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TRUMPETER SWAN SURVEY of the ROCKY MOUNTAIN POPULATION, U.S. BREEDING SEGMENT FALL 2007

James A. Dubovsky

Migratory Birds and State Programs

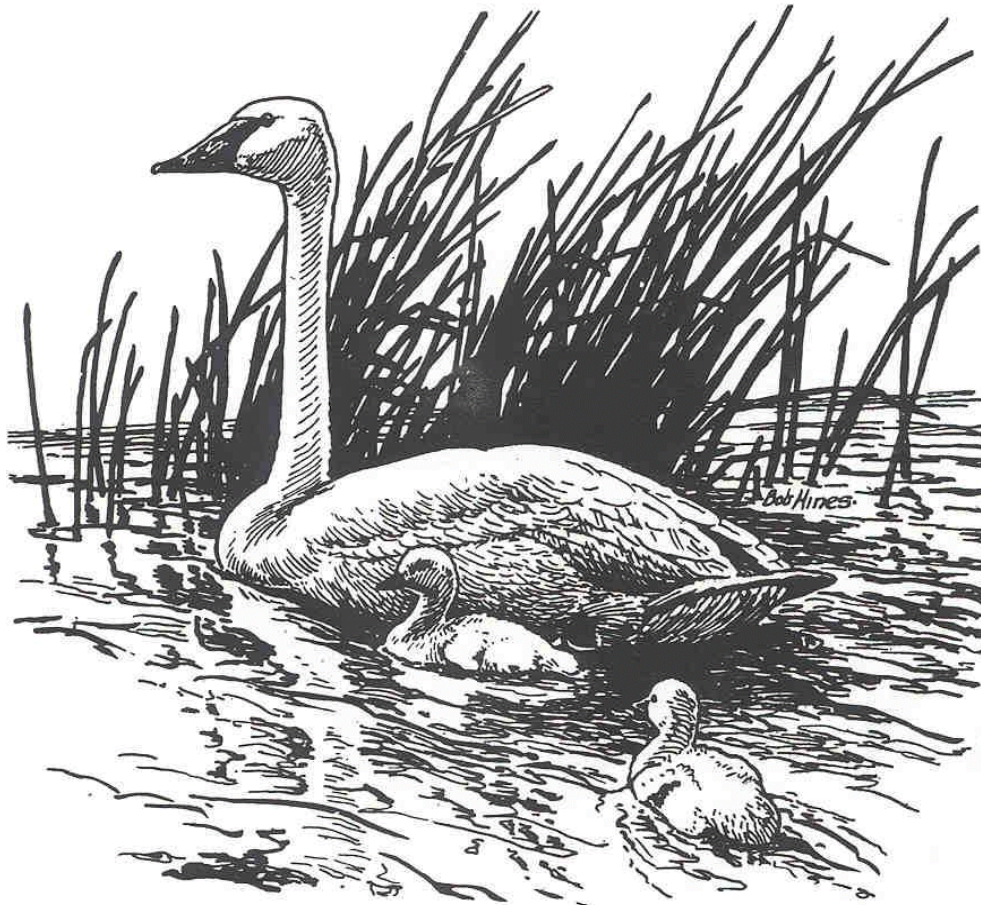
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FALL 2007



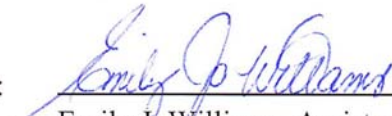
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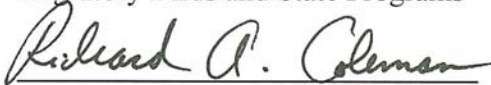
FALL 2007

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

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Abstract.— Observers counted 527 swans (white birds and cygnets) in the U.S. Breeding Segment of the Rocky Mountain Population of trumpeter swans during fall of 2007, 4% higher than the count from last year (507) and the highest count since 1992. The number of white birds in the tri-state region was about the same as in 2006, but the number of cygnets was 40% higher. The numbers of young produced in Montana and Wyoming were 141% and 127% higher, respectively, than those of last year, but the number of young counted in Idaho was 62% lower. The number of cygnets counted in Wyoming this fall was a record high, 20 birds higher than the previous record. The number of white birds counted in Montana was the highest since 1992, but counts in Idaho and Wyoming were 14% and 12% lower, respectively, than counts in 2006. The abundance of birds at Malheur National Wildlife Refuge (NWR) was the lowest recorded since 1967, and no cygnets were counted. No swans were observed at Summer Lake Wildlife Management Area this fall. The count for Nevada was about the same as in recent years. Precipitation throughout most of the tri-state area was below average during winter 2006-2007. During the summer months, temperatures were 2-6 degrees above average and precipitation was below average, resulting in Palmer Drought Indices for areas within the tri-state region that were somewhat lower than those during summer 2006.

The Rocky Mountain Population (RMP) of trumpeter swans (*Cygnus buccinator*) consists of birds that nest primarily from western Canada southward to Nevada and Wyoming (Fig. 1). The population is comprised of several flocks that nest in different portions of the overall range. The RMP/Canadian Flocks consist of birds that summer primarily in southeastern Yukon Territory, southwestern Northwest Territories, northeastern British Columbia, Alberta, and western Saskatchewan. The 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 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 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 Moser 2006).

