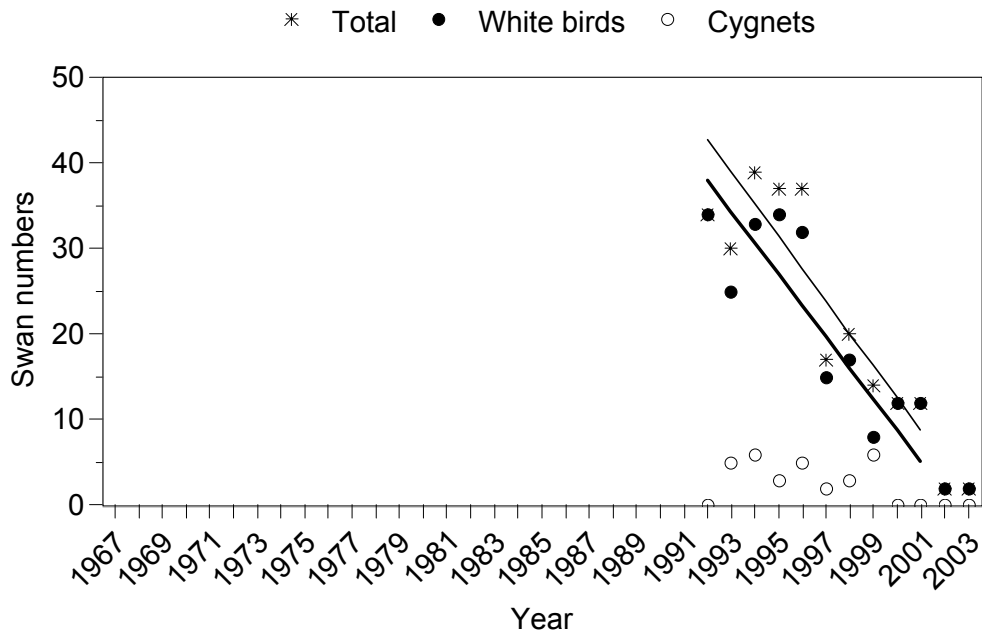


Fig. 12. Numbers of swans counted at Summer Lake WMA during the Fall Trumpeter Swan Survey, 1992-2003 (thin and thick lines depict trends for total swans and white birds, respectively).

2002 was very influential in determining the slope of the regression. Although the count of white birds in 2002 was the lowest since 1994, their average rate of growth increased (+6.0% per year, $P = 0.04$) over the entire period; the data for cygnets suggested no trend ($P = 0.29$). In Idaho, although slopes for all regressions (i.e., total birds, white birds, cygnets) were positive, none were statistically significant ($P \geq 0.34$) (Fig. 8). Similarly, data suggested no trends ($P \geq 0.19$) in any component of the swans counted in Wyoming (Fig. 9).

Because the Summer Lake WMA was not surveyed last year (2002), 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 1992-2002, although the regression coefficient for total swans (-4.4% per year) was not statistically significant ($P[\beta < 0] = 0.28$) (Fig. 10). The rate for white birds decreased (-6.5% per year, $P = 0.07$), whereas that for cygnets was unchanged ($P = 0.96$). 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, $\bar{x} = 3.0$). The steep decrease in the number of swans at Summer Lake WMA suggests 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.

During 1992-2002, the growth rate for total birds (+8.2% per year) and white birds (+12.1% per year) increased at Ruby Lake NWR ($P \leq 0.05$), whereas the rate for cygnets did not change ($P = 0.75$) (Fig. 11). The increase brought the number of birds in 2001 to the highest level since 1969, although the count declined in 2002.

Results from the 2003 survey

Because areas near the Summer Lake WMA were not surveyed this year, partial counts for that area were excluded from the 2002 and 2003 summaries. During fall 2003, observers counted 417 trumpeter swans for the RMP/U.S. Breeding Segment, an increase of 12% from the count (371) for comparable areas last year (Table 1, Fig. 5). The increase was attributable mostly to an increase in production (+60%) from that in 2002; the number of white birds (321) was slightly higher than that of last year (311).

