U.S. Fish & Wildlife Service

The 2005 North American Trumpeter Swan Survey

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A Cooperative North American Survey

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***Abstract**:* The abundance and productivity of North American trumpeter swans (*Cygnus buccinator*) was assessed during the 2005 quinquennial trumpeter swan survey, May 2005-January 2006. The continental estimate of trumpeter swan abundance in 2005 was 34,803, a record-high level since comprehensive surveys were initiated in 1968, and 47% higher than the estimate during the 2000 survey. Abundance estimates for each of North America's 3 recognized trumpeter swan populations also reached record-high levels during the 2005 survey. Survey biologists estimated that the Pacific Coast Population included 24,928 swans, 42% more than during the 2000 survey. The abundance estimate of Rocky Mountain Population swans during the 2005 survey was 5,228 birds, 43% higher than in 2000. The 2005 survey estimate for the Interior Population was 4,647 swans, an increase of 91% from the estimate in 2000. The age distributions of all swan populations during the 2005 survey ranged from 27% to 31% cygnets, and were higher than the 2000 percentage for each population. We present estimates of average annual growth rates and indices of production for these populations and their component flocks.

INTRODUCTION

Quinquennial trumpeter swan surveys are intended to provide comprehensive assessments of swan abundance and indices of swan productivity throughout the entire breeding ranges of the 3 recognized North American populations: the Pacific Coast, Rocky Mountain, and Interior populations (Fig. 1). These systematic and cooperative surveys of North American trumpeter swans were first conducted in 1968, repeated in 1974-75, and continued at 5-year intervals thereafter (1980-2005). Survey coverage was expanded in 1985 and considered comprehensive, but survey coverage has continued to change in response to population restoration efforts and changes in swan distribution. This report summarizes results of the 2005 North American trumpeter swan survey and compares these data with previous quinquennial survey results (Caithamer 2001).

METHODS

Cooperating observers were requested to assess the abundance and productivity of wild trumpeter swans that were present during the breeding season throughout each survey region. Late summer was the targeted survey period, but some regions delayed efforts until winter to allow swans to congregate from dispersed breeding areas within regions. No efforts were directed at surveying captive swans in 2005.

Survey biologists counted trumpeter swans in each of 2 age classes (cygnet or adult/subadult), and adult/subadult swans were separated into 5 social groups (paired with cygnets, paired without cygnets, single without cygnets, single with cygnets, or members of flocks).

All population estimates were treated as though they were measured without error. Trends in abundance estimates for populations and flocks over the long term (generally 1968-2005) and the last 2 survey periods (2000 and 2005) were calculated through regression of the natural logarithm of survey estimates on year. The estimated annual growth rates (regression slopes) from the long-term regressions were tested for equality to zero (*t*-test). The alpha level (*P* value) used for determining statistical significance was 0.10. In some regions, wild swan populations have been supplemented through restoration releases; in these cases growth rates may overestimate intrinsic growth. Mean brood sizes were calculated by weighting averages from various reporting areas. Temporal trends in the age distributions of flocks were evaluated through linear regression. Adult/subadult ("white") swans for which social status was not determined were excluded from calculation of social group distribution.

Population and flock terminology in this report follows population-specific management plans (Subcommittee on the Interior Population of Trumpeter Swans 1998, Pacific Flyway Council 2002, 2006). Most trumpeter swan reporting regions named in this report can be adequately located using their geographic titles and Figure 1, but additional descriptions for some regions are provided here. Tri-state Area Flock swans nest in southeastern Idaho, southwestern Montana, and western Wyoming; Canadian

Rocky Mountain Population swans nest in this population's range in Canada; and swans in Other U.S. flocks nest within the remaining Rocky Mountain Population range. High Plains Interior Population swans nest from the Rocky Mountain Population's eastern boundary to the western borders of Ontario, Minnesota, and Iowa; Mississippi and Atlantic Flyway swans nest from the last-mentioned borders eastward.

During 2005, managers of Pacific Coast Population trumpeter swans in the Yukon and British Columbia region reconciled historical datasets which prompted slight revision (<4 swans per year) of PCP abundance estimates from previous quinquennial surveys. The reconciled estimates are included in this report and therefore differ slightly from those within previous quinquennial reports.