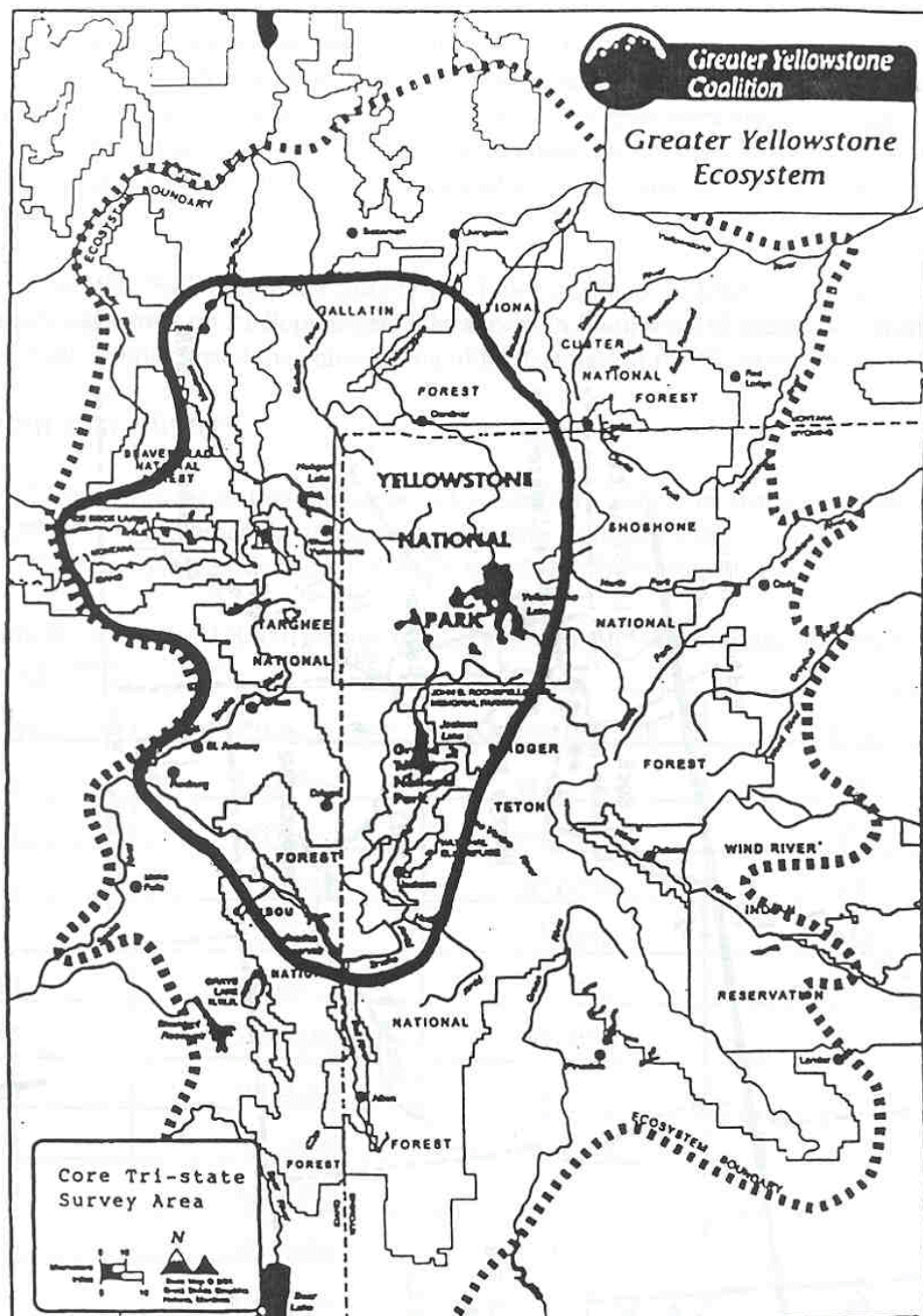


Fig. 2. Map showing the ‘core’ tri-state area of southeast Idaho, southwest Montana, and northwest Wyoming (provided by the Greater Yellowstone Coalition, Bozeman, Montana).

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 2006, the majority of the summer range of the swans was surveyed during 10-12 September. Approximately 27 h of flight time and additional ground survey time were required to complete the survey. Weather conditions during surveys generally consisted of sunny or partly cloudy skies and light winds.

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 (2007) 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 2007, Wilkins et al. 2007).

RESULTS AND DISCUSSION

Weather conditions were highly variable throughout the west during winter 2006-07. Areas within the summer range of the Tri-state Area Flocks received 75%-100% of normal precipitation. Overall for the winter, the temperature for the region was about average or slightly below (Joint Agricultural Weather Facility 2007a). Warm and dry conditions returned to the region during spring and summer. Precipitation amounts totaled only 50%-75% of average during June-August, and temperatures averaged 2° to 4°F greater than normal (Joint Agricultural Weather Facility 2007b). During mid-June much of the tri-state region, as well as important areas for nesting swans in southern Oregon and Nevada, were in severe to extreme drought (Fig. 3). Survey biologists reported that many wetlands in Montana, Idaho, and Oregon were completely dry. The Palmer Drought Index for southwestern Montana (near the north-central portion of the core tri-state area) was lower than that of last year and remained below average (Fig. 4).

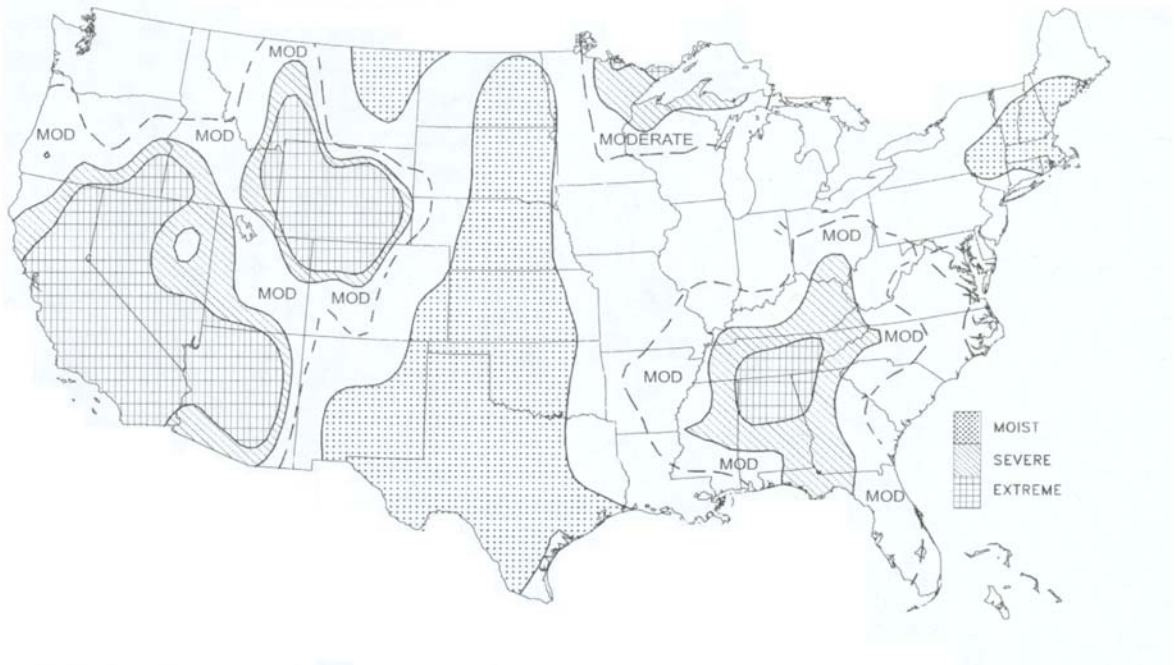


Fig. 3. Palmer Drought Index map for June 23, 2007 (Joint Agricultural Weather Facility 2007c).