Increased numbers of swans occurred in all states of the Tri-state Area Flocks. The largest increases in total swans from 2002 counts occurred in Montana (+26%), followed by Wyoming (+23%) and Idaho (+9%). The number of white birds increased somewhat in both Montana (+17%) and Wyoming (+9%), but essentially was unchanged in Idaho (-3%). However, some birds at Bear Lake NWR in Idaho may have been missed during the aerial survey (C. Mitchell and R. Bundy, personal communication). The aerial survey found only 4 birds at the refuge, but staff at the refuge reported seeing 18-19 swans on or near the refuge around the time at which the survey was conducted. Thus,

an additional 14-15 birds may have been in Idaho. Biologists indicated that birds using the refuge were moving around the area, and may not have been on the refuge at the exact time the survey crew flew over the refuge. Primarily because these additional swans were not observed during the official survey, we did not include the additional birds in the official count. However, we also cannot be certain that the birds weren't counted elsewhere in the survey. If they were, including them would bias the count upward.

Counts for restoration flocks declined again this fall. The number of swans counted at Malheur NWR dropped to just 12 birds, the lowest count recorded during the 1967-2003 period. Although no surveys have been conducted the last 2 years at Summer Lake WMA, habitat conditions have been very poor recently and the drought has negatively impacted wetland availability (M. St. Louis, personal communication). The Ruby Lake area is experiencing a fourth consecutive year of drought. The number of swans in the Nevada flock decreased 21% from that of last year, and was the lowest count since 1995.

Production of cygnets in the tri-state region increased dramatically compared to last year. Overall, the number of cygnets counted during fall 2003 was 79% higher than the count from last year. An index¹ to production rate (i.e., cygnets/white birds) for Montana (0.326), Wyoming (0.382), and Idaho (0.270) were higher than their long-term (i.e., 1967-2002) averages (0.265, 0.194, and 0.205, respectively). At Seedskadee NWR in southwestern Wyoming, no cygnets were produced last year while wetlands impoundments were dewatered and repaired. This year, following reflooding of those wetlands, 4 pairs produced 16 cygnets, greatly exceeding the past Refuge peak production (5). Only 1 cygnet was counted at Malheur NWR this year. For the third consecutive year, the Nevada flock fledged no cygnets. Although much of the area around Ruby Lake NWR was dry, swans historically produced young under such conditions (J. Mackay, personal communication); the reason for the lack of production from the Nevada flock is unknown.

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 (note the Bear Lake NWR issue, above). 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.

¹A 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.

The number of swans in the entire RMP/U.S. Breeding Segment increased slightly this year, whereas the Tri-state Area Flocks increased by almost 20%. Most of that increase was attributable to production of cygnets, but the number of white birds also increased over the count from last year. Weather in the tri-state area during winter 2002-03 was relatively mild (Joint Agricultural Weather Facility 2003b), and biologists believe mild weather may enhance winter survival of swans in this region; field reports suggest mortality was within the range expected (Southeast Idaho National Wildlife Refuge Complex, unpublished memo). Swans had greater access to agricultural fields than in most years due to a lack of snow, and extensive field feeding occurred (C. Whitman, personal communication). Although the number of white birds in the 2003 count is above the average of recent (i.e., 1993-2002) counts, it remains below higher counts of a few years ago and below objectives stated in the management plan for this group of birds (Pacific Flyway Study Committee 2002). Nonetheless, we are encouraged that the sharp drop in the count from last year did not repeat this fall, despite worsening drought conditions in the core area of the Tri-state Area Flocks. The effect of the drought and its impact on these swans is unknown, but potentially can impact movements, recruitment, and survival. Survey results for the next few years will be necessary to assess whether the lower counts during the last two years are an indication of changing demographics.

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. S. Comeau, J. Cornely, T. McEneaney, C. Mitchell, S. Patla, J. Mackay, and R. Roy 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, 2003.