The 2005 trumpeter swan survey was conducted by numerous individuals and agencies throughout North America between 15 May 2005 and 7 January 2006 (see Appendix A for these dates and other 2005 raw data). The median starting and ending dates for the 2005 survey were 24 August and 14 September, respectively. For comparison, the 2000 survey was conducted 15 April to 25 January with median starting and ending dates of 20 August and 11 September, respectively. Most areas were surveyed aerially or by a network of ground observers similar to efforts during the 2000 survey with 1 exception. Due to warm temperatures and wide dispersal of swans in Minnesota during 2005, the formal survey was not conducted. Minnesota estimates for the 2005 survey were based on periodic ground counts from spring through mid-winter. Generally, survey results in 2005 were believed to be complete censuses, except for northern British Columbia and the Yukon Territory where swan estimates were based on stratified random sample of mapsheets across the probable range of trumpeter swans.

RESULTS

North American Trumpeter Swans

During the 2005 trumpeter swan survey the estimated abundance of all North American trumpeter swans was 34,803, 47% higher than the estimate from the 2000 survey (23,647), and a record-high level since surveys began in 1968 (Tables 1-2, Fig. 2). These data suggest North America's trumpeter swan population increased an average of 7.7% each year during 2000-2005. The estimated rate of growth during 1968-2005 was +6.0% per year ($P < 0.0001$, Table 2). Abundance estimates from the 2005 survey reached record-high levels for each of the 3 recognized populations (see population-specific sections below).

During the 2005 survey 28% of all trumpeter swans observed were cygnets, the third highest proportion on record (1968-2005, Table 3), and a higher proportion than observed during the 2000 survey (22%). Analysis indicated no long-term trend in the percentage of the population comprised of cygnets (Fig. 3, $P = 0.33$). The average brood size in 2005 was 3.10 cygnets, slightly higher than the 2000 value of 3.0.

Survey observers in 2005 indicated trumpeter swans had expanded their range since the 2000 survey in all 4 directions from previously reported range in Alaska, along the Mackenzie River in the Northwest Territories, and to small areas adjacent to the previous range in Alberta, western Wyoming, eastern Saskatchewan, western Manitoba, and southeastern Michigan (Fig. 1).

Pacific Coast Population (PCP)

Abundance estimates of all PCP swans reached a record-high level of 24,928 in 2005, 42% higher than in 2000 (Tables 1-2, Fig. 4). Estimated annual growth rates during 2000-2005 and 1968-2005 averaged +7.0% and +5.8%, respectively (Table 2). In 2005, 27% percent of PCP swans observed were cygnets, higher than in 2000 (19%) and slightly higher than the 1968-2000 average of 26% (Table 3). Analysis showed little indication of a long-term trend in the age distribution of the population (Fig. 3, $P = 0.19$). Average brood size for PCP swans in 2005 was 3.1 cygnets, somewhat higher than in 2000 (2.8).

The abundance estimate of the Alaska flock in 2005 was 23,692 swans, a record-high level and 38%

higher than in 2000 (Tables 1-2). The 2005 estimate of Yukon and northwest British Columbia flock swans was 1,236 (95% CI = 1,114–1,358), also a record high, and 211% higher than in 2000. Additional flock information is provided in Tables 1-4.

Rocky Mountain Population (RMP)

The 2005 survey yielded an estimate of 5,228 RMP trumpeter swans, which was 43% higher than the 2000 estimate, and the highest estimate on record (Tables 1-2, Fig. 5). Estimated average annual growth rates during 2000-2005 and 1968-2005 were +7.1% and +5.4%, respectively. The proportion of observed swans that were cygnets in 2005 was 30%, the same proportion as in 2000, and higher than the 1968-2000 average of 25% (Table 3). Linear regression indicates an increasing trend in the percentage of cygnets in the RMP population during 1968-2005 (+0.33% per year, P = 0.07, Fig. 3). Brood sizes in 2005 averaged 3.0 cygnets, slightly lower than in 2000 (3.1).

During the 2005 survey, the RMP Canadian flocks were estimated to include 4,718 swans, 48% more than in 2000, and the most recorded since 1968 (Tables 1-2). In 2005, there were 453 swans counted in the Tri-state Area Flock, 6% more than in 2000, but fewer than the peak count of 589 in 1990. Although swan abundance in the Tri-state Area Flock remains below the levels of 1968-1990, quinquenniel survey abundance estimates have increased consecutively from 1995 through 2005 (Table 2). The 2005 survey estimated a population of 57 swans in Other U.S. flocks, 1 bird more than observed in 2000. Other U.S flocks are the only regional group that showed significant decline during the 1968-2005 period (-2.6% per year, P = 0.02). Additional flock information is provided in Tables 1-4.