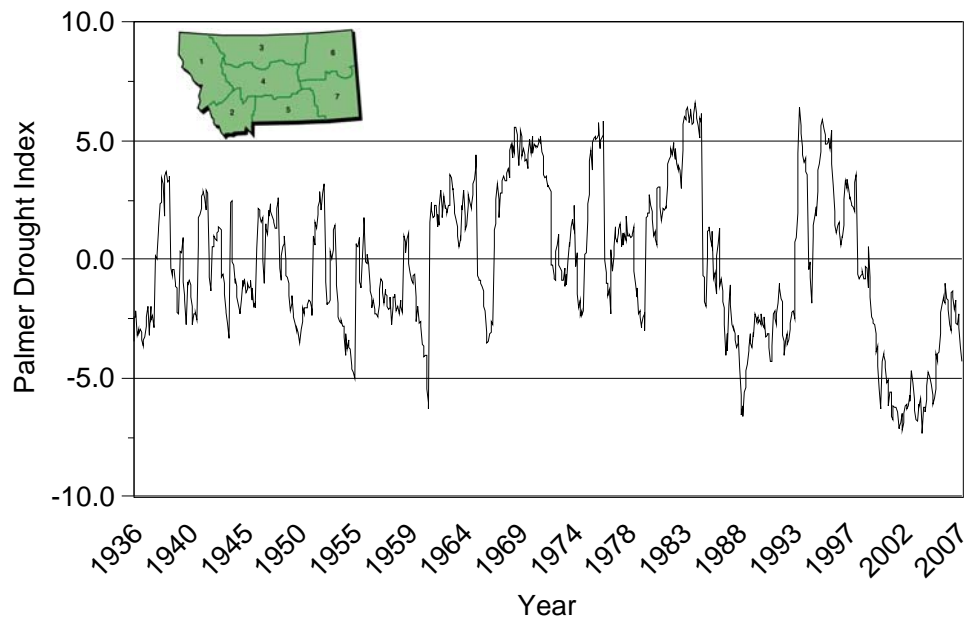


Fig. 4. Monthly Palmer Drought Indices for climate division 2 in southwest Montana (data from the National Climatic Data Center [<http://www1.ncdc.noaa.gov/pub/data/cirs/drd964x.pdsi.txt>]).

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).

Complete surveys of the Summer Lake WMA have not been conducted consistently since 2001. 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

Table 1. Counts of trumpeter swans of the Rocky Mountain Population U.S. Breeding Segment during fall, 1967-2007.

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	38 ^b	7 ^b	45 ^b	311 ^b	60 ^b	371 ^b
2003	291	95	386	30 ^b	1 ^b	31 ^b	321 ^b	96 ^b	417 ^b
2004	291	94	385	27 ^b	5 ^b	32 ^b	318 ^b	99 ^b	417 ^b
2005	355	98	453	49	8	57	404	106	510
2006	377	82	459	39 ^c	9 ^c	48 ^c	416 ^c	91 ^c	507 ^c
2007	383	115	498	28	1	29	411	116	527

^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.

^c Count biased low; only a portion of Summer Lake WMA surveyed.

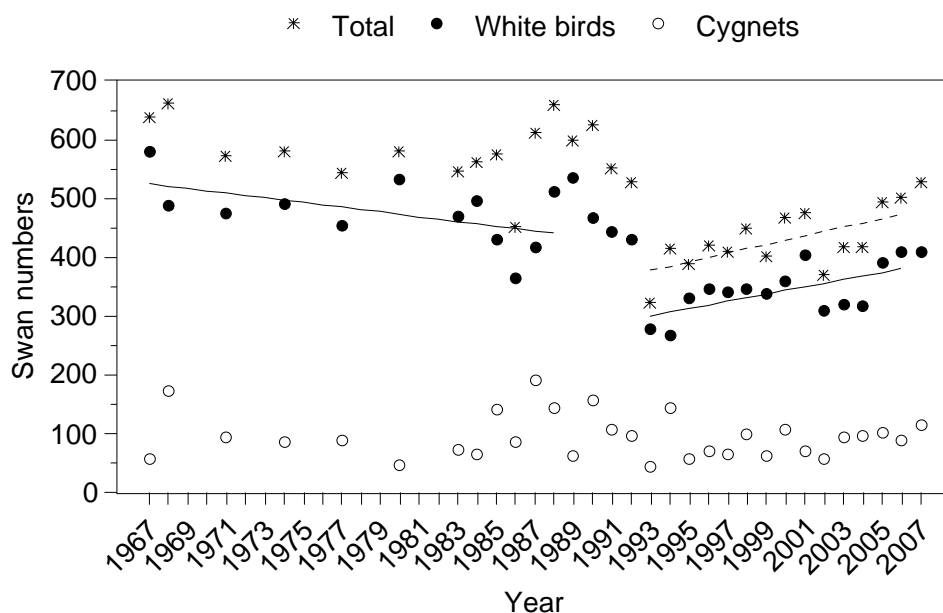


Fig. 5. Counts of swans in the RMP/U.S. Breeding Segment during the Fall Trumpeter Swan Survey, 1967-2007 (dashed and solid lines depict trends for total swans and white birds, respectively). The counts do not include those for the Summer Lake WMA (see text).

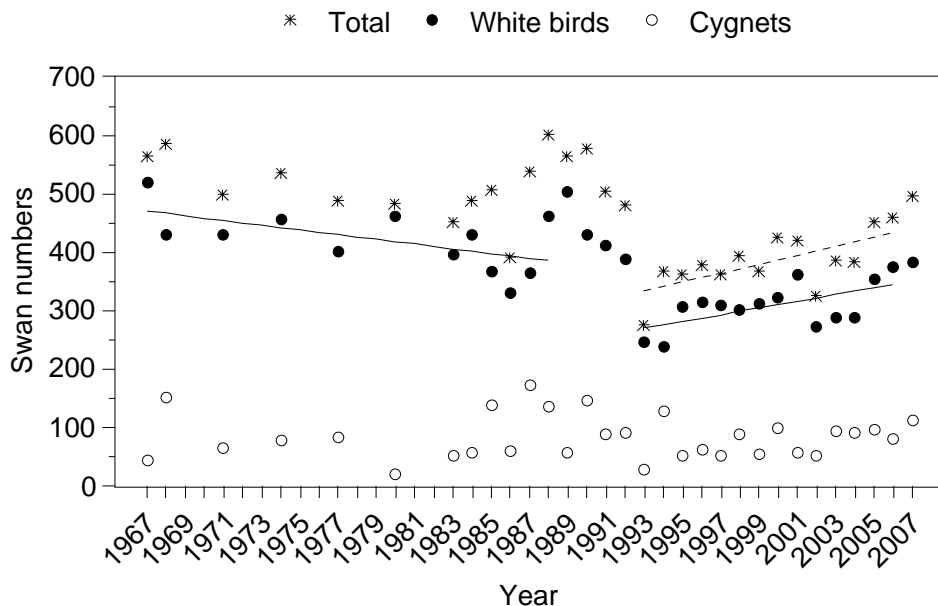


Fig. 6. Counts of swans in the Tri-state Area Flocks during the Fall Trumpeter Swan Survey, 1967-2007 (dashed and solid lines depict trends for total swans and white birds, respectively).

Table 2. Counts of trumpeter swans of the Rocky Mountain Population U.S. Breeding Segment during fall, 1967-2007.

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 ^c	0 ^c	2 ^c	24	0	24
2003	89	29	118	100	27	127	102	39	141	11	1	12	2 ^c	0 ^c	2 ^c	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
2006	117	17	134	132	39	171	128	26	154	17	5	22	6	0	6	16	4	20
2007	157	41	198	113	15	128	113	59	172	11	0	11	0	0	0	17	1	18

^aSwans translocated to Summer Lake WMA beginning in winter 1991; count from 1991 not used in analyses.

^bBlank denotes survey was not conducted.

^cIncomplete count; data not used in analyses.