Montana	White birds	Cygnets	Total	Pilot/observer/notes
<i>Red Rock Lakes NWR</i>				O: S. Comeau, G. Dehmer; P: B. Twist (9/14)
Upper Red Rock Lake	33	0	33	one green collar
Upper Lake Outlet to River Marsh	3	0	3	
Swan Lake	0	0	0	
Shambo Pond	2	0	2	
Lower Red Rock Lake	6	3	9	
West Pintail Ditch	0	0	0	
Widgeon Pond	2	5	7	
Sparrow Slough	0	0	0	dry
Sparrow Pond	0	0	0	almost dry
Culver Pond	2	0	2	
MacDonald Pond	0	0	0	
ElkSprings Creek	0	0	0	
Tucks Slough	0	0	0	0.10 acre of water
Red Rock Creek	6	4	10	includes river marsh
Antelope Pond	2	0	2	
Sora Pond	0	0	0	
Subtotal	56	12	68	
<i>Centennial Valley (CV)</i>				
Red Rock River	14	8	22	
Lima Reservoir	0	0	0	main channel
Blake Slough	0	0	0	
Twin Forks wetland	0	0	0	
Conklin Lake	2	0	2	
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	
Subtotal	16	8	24	
<i>Madison Valley</i>				
Ennis Lake	0	0	0	
Walsh Ponds	0	0	0	
Madison River	0	0	0	
Hidden Lake	0	0	0	
Otter & Goose Lake	0	0	0	
Cliff Lake	1	0	1	
Wade Lake	0	0	0	
Tributary to Odell Creek	0	0	0	

Appendix A. (cont.)

Quake Lake	3	0	3	
Hebgen Lake	0	0	0	
Subtotal	4	0	4	
<i>Paradise Valley</i>				O: T. McEneaney; P: R. Stradley (9/15)
Call of the Wild Ranch	0	0	0	
Lower DePuy's	2	3	5	
DePuy's	1	0	1	
Upper DePuy's	2	0	2	
Baileys	2	5	7	
Brandis'	2	0	2	
Brandis' Slough	4	1	5	
Diamond B	0	0	0	
Dana's	0	0	0	
Emigrant Pond	0	0	0	
Subtotal	13	9	22	
Idaho				
<i>Island Park/Upper Henry's Fork</i>				O: C. Mitchell; P: C. Anderson (9/18-19)
Henry's Lake	2	1	3	
Henry's Lake Flat	0	0	0	
North Fork area/Mack's Inn	0	0	0	Big Springs to Mack's Inn
Henry's Fork	0	0	0	Henry's Fork - Mack's Inn to Island Park Reservoir
Subtotal	2	1	3	
<i>Shotgun Valley</i>				
South Shore Island Park Reservoir	0	0	0	very low water
Sheep Creek Reservoir	0	0	0	
Icehouse Reservoir	9	0	9	
Pond south of Icehouse Reservoir	2	0	2	
Shotgun Reservoir	3	0	3	
North shoreline Island Park Reservoir	0	0	0	
Sheridan Reservoir	3	0	3	
Sheridan Creek (cabin with pond)	0	0	0	
Subtotal	17	0	17	
<i>Harriman State Park</i>				
Henry's Fork above Osbourne Bridge	9	0	9	
Henry's Fork below Osbourne Bridge	2	0	2	
Silver Lake	3	5	8	
Golden Lake	0	0	0	
Pond east-northeast of Golden Lake	0	0	0	
Thurman Creek	0	0	0	
Fish Pond	0	0	0	
Subtotal	14	5	19	

Appendix A. (cont.)

<i>Upper Henry's Fork Area</i>				
Buffalo River	0	0	0	
H. Fork-Box Canyon to Harriman State Park	0	0	0	Island Park dam to Harriman State Park
Trude Siding-Pond/Elk Creek complex	4	0	4	
Pond on Split Creek	a			not counted; not good habitat
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	
Unnamed wetland #3	0	0	0	
Eccles East	0	0	0	cattle pond - can delete
Unnamed wetland #2	0	0	0	dry
Unnamed wetland #4	0	0	0	dry
Unnamed wetland #5	0	0	0	old unnamed wetland #2
Unnamed wetland #1	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	
North of Hatchery Butte	0	0	0	
Beaver Pond (Gerrit)	0	0	0	
Railroad Pond	0	0	0	
Pond northeast of Gerrit	2	0	2	
Mesa Marsh	2	3	5	
Northwest of Mesa Marsh	0	0	0	
Bear Lake	0	0	0	Bear and Cub Lakes, Cub Lake dry
Twin Lakes	0	0	0	
Porcupine Lake	0	0	0	
Beaver Lake	0	0	0	
Rock Creek	0	0	0	
Lower Goose Lake	0	0	0	very low water
Upper Goose Lake	0	0	0	dry
Long Meadows	0	0	0	
Swan Lake (east-Falls River)	0	0	0	
Steele Lake	5	0	5	
Putney Meadows	0	0	0	
Falls River Ridge 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	0	0	0	
McReynolds Reservoir	0	0	0	
Subtotal	15	3	18	

Appendix A. (cont.)