Interior Population (IP)

The 2005 survey indicated a record-high estimate of 4,647 IP swans, an increase of 91% over the 2000 estimate (Tables 1-2, Fig. 6). The IP exhibited the highest average annual growth rate of the 3 trumpeter swan populations, +13.0% during 2000-2005, and +11.7% during 1968-2005. In 2005, 31% percent of IP swans observed were cygnets, similar to the proportion in 2000 and the 1968-2000 average (30% and 29%, respectively; Table 3). The age distribution of the population indicated no long-term trend in the proportion of cygnets (Fig. 3, P = 0.67). Average brood size in 2005 was 3.2 cygnets, lower than the value of 3.6 from the 2000 survey.

The 2005 abundance estimate for Mississippi and Atlantic Flyway trumpeter swans was 4,176 swans, 103% higher than in 2000, and the highest estimate on record. The High Plains flock estimate was 471 swans in 2005, 27% higher than in 2000, and a record-high estimate. Additional flock information is provided in Tables 1-4.

DISCUSSION

Abundance estimates for all North American trumpeter swans and for each of the 3 recognized populations reached record-high levels during the 2005 survey. Estimated average annual growth rates for all populations exceeded 5% (range: 5.4-11.7%) over the long term and 7% (range: 7.0-7.7%) between 2000 and 2005 (Table 2). Additionally, abundance estimates for each of the 7 swan flocks was higher during the 2005 survey than in 2000, although increases for the Tri-state Area and Other U.S. RMP flocks were small. With the exception of Tri-state Area and Other U.S. RMP flocks, estimated annual growth rates for flocks exceeded 4.8% (range: 4.8-23.7%) over the long term and 4.9% (range: 4.9-22.7%) between 2000 and 2005. These growth rates include the effects of swan releases associated with restoration efforts. Only the Tri-state Area and Other U.S. flocks of the RMP exhibited negative growth over the long-term period and showed only slight growth between 2000 and 2005. A more detailed evaluation of population status of these flocks is available (U.S. Fish and Wildlife Service 2005, 2006).

Comparison of abundance estimates from the 2005 quinquennial trumpeter swan survey with numerical goals contained within current management plans for these populations indicate that substantial

accomplishments have been made (Subcommittee on the Interior Population of Trumpeter Swans 1998, Pacific Flyway Council 2002, 2006). The PCP objective is to maintain "not less than 25,000 swans" as measured by quinquennial surveys, compared with the 2005 estimate of 24,929 swans. The RMP management plan goal is "a 5% average annual growth in the number of wintering birds." The short-term and long-term growth rates from the summer/fall quinquennial survey data (7.1% and 5.4%, respectively) would appear to support that goal. However, the RMP plan also contains several flock-specific objectives which have not yet been achieved. The number of IP swans exceeded the management plan's principal population objective of "at least 2,000 birds and 180 successful breeding pairs by 2001" by the time of the 2000 quinquennial survey (2,430 swans and 203 broods [Caithamer 2001]). While significant accomplishments have been made towards reaching goals for all 3 populations, it is noted that each management plan includes additional goals or objectives that have not been achieved.

For all 3 North American trumpeter swan populations, growth rates during 2000-2005 exceeded the average growth rates during 1968-2005 (Table 2) and 1968-2000 (6.0%, 5.0%, and 10.9% for the PCP, RMP, and IP, respectively). No population exhibited a significant decline in the proportion of cygnets composing the surveyed population over the period of survey (*P*-values for any negative trends were greater than 0.19). Notwithstanding challenges regarding swan habitats and migratory behaviors, prospects for continued growth of North America's trumpeter swan populations appear promising.

ACKNOWLEDGMENTS

Data for the 2005 North American trumpeter swan survey were collected by numerous individuals employed by many agencies, volunteers, and citizens who reported incidental swan observations. The compiler apologizes for any cooperators omitted from Appendix B. Regional surveys were coordinated or summarized by B. Bales, G. Beyersbergen, B. Bortner, A. Breault, S. Comeau-Kingfisher, B. Conant, J. Cornely, J. Dubovsky, D. Groves, C. Harris, J. Hawkings, D. Hoffman, T. Hogrefe, J. Johnson, S. Kittelson, H. Lumsden, S. Matteson, D. Sherman, and B. Swift. The cooperation of Canadian Wildlife Service and the Trumpeter Swan Society was integral to survey completion. R. Oates, R. Trost, and B. Millsap helped secure and administer Fish and Wildlife Service funding for the 2005 survey. The cover photograph was provided by J. Cornely. J. Dubovsky, M. Koneff, R. Shea, and K. Wilkins provided helpful comments on earlier drafts of this report.