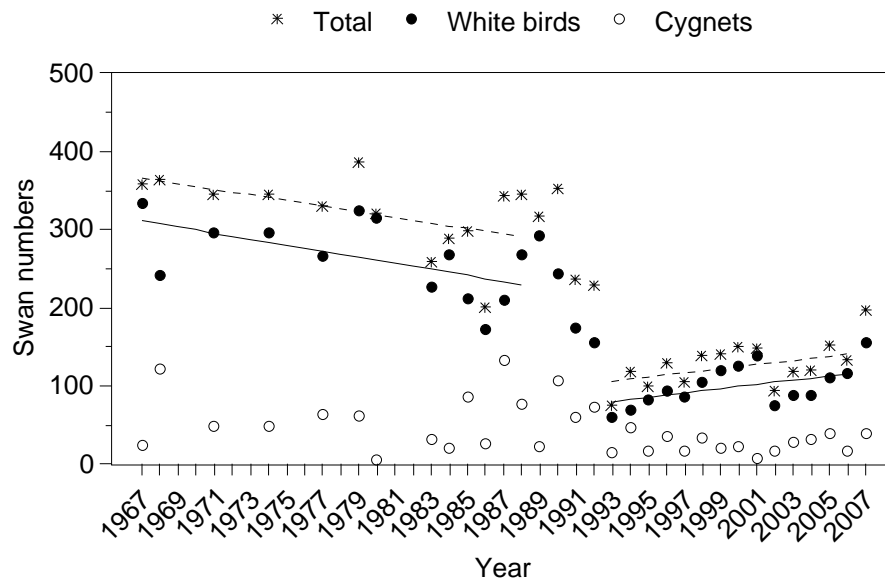


Fig. 7. Numbers of swans counted in Montana during the Fall Trumpeter Swan Survey, 1967-2007 (dashed and solid lines depict trends for total swans and white birds, respectively).

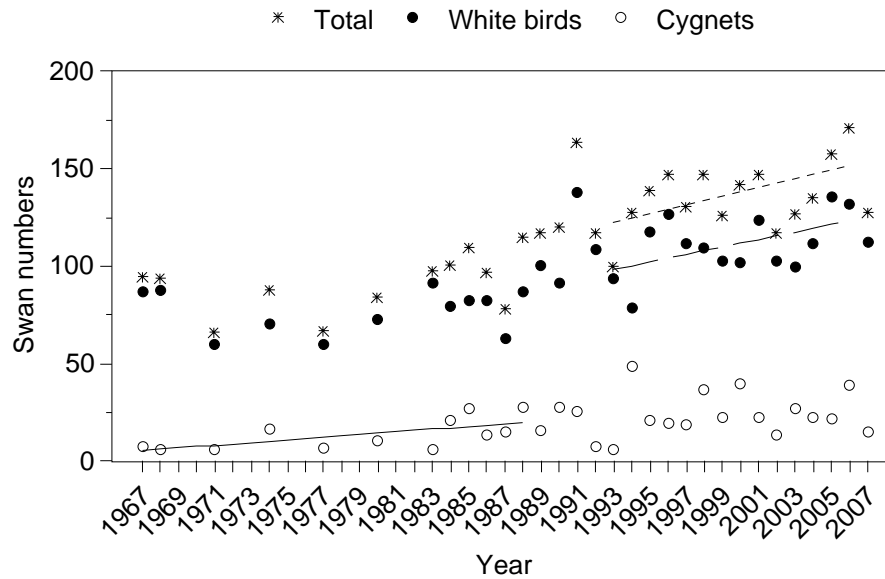


Fig. 8. Numbers of swans counted in Idaho during the Fall Trumpeter Swan Survey, 1967-2007 (solid line depicts trend for cygnets; dotted and dashed lines depict trends for total swans and white birds, respectively).

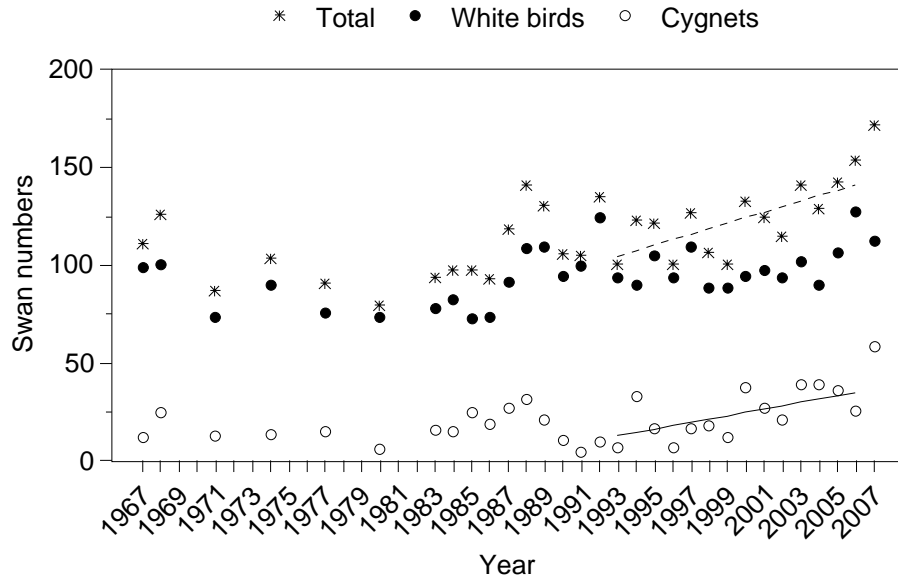


Fig. 9. Numbers of swans counted in Wyoming during the Fall Trumpeter Swan Survey, 1967-2007 (dashed and solid lines depict trends for total birds and cygnets, respectively).

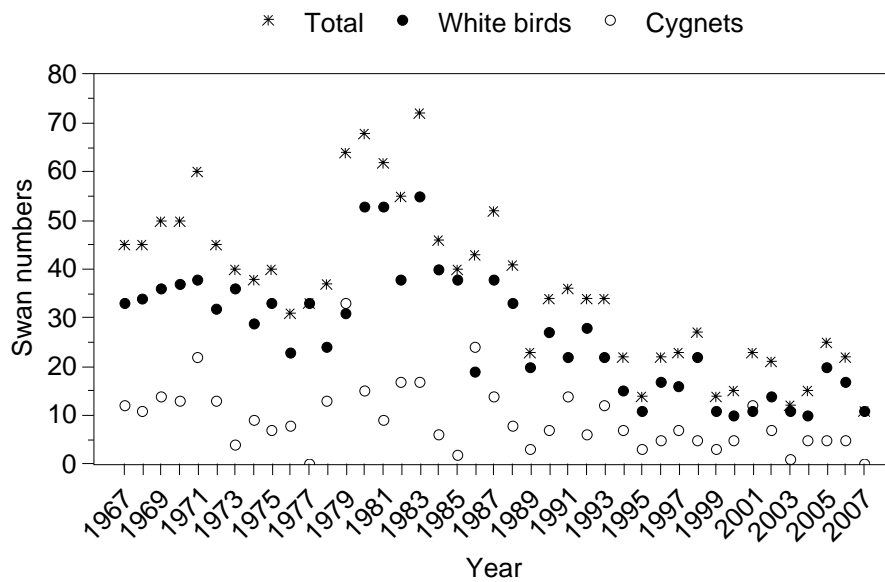


Fig. 10. Numbers of swans counted at Malheur NWR during the Fall Trumpeter Swan Survey, 1967-2007.