<i>Lower Henry's Fork</i>				
Upper Arcadia Reservoir	5	0	5	
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	3	7	
Wetlands west of Ashton	0	0	0	
Willow Creek ponds	0	0	0	
Chester Reservoir	0	0	0	
West of Chester Dam	0	0	0	
Singleton Ponds	0	0	0	
Lemon Lake	0	0	0	
Mackerts Pond	0	0	0	good habitat conditions
Pond +/- 1 mile north of St. Anthony	5	0	5	good habitat conditions
Ponds west of Menan Buttes	0	0	0	excellent habitat conditions
Lower Henry's Fork to east of Market Lake	0	0	0	
Subtotal	14	3	17	
<i>Camas NWR</i>				
Toomey Pond	0	0	0	dry
2-Way Pond	2	5	7	
Rays Lake	0	0	0	
Center Pond	0	0	0	
Big Pond	2	2	4	
First pond north of Sandhole Lake	0	0	0	
Mud Lake Wildlife Management Area	2	0	2	on canal between Mud Lake and Camas NWR
Market Lake Wildlife Management Area	0	0	0	
Teton Basin	0	0	0	
Subtotal	6	7	13	
<i>Grays Lake NWR</i>				
Shorty's Cabin	0	0	0	dry
Buck Lake (west of Bear Island)	0	0	0	dry
Big Springs Area	0	0	0	dry
Bishop Island	3	0	3	very low water
B Riley Point (northwest of Bear Island)	0	0	0	dry
Outlet (main)	3	0	3	
Big Bend Marsh	4	2	6	
Brockman Creek	4	1	5	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	
Kackley/Gravel Creek	0	0	0	
Beavertail	2	1	3	
Crane Reservoir (Little Valley)	2	0	2	
Chubb Springs	0	0	0	
Subtotal	18	4	22	

Appendix A. (cont.)

<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	2	0	2	
Soda Creek-spring creek west of Soda Springs	2	0	2	
Chester Basin	1	0	1	
Alexander Reservoir	0	0	0	
Alexander Siding	0	0	0	
Woodall Ponds	0	0	0	
Subtotal	5	0	5	
<i>Bear Lake NWR</i>				*14-15 birds possibly missed during survey not included in total (see pp. 14-15)
Rainbow Unit	0	0	0	
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	0	0	0	
Subtotal	4	0	4	
<i>Fort Hall Bottoms</i>				
Head of Clear Creek	0	0	0	Clear Creek above Sheepskin Road
American Falls Reservoir-northwest corner	0	0	0	
Kinney Creek	0	0	0	
Clear Creek - middle	0	0	0	Clear Creek below Sheepskin Road
Mouth of Portneuf River	0	0	0	
Flying Y	2	4	6	
Diggie Creek & sloughs on Broncho Road	0	0	0	
Springfield Reservoir	0	0	0	
Sterling Wildlife Management Area	0	0	0	many wetlands dry
Subtotal	2	4	6	
<i>Other Idaho</i>				
Chesterfield	0	0	0	
Chicken Creek wetland	0	0	0	
Wetlands east of Blackfoot	0	0	0	
Blackfoot Reservoir	3	0	3	very low water
Subtotal	3	0	3	
<i>Lower Snake River</i>				
American Falls Reservoir - Minnedoka NWR	0	0	0	

Appendix A. (cont.)

C. J. Strike Reservoir	0	0	0	
Subtotal	0	0	0	
<i>Minnedoka NWR</i>	0	0	0	
<i>Central & Western Idaho</i>				
White Arrow Ponds (Bliss)				
Fairfield Gravel Pit				
Silver Creek (Picabo)				
Oxford Slough Waterfowl Production Area	0	0	0	dry
Swan Lake (Bannock County)	0	0	0	dry
Subtotal	0	0	0	
Wyoming				
<i>Yellowstone National Park</i>				O: T. McEneaney; P: R. Stradley (9/15)
Geode Lake	1	0	1	
Crescent Pond	0	0	0	
Slough Creek	4	0	4	
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	1	0	1	
Yellowstone River, Alum-Grizzly Overlook	0	0	0	
Yellowstone River, north of Fishing Bridge	0	0	0	
Boundary Creek	0	0	0	
Boundary Creek Pond	0	0	0	
Buela Meadow (Lake)	0	0	0	
Lillypad Lake	0	0	0	
Junco Lake	0	0	0	
Riddle Lake	2	4	6	
Falls River	2	0	2	
Upper Boundary Lake	2	0	2	
7-Mile Bridge	1	0	1	
Robinson Lake	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	2	0	2	
Obsidian Lake	0	0	0	
Trumpeter Lake	0	0	0	

Appendix A. (cont.)