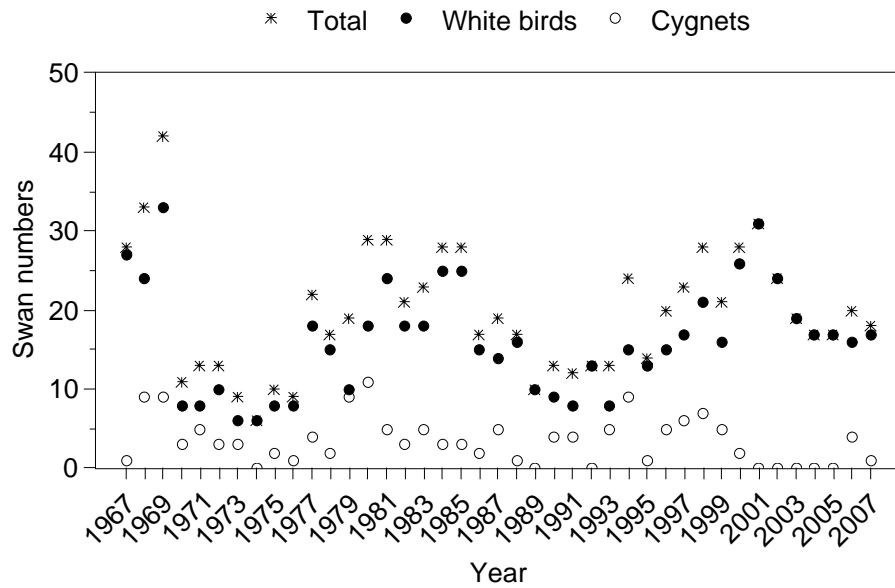


Fig. 11. Numbers of swans counted in the Nevada flock during the Fall Trumpeter Swan Survey, 1967-2007.

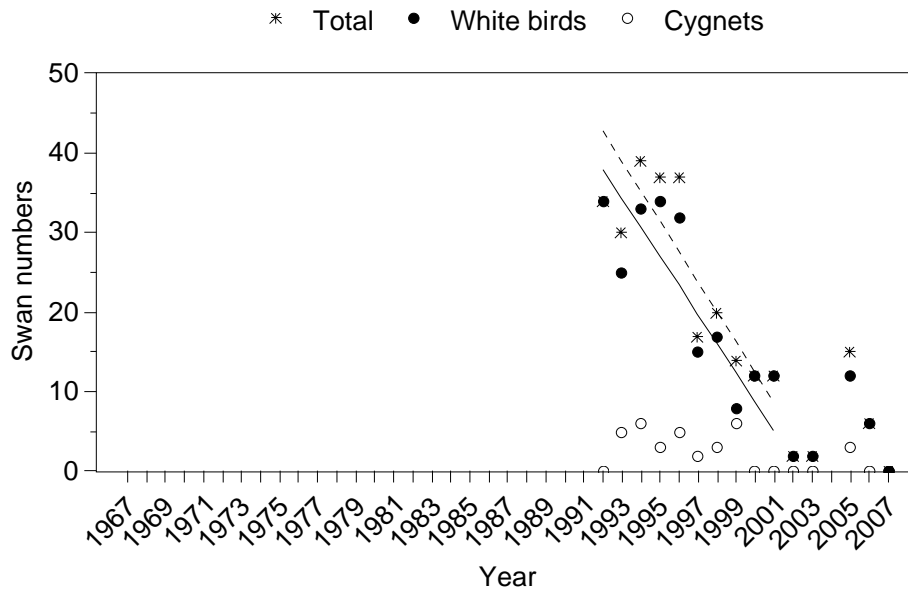


Fig. 12. Numbers of swans counted at Summer Lake WMA during the Fall Trumpeter Swan Survey, 1992-2007 (dashed and solid lines depict trends for total swans and white birds, respectively).

count was 44% below the 1967-88 average (Fig. 5). No marked changes in abundance were apparent for restoration flocks (Figs. 10, 11).

Recent Trends

During 1993-2006, the growth rates for total swans and white birds in the RMP/U.S. Breeding Segment increased 1.8% annually ($P \leq 0.02$) (Fig. 5). However, no trend ($P = 0.28$) was evident for cygnets. Similar results were evident for swans in the Tri-state Area Flocks during the same period, but the rates for total swans (+2.0, $P = 0.01$) and white birds (+1.9, $P = 0.02$) were slightly greater (Fig. 6).

The rate of growth for total swans in Montana increased 2.4% per year during the 1993-2006 period ($P = 0.08$, Fig. 7), and the rate for white birds increased 3.1% per year ($P = 0.05$); the data for cygnets suggested no trend ($P = 0.95$). In Idaho, increases also occurred for both total swans and white birds (+1.7 [$P = 0.05$] and +1.8 [$P = 0.06$]), respectively, but no trend ($P = 0.33$) was evident for cygnets (Fig. 8). For Wyoming during 1993-2006, total swans (+2.2% per year, $P < 0.01$) and cygnets (+9.0% per year, $P = 0.01$) increased, but no trend was evident for white birds ($P = 0.14$) (Fig. 9).

Because complete surveys of the Summer Lake WMA were not conducted 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 1992-2006 for both total swans and white birds (-2.9% per year), although the trends were not significant ($P > 0.13$) (Fig. 10). The rate for cygnets was unchanged ($P = 0.31$). 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, $\bar{x} = 2.50$). However, 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 during 2005 and 2006 were low (Table 2).

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 ($P \geq 0.11$) were evident for any component of the Nevada flock (Fig. 11), although the data suggest a cyclic pattern may exist.

Results from the 2007 survey

During fall 2007, observers counted 527 trumpeter swans in the RMP/U.S. Breeding Segment, a number 4% above the count last year (507) and the highest count since 1992 (Table 1, Fig. 5). The total count of swans in the Tri-state Area Flocks (498) was 8.5% higher than the count last year (459) and the highest count since 1991 (Table 1). The number of white birds in the tri-state region was about the same as in 2006. The count for Montana was the highest since 1992, and the count for Wyoming was a record high. The number of white birds counted in Montana was the highest since 1992, but counts in Idaho and Wyoming were 14% and 12% lower, respectively, than counts in 2006.

The count for birds at Malheur NWR (11) was the lowest recorded since 1967, and no cygnets were counted. No swans were observed at Summer Lake Wildlife Management Area this fall. The count for Nevada was about the same as in recent years.

Overall, production of cygnets in the tri-state region increased 40% compared to last year. The numbers of young produced in Montana and Wyoming were 141% and 127% higher, respectively, than those of last year, but the number of young counted in Idaho was 62% lower (Table 2). The number of cygnets counted in Wyoming this fall was a record high, 20 birds higher than the previous record. An index to production rate (i.e., cygnets/white birds) for Wyoming (0.522) was over double that of its long-term (i.e., 1967-2006) average (0.214). The index for Montana (0.261) was about the same as its long-term average (0.269), and the value for Idaho (0.133) was below average (0.209). No cygnets were counted at Malheur NWR this year, only the second time since 1967 no production occurred at the refuge. The long-term average for the refuge is 9.6. No cygnets were counted at the Summer Lake WMA this year, and only 1 cygnet was counted in the Nevada flock.

In addition to counts from the official survey areas, other entities are attempting to restore trumpeter swans within the RMP range of the U.S. The Confederated Salish and Kootenai Tribes have been releasing swans in the Flathead Valley of Montana for the last several years, and typically have about 30-40 birds in their release area during the fall. 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, also has released trumpeter swans on wetlands west of Helena, Montana during summer in 2005 (10 birds), 2006 (17 birds), and 2007 (14 birds). All of these swans were captive stock of tri-state origin, and were reared at facilities operated by the Wyoming Wetland Society. The birds from these reintroduction efforts are not included in the tables and figures in this report. In the future, if the reintroduction efforts succeed in establishing nesting flocks, the birds will be included in the official counts. Additionally, results from a recent study indicate that trumpeter swans nesting in British Columbia and Alberta, Canada, and those nesting in the tri-state region of the U.S. are not genetically different (Oyler-McCance et al. 2007). Therefore, during summer 2007 eggs were collected from wild trumpeter swan nests in Canada to enhance reintroduction efforts for U.S. nesting flocks (B. Long, Wyoming Wetland Society, personal communication). The eggs were hatched in facilities of the Wyoming Wetland Society, and young eventually will be released to the wild according to recommendations in the management plan for this population.

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 increased over that of last year, as did the count for the Tri-state Area Flocks. The RMP count was the highest since 1992, whereas that for the Tri-state Area flocks was the highest since 1991. Palmer Drought Indices suggest that June 2007 moisture conditions within the U.S. RMP range were below average, and were slightly lower than those of last year. We are encouraged that the counts remained relatively high this fall, and are slightly higher than those from the few years immediately preceding the drought. However, the number of birds this fall remained below objectives stated in the management plan for this group of birds (Pacific Flyway Study Committee 2002).

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.

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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, 2007.

Montana	White birds	Cygnets	Total	Pilot/observer/notes
<i>Red Rock Lakes NWR</i>				P: D. Chapman; O: J. Warren (9/10)
Upper Red Rock Lake	54	6	60	
Upper Lake Outlet to River Marsh	4	4	8	
Swan Lake	6	0	6	
Shambo Pond	0	0	0	
River Marsh	4	4	8	
Lower Red Rock Lake	10	7	17	
West Pintail Ditch	0	0	0	
Widgeon Pond	2	0	2	
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	
Subtotal	80	21	101	
<i>Centennial Valley (CV)</i>				
Red Rock River	54	5	59	
Lima Reservoir	3	0	3	
Blake Slough	0	0	0	
Twin Forks wetland	0	0	0	
Conklin Lake	2	0	2	
Elk Lake	0	0	0	
7L Wetland	2	1	3	
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	
Pond, T16 R39 S28	2	3	5	
Subtotal	63	9	72	
<i>Madison Valley</i>				
Ennis Lake	3	0	3	
Walsh Ponds	1	0	1	
Madison River	0	0	0	

Appendix A. (cont.)

Hidden Lake	0	0	0	
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	
Subtotal	4	0	4	
<i>Paradise Valley</i>				P: R. Stradley; O: T. McEneaney (9/10)
Sacagawea Park	0	0	0	
DePuy's-South	0	0	0	
Beaver Creek	0	0	0	
DePuy's-Main Lake	2	2	4	
DePuy's-North	2	0	2	
Armstrong's	0	0	0	
Bailey's	0	0	0	
Brandis'	2	6	8	
Brandis' North Fish Ponds Slough	0	0	0	
Diamond B	0	0	0	
Dana's	0	0	0	
Nelson's	1	0	1	
Paradise Valley Airport	1	0	1	
Emigrant Pond	2	3	5	
Subtotal	10	11	21	
Idaho				
<i>Island Park/Upper Henry's Fork</i>				P: C. Anderson; O: C. Mitchell (9/12)
Henry's Lake	2	0	2	
Henry's Lake Flat	0	0	0	
Big Springs to Mack's Inn	0	0	0	
Henry's Fork	0	0	0	
Subtotal	2	0	2	
<i>Shotgun Valley</i>				
South Shore Island Park Reservoir	0	0	0	Much of reservoir only mudflat
Sheep Creek Reservoir	0	0	0	
Icehouse Reservoir	0	0	0	
Shotgun Reservoir	2	1	3	
North shoreline Island Park Reservoir	0	0	0	Much of reservoir only mudflat
Sheridan Reservoir	11	0	11	

Appendix A. (cont.)

Sheridan Creek (cabin with pond)	0	0	0	
Twin ponds on Icehouse Creek	0	0	0	
Subtotal	13	1	14	
<i>Harriman State Park</i>				
Henry's Fork above Osbourne Bridge	2	0	2	
Henry's Fork below Osbourne Bridge	0	0	0	
Silver Lake	2	3	5	
Golden Lake	2	0	2	
Pond east-northeast of Golden Lake	2	0	2	
Thurman Creek	0	0	0	
Fish Pond	0	0	0	
Subtotal	8	3	11	
<i>Upper Henry's Fork Area</i>				
Buffalo River	0	0	0	
Henry's Fork-Box Canyon to Harriman State Park	0	0	0	IP dam to HSP
Trude Siding-Pond/Elk Creek complex	0	0	0	
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	NE of Fish Pond
Eccles wetland #2	0	0	0	One mile west of Eccles #1
Eccles wetland #4	0	0	0	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	
North of Hatchery Butte	0	0	0	
Beaver Pond (Gerrit)	4	0	4	
Railroad Pond	0	0	0	
Pond northeast of Gerrit	2	0	2	
Mesa Marsh	0	0	0	
Northwest of Mesa Marsh	2	0	2	
Bear Lake and Cub Lake	2	0	2	
Twin Lakes	0	0	0	
Porcupine Lake	0	0	0	
Beaver Lake	0	0	0	
Rock Creek and adjacent pond	0	0	0	
Lower Goose Lake	0	0	0	

Appendix A. (cont.)

Upper Goose Lake	0	0	0	
Long Meadows	0	0	0	
Swan Lake (east-Falls River)	0	0	0	
Steele Lake	0	0	0	
Putney Meadows	0	0	0	
Falls River Ridge complex-4 ponds	0	0	0	
Thompson's Hole	0	0	0	
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	
Subtotal	10	0	10	
<i>Teton Basin</i>				
McReynolds Reservoir	0	0	0	
Teton Basin	0	0	0	
Subtotal	0	0	0	
<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	5	2	7	
Sand Creek below Wildlife Management Area	0	0	0	
Wetlands west of Ashton	4	0	4	
Willow Creek ponds	0	0	0	
Chester Reservoir	1	0	1	
West of Chester Dam	0	0	0	
Singleton Ponds	0	0	0	
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	1	0	1	
Cartier Slough Wildlife Management Area	0	0	0	
Davis Lake	0	0	0	
Egin Lakes	0	0	0	
Quayle's Lake	0	0	0	
Henry's Fork above Menan Butte	0	0	0	
Lower Henry's Fork to east of Market Lake	0	0	0	
Snake River	0	0	0	
Subtotal	11	2	13	

Appendix A. (cont.)