North Kidney Lake	0	0	0	
Grebe Lake	0	0	0	
Yellowstone Delta	1	0	1	
South Arm - Grouse	0	0	0	
East end of Mary Bay	0	0	0	
Delusion Pond	0	0	0	
Winegar Lake	0	0	0	
Fern Lake	0	0	0	
Tanager Lake	0	0	0	
Subtotal	16	4	20	
<i>Upper Snake River/Targhee National Forest</i>				O: C. Mitchell; P: C. Anderson (9/19)
Ernest Lake	0	0	0	
Bergman Reservoir	0	0	0	
Indian Lake	2	3	5	lake low
Squirrel Meadows	0	0	0	
Widget Lake	2	0	2	pond northwest of lake
Junco Lake	0	0	0	
Moose Lake	0	0	0	
Loon Lake	3	0	3	
Rock Lake	0	0	0	
Fish Lake	0	0	0	
Grassy Lake Reservoir	0	0	0	
Subtotal	7	3	10	
<i>Bridger-Teton National Forest-Jackson</i>				O: S. Patla; P: D. France (9/15)
Arizona Lake				
Blackrock Ranger Station pond/sloughs	0	0	0	
Enos Lake	2	4	6	west side of lake; water low
Bridger Lake	0	0	0	
Atlantic Creek	0	0	0	
Lily Lake	2	1	3	water low
Pinto Pond	2	0	2	
Tracy Lake	0	0	0	
Burnt Fork Potholes	0	0	0	
Upper Slide Lake	2	0	2	west end of lake
Goose Lake	0	0	0	dry
Grizzly Pond				dry
Lower Slide Lake	2	0	2	mud flats east end
Subtotal	10	5	15	

Appendix A. (cont.)

<i>Grand Teton National Park</i>				
Polecat Slough				
Flagg Ranch gravel pits	2	0	2	new site, restored wetlands
Elk Ranch Reservoir	2	0	2	
Hedrick Pond	0	0	0	
Swan Lake	2	0	2	slough south of lake
Christian Pond	0	0	0	
Glade Creek south	2	0	2	pair just north of Tusker Island
Steamboat Mountain	2	0	2	pair in beaver complex
Jackson Lake north	0	0	0	
Jackson Lake south	7	0	7	south of dam, mud flats
Two Ocean Lake	0	0	0	young hatched but lost, 2003
Emma Matilda Lake	2	0	2	added site, 2003
Dam to Moran, Snake River	0	0	0	added site, 2003
Moran to Moose, Snake River	0	0	0	added site, 2003
Subtotal	19	0	19	
<i>National Elk Refuge</i>				
Southwest Main Marsh	2	3	5	
Northwest Main Marsh (near overlook)	2	1	3	
Southeast Main Marsh	2	0	2	pair lost one young
Northeast Main Marsh	2	0	2	
Miller Springs	0	0	0	
Pierre Pond east	2	3	5	nest site on Pierre west
Pierre Pond west	0	0	0	
Romney Pond #2	1	0	1	
Nowlin Ponds	0	0	0	
Flat Creek north	0	0	0	
Subtotal	11	7	18	
<i>Jackson Area</i>				
Tucker Pits	0	0	0	
Skyline Pond (Puzzleface Ranch)	2	0	2	pair reported on pond briefly Sept. 17
Boyles Hill area	1	0	1	reported by Bill Long, WSS
Highway 89 winter pen	1	0	1	reported by Bill Long, WSS
South Park Unit, Wyoming Game & Fish Dept.	0	0	0	
Treatment Plant ponds	1	0	1	barrow pit pond, new category, 2003
Subtotal	5	0	5	
<i>Upper Green River (north of Warren Bridge)</i>				
Mosquito Lake	2	0	2	
Wagon Creek Lake	0	0	0	
Rock Crib Lake	0	0	0	
Mud Lake	2	0	2	not occupied until late summer
Roaring Fork Pond	0	0	0	dry

Appendix A. (cont.)