<i>Camas NWR</i>				
Toomey Pond	0	0	0	
2-Way Pond	0	0	0	
Rays Lake	0	0	0	
Center Pond	0	0	0	
Big Pond	2	0	2	
First pond north of Sandhole Lake	0	0	0	
Sandhole Lake	14	0	14	
Avocet Pond	0	0	0	
Redhead Pond	0	0	0	
Mud Lake Wildlife Management Area	0	0	0	
Market Lake Wildlife Management Area	2	4	6	
Pond southeast of Market Lake	0	0	0	
Subtotal	18	4	22	
<i>Grays Lake NWR</i>				
Shorty's Cabin	0	0	0	
Buck Lake (west of Bear Island)	0	0	0	Dry
Big Springs Area	0	0	0	Dry
Bishop Island	0	0	0	Dry
B Riley Point (northwest of Bear Island)	0	0	0	
Outlet (main)	4	0	4	
Big Bend Marsh	4	0	4	
Brockman Creek	3	0	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	Dry
Kackley/Gravel Creek	0	0	0	Dry
Beavertail	0	0	0	Dry
Crane Reservoir (Little Valley)	4	0	4	Off refuge
Chubb Springs	0	0	0	Off refuge
Subtotal	15	0	15	
<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	

Appendix A. (cont.)

Woodall Springs	0	0	0	
Blackfoot Reservoir	9	0	9	
Chicken Creek wetlands	0	0	0	3 miles southwest of Blackfoot Reservoir Dam
Wetlands southwest of Chesterfield Reservoir	0	0	0	
Subtotal	9	0	9	
<i>Bear Lake NWR</i>				
Rainbow Unit	0	0	0	
Rainbow Subunit	7	0	7	
Alder Unit	0	0	0	Dry
Mud Lake Unit	3	0	3	
Salt Meadow Unit	2	5	7	
Dingle Unit	0	0	0	
West Canal Unit	0	0	0	
Saint Charles Unit	3	0	3	
Bloomington Unit	6	0	6	
Private wetland-off refuge	0	0	0	
Subtotal	21	5	26	
<i>Fort Hall Bottoms</i>				
Head of Clear Creek	0	0	0	
American Falls Reservoir-northwest corner	3	0	3	
Kinney Creek	0	0	0	
Clear Creek above Sheepskin Road	0	0	0	
Clear Creek below Sheepskin Road	0	0	0	
Portneuf River	3	0	3	
Flying Y	0	0	0	
Slough west of Flying Y	0	0	0	
Sloughs along Broncho Road	0	0	0	
Diggie Creek	0	0	0	
Big Jimmy Creek	0	0	0	
Springfield Reservoir	0	0	0	
Sterling Wildlife Management Area	0	0	0	
Subtotal	6	0	6	
<i>Lower Snake River</i>				
American Falls Reservoir - Minidoka NWR	a			
C. J. Strike Reservoir				
Subtotal	0	0	0	
<i>Minidoka NWR</i>				

Appendix A. (cont.)

<i>Other Idaho</i>				
Pond near Bear River southwest of Grace	0	0	0	
Chesterfield Reservoir	0	0	0	
Wetland on Toponce Creek				
Wetlands east of Blackfoot	0	0	0	
Subtotal	0	0	0	
<i>Central and Western Idaho</i>				
White Arrow Ponds (Bliss)				
Fairfield Gravel Pit	0	0	0	Spring Creek Reservoir, via Betty Davenport
Silver Creek (Picabo)				
Oxford Slough Waterfowl Production Area	0	0	0	
Swan Lake (Bannock County)	0	0	0	
Subtotal	0	0	0	
Wyoming				
<i>Yellowstone National Park</i>				P: R. Stradley; O: T. McEneaney (9/10)
Geode Lake	0	0	0	
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	2	0	2	
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)	0	0	0	
Lillypad Lake	0	0	0	
Junco Lake	0	0	0	
Riddle Lake	2	0	2	
Falls River	0	0	0	
Upper Boundary Lake	0	0	0	
7-Mile Bridge	0	0	0	
Swan Lake	0	0	0	
Robinson Lake	0	0	0	

Appendix A. (cont.)

Little Robinson	0	0	0	
West Robinson Lake	0	0	0	
Bechler Meadow	2	0	2	
Lower Madison River	0	0	0	
Nymph Lake	0	0	0	
Grizzly Lake	0	0	0	
Obsidian Lake	0	0	0	
Floating Island Lake	0	0	0	
Trumpeter Lake	1	0	1	
North Kidney Lake	0	0	0	
Grebe Lake	0	0	0	
Yellowstone Delta	2	0	2	
Winnegar Lake	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	0	0	0	
Fern Lake	0	0	0	
Cascade Lake	0	0	0	
Pelican Creek (mouth)	0	0	0	
Goose Lake	0	0	0	
Tanager Lake	0	0	0	
Subtotal	10	0	10	
<i>Upper Snake River/Targhee National Forest</i>				P: D. Stinson; O: S. Patla (9/10)
Ernest Lake				Dry
Bergman Reservoir	0	0	0	Dry
Indian Lake	2	4	6	
Squirrel Meadows	0	0	0	Pond by buildings almost dry
Widget Lake	0	0	0	
Junco Lake	0	0	0	
Moose Lake	0	0	0	Canoe on lake; camper north end
Loon Lake	0	0	0	
Rock Lake	0	0	0	Dry; no standing water
Fish Lake	0	0	0	
Grassy Lake Reservoir				
Subtotal	2	4	6	

Appendix A. (cont.)

<i>Bridger-Teton National Forest-Jackson</i>				
Arizona Lake	0	0	0	Pair lost 4 cygnets early in season
Blackrock Ranger Station pond/sloughs				WYDOT gravel pit for road construction
Enos Lake	0	0	0	Five subadults earlier in season
Bridger Lake				No swans observed all season
Atlantic Creek				No swans observed all season
Lily Lake				No swans observed all season
Pinto Pond	2	6	8	Largest brood in WY; close to fledging
Half Moon Lake	5	0	5	Probably group in Enos early in year
Tracy Lake	0	0	0	
Burnt Fork Potholes	0	0	0	
Upper Slide Lake	2	0	2	Did not produce this year
Goose Lake	0	0	0	
Grizzly Pond	0	0	0	Dry
Lower Slide Lake	0	0	0	
Soda Lake	0	0	0	
Bradley Lake (Snake River Canyon)				
Subtotal	9	6	15	
<i>Grand Teton National Park</i>				
Polecat Slough	0	0	0	
Flagg Ranch gravel pits	0	0	0	Ponds refilled; no vegetation yet
Elk Ranch Reservoir	2	0	2	Over 50% dry
Hedrick Pond	0	0	0	Water low
Swan Lake	2	0	2	Pair on slough north of lake
Christian Pond	0	0	0	Almost dry
Glade Creek north	0	0	0	Almost dry
Glade Creek south (north of Tusker's Island)	0	0	0	
Glade Creek cliff slough	2	0	2	Lost one cygnet during last 3 weeks
Steamboat Mountain	2	3	5	Lost one cygnet early
Jackson Lake north	0	0	0	Lake level dropping rapidly
Jackson Lake south	7	0	7	Pair plus group of 4 and one single
Two Ocean Lake	0	0	0	Far west end of lake; no nest found
Emma Matilda Lake	0	0	0	
Dam to Moran, Snake River	0	0	0	
Moran to Moose, Snake River				No swans in previous fall surveys
Subtotal	15	3	18	
<i>National Elk Refuge</i>				
Visitor Center ponds	0	0	0	
Southwest Main Marsh	0	0	0	
Northwest Main Marsh (near overlook)	2	2	4	Lost 3 cygnets to another pair; see Winnegar
Southeast Main Marsh	2	0	2	
Northeast Main Marsh	2	5	7	1 white morph cygnet
Miller/Winnegar Springs	2	7	9	3 cygnets north end of slough; adults and 4 young in center

Appendix A. (cont.)

Pierre Pond east	0	0	0	
Pierre Pond west	0	0	0	
Romney Pond #2	2	4	6	Cygnets well developed
Nowlin Ponds	7	0	7	
Flat Creek north	0	0	0	
Subtotal	17	18	35	
<i>Jackson Area</i>				
Tucker Pits	0	0	0	
Skyline Pond (Puzzleface Ranch)	0	0	0	One yearling molted on site
Boyles Hill area	1	0	1	Reported by Bill Long, captive facility
Highway 89 winter pen	1	0	1	With 5 captive swans at holding facility
South Park Unit, Wyoming Game & Fish Dept.	0	0	0	Pair molted on site
Treatment Plant ponds	0	0	0	
Subtotal	2	0	2	
<i>Upper Green River (north of Warren Bridge)</i>				
Mosquito Lake	2	2	4	Little ice water's edge
Wagon Creek Lake	0	0	0	
Rock Crib Lake	0	0	0	
Mud Lake	0	0	0	Pair and young moved to river
Roaring Fork Pond	0	0	0	Completely dry
Dollar Lakes	0	0	0	
Upper Green River above Big Bend	2	2	4	Pair from Mud Lake
Green River Big Bend to Black Butte	2	4	6	Carney slough
QY Bar Reservoir	2	0	2	New site added 2007
Green River Black Butte to Warren Bridge	0	0	0	Did not fly entire; only north end
Spade Slough	0	0	0	
New Fork Potholes/Marsh Creek	0	0	0	
Kendal Wetland	2	2	4	Pair from potholes; young 2/3 grown
New Fork River (north of highway 191)	2	0	2	Private reservoir
Kitchen Reservoir north	5	0	5	Two pairs and one single
Kitchen Ranch Reservoir main	2	4	6	Cygnets large; one lost early in season
Soda Lake area	0	0	0	
Fayette Ranch ponds	0	0	0	Main ranch north of highway
Subtotal	19	14	33	
<i>New Fork River & Big Sandy to Farson area</i>				
New Fork River Pinedale to Boulder	2	0	2	
Fayette Ranch New Fork ponds	2	3	5	New site added 2007
Boulder Sloughs	0	0	0	
Oliver Slough (Barden)	0	0	0	
Swift Reservoir	2	0	2	
New Fork to confluence with Green	3	0	3	Jensen slough

Appendix A. (cont.)

Big Sandy/Big Bend	0	0	0	Checked during FWS crane survey Sept. 11
Big Sandy/Eden reservoirs	0	0	0	Checked during FWS crane survey Sept. 11
Farson area	0	0	0	Checked during FWS crane survey Sept. 11
Subtotal	9	3	12	
<i>Seedskadee NWR (SNWR) and lower Green River</i>				
Main Marsh Hawley Unit, Pool 6, SNWR	0	0	0	
Main Marsh Hawley, Pool 1, SNWR	2	2	4	1 gray and 1 white cygnet
Main Marsh Hawley, Pool 2, SNWR	2	3	5	
Main Marsh Hawley, Pool 3, SNWR	2	0	2	
Main Marsh Hawley, Pool 4, SNWR	2	0	2	
Main Marsh Hawley, channel, SNWR	1	0	1	
Headquarters Marsh, SNWR	2	0	2	One adult with yellow legs; failed nest attempt
North Marsh Hamp, SNWR	2	3	5	Adult lost early in season; replaced by late August
Sagebrush Wetland, SNWR	3	0	3	Pair plus single white bird
Dunkle Wetland, SNWR	1	0	1	
Green River south of Highway 28, SNWR	2	1	3	Lost 2 cygnets; pair from Sagebrush pool nest
Green River Highway 28 to dam, SNWR	0	0	0	
Subtotal	19	9	28	
<i>Green River Fontenelle Reservoir north to Daniel</i>				
Fontenelle Reservoir	2	0	2	Northeast end; mudflats
Big Piney cutoff, Green River	1	0	1	Pond west of river
Dry Piney Creek area, Green River	2	0	2	South of Long Island on river
La Barge pond (private)	0	0	0	Water level high
Ferry Island Slough	2	2	4	Added 2007; one white morph cygnet
Daniel, Cottonwood Creek area				
Subtotal	7	2	9	
<i>Hamm's Fork</i>				
McNaughton Reservoir, Hamm's Fork	0	0	0	FWS crane survey Sept. 10
Hamm's Fork north of Kemmerer	0	0	0	FWS crane survey Sept. 10
Subtotal	0	0	0	
<i>Salt River</i>				
Palisades Reservoir, Alpine wetland	1	0	1	One pair and 2 singles
Kibby wetland, Alpine	3	0	3	Salt Cove subdivision
Salt River, Alpine to Freedom	0	0	0	
Salt River, Freedom to Afton	0	0	0	
Subtotal	4	0	4	
<i>Other Wyoming</i>				
Swamp Lake, Sunlight Basin	0	0	0	

Appendix A. (cont.)

Colony Site, eastern Wyoming				
Trail Lake, Dubois	0	0	0	No reports this year
Subtotal	0	0	0	
Nevada				
Ruby Lake NWR	17	1	18	P: R. Cassinelli; O: J. Mackay (9/11)
Franklin Lake	0	0	0	
Oregon				
Malheur NWR	11	0	11	R. Roy (9/24)
Summer Lake Wildlife Management Area	0	0	0	M. St. Louis (9/26)
Warner Valley	0	0	0	
Sycan Marsh	0	0	0	
Deschutes River				

^aBlank denotes area not surveyed.

Appendix B. Personnel who conducted the 2007 Fall Trumpeter Swan Survey in the U.S.

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

Observer: J. Warren (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: C. Anderson (AvCenter)

Wyoming

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

Wyoming (Yellowstone National Park)

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

Ruby Lake NWR and vicinity

Observer: J. Mackay (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)