Dollar Lakes	0	0	0	many ducks
Upper Green River above Big Bend	0	0	0	
Green River Big Bend to Black Butte	2	0	2	pond west of river: 43 09.75 110 02.60
Green River Black Butte to Warren Bridge	0	0	0	
Spade Slough	0	0	0	
New Fork Potholes/Marsh Creek	1	0	1	2K3 green collar, creek west of highway
Kendal Wetland	2	0	2	pair laid 5 eggs, none hatched
New Fork River (north of highway 191)				
Kitchen Reservoir north	0	0	0	5 collared swans gone
Kitchen Ranch Reservoir main	2	4	6	
Soda Lake area				
Subtotal	11	4	15	
<i>New Fork River & Big Sandy to Farson area</i>				
New Fork River Pinedale to Boulder	0	0	0	
Boulder Sloughs				
Oliver Slough (Barden)	6	0	6	3 pairs, no collars
Swift Reservoir	1	0	1	yellow collar F13
New Fork to confluence with Green	0	0	0	added category, 2003
Big Sandy/Big Bend	0	0	0	
Big Sandy/Eden reservoirs	0	0	0	pilot checked on return flight
Farson area	0	0	0	pilot checked on return flight
Subtotal	7	0	7	
<i>Seedskadee NWR (SNWR) and lower Green River</i>				
Main Marsh Hawley Unit, Pool 6, SNWR	2	4	6	
Main Marsh Hawley, Pool 1, SNWR	2	4	6	2 cygnets, white morph
Main Marsh Hawley, Pool 2, SNWR	2	4	6	
Main Marsh Hawley, Pool 3, SNWR	2	4	6	
Main Marsh Hawley, Pool 7, SNWR	2	0	2	not a nesting pair
North Marsh Hamp, SNWR	0	0	0	
Sagebrush Wetland, SNWR	0	0	0	
Dunkle Wetland, SNWR	0	0	0	
Green River south of Highway 28, SNWR	0	0	0	
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)	0	0	0	
Daniel, Cottonwood Creek area	2	0	2	yellow collars F12 and F14
McNaughton Reservoir, Hamm's Fork	0	0	0	no reports; not flown
Hamm's Fork north of Kemmerer	0	0	0	no reports; not flown
Subtotal	12	16	28	
<i>Salt River</i>				
Palisades Reservoir, Targhee NF	1	0	1	
Kibby wetland, Alpine	2	0	2	pair on nest island

Appendix A. (cont.)

Salt River, Alpine to Freedom	0	0	0	
Salt River, Freedom to Afton	0	0	0	flew to Thayne only
Subtotal	3	0	3	
<i>Other Wyoming</i>				
Swamp Lake, Sunlight Basin	1	0	1	ground survey
Colony Site, eastern Wyoming	0	0	0	LaCreek birds, not counted in Tri-State total
Subtotal	1	0	1	
Nevada				O: J. Mackay, M. Collins; P: R. Cassinelli (9/22)
Ruby Lake NWR	19	0	19	
Franklin Lake	0	0	0	dry
Oregon				
Malheur NWR	11	1	12	R. Roy (9/15)
Summer Lake Wildlife Management Area	2	0	2	M. St. Louis
Lower Chewaucan Marsh				
Upper Chewaucan Marsh				
Paulina Marsh				
Sycan Marsh				
Upper Williamson River				
Klamath Marsh NWR				
Ward/Lily Lakes				
Swan Lake Valley				
Sprague River				
Upper Crooked River				
Thompson Reservoir				
Rivers End Ranch				
Whiskey Creek				

^aBlank denotes area not surveyed.

Appendix B. Personnel who conducted the 2003 Fall Trumpeter Swan Survey in the U.S.

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

Observers: S. Comeau and G. Dehmer (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. Mitchell (Gray's Lake NWR)

Pilot: C. Anderson (Idaho Department of Fish and Game)

Wyoming

Observer: S. Patla (Wyoming Game and Fish Department)

Pilot: D. France (France Air Service)

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

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