LITERATURE CITED

Caithamer, D. F., compiler. 2001. Trumpeter swan population status, 2000. U.S. Fish and Wildlife Service. Washington, D.C.

U.S. Fish and Wildlife Service. 2005. Trumpeter swan survey of the Rocky Mountain Population, U.S. Breeding Segment – Fall 2005. U.S. Fish and Wildlife Service report. Denver, Colorado.

U.S. Fish and Wildlife Service. 2006. Trumpeter swan survey of the Rocky Mountain Population – Winter 2006. U.S. Fish and Wildlife Service report. Denver, Colorado.

Subcommittee on the Interior Population of Trumpeter Swans. 1998. Mississippi and Central Flyway Management Plan for the Interior Population of Trumpeter Swans. Mississippi and Central Flyway Councils [c/o U.S. Fish and Wildlife Service]. Twin Cities, Minnesota.

Pacific Flyway Council. 2006. Pacific Flyway management plan for the Pacific Coast Population of Trumpeter Swans. Pacific Flyway Study Committee [c/o U.S. Fish and Wildlife Service]. Portland, Oregon.

Pacific Flyway Council. 2002. Pacific Flyway management plan for the Rocky Mountain Population of Trumpeter Swans. Pacific Flyway Study Committee [c/o U.S. Fish and Wildlife Service]. Portland, Oregon.

Table 1. Demographics of Pacific Coast, Rocky Mountain, and Interior populations of trumpeter swans during the 2005 North American trumpeter swan survey.

Population and flock	Total swans	White swans[1]	Cygnets	% cygnets	Broods	Mean brood size[2]	
						x	*n*
Pacific Coast Population							
Alaska	23,692	17,245	6,447	27	2,084	3.09	2,084
Yukon and northwestern British Columbia	1,236	867	369	30	100	3.74	72
Total Pacific Coast Population	24,928	18,112	6,816	27	2,184	3.11	2,156
Rocky Mountain Population							
Canadian	4,718	3,270	1,448	31	470	3.03	358
Tri-state Area Flock	453	355	98	22	34	2.81	32
Other U.S. flocks	57	49	8	14	4	2.00	4
Total Rocky Mountain Population	5,228	3,674	1,554	30	508	3.00	394
Interior Population							
High Plains	471	362	109	23	41	2.32	41
Mississippi and Atlantic Flyways	4,176	2,858	1,318	32	219	3.39	219
Total Interior Population	4,647	3,220	1,427	31	260	3.22	260
North American total	34,803	25,006	9,797	28	2,952	3.10	2,810

[1] Adult and subadult swans.

[2] Weighted mean based on number of broods of known size observed in each survey area.

Table 2. Estimates of abundance and average annual growth rates of North American trumpeter swans from quinquennial surveys, 1968-2005[1]

	Year of survey								Annual growth rate	Annual growth rate[3]
Population and flock	1968	1975	1980	1985	1990	1995	2000	2005	2000-2005	1968-2005
Pacific Coast Population										
Alaska	2,847	4,170	7,696	9,459	13,337	15,823	17,155	23,692	+6.5%	+5.6%**
Yukon and northwestern British Columbia				41	119	492	397	1,236	+22.7%	+16.0%*
Total Pacific Coast Population	2,847	4,170	7,696	9,500	13,456	16,315	17,552	24,928	+7.0%	+5.8%**
Rocky Mountain Population										
Canadian	106	131[2]	379	614	1,117	2,076	3,183	4,718	+7.9%	+11.1%**
Tri-state Area Flock	585	537[2]	485	507	589	364	426	453	+1.2%	-0.8%
Other U.S. flocks	120	131	111	74	41	77	56	57	+0.3%	-2.6%*
Total Rocky Mountain Population	811	799[2]	975	1,195	1,747	2,517	3,665	5,228	+7.1%	+5.4%**
Interior Population										
High Plains	64	116	164	158	185	240	370	471	+4.8%	+4.9%**
Mississippi and Atlantic Flyways	0	0	12	51	237	687	2,060	4,176	+14.1%	+23.7%**
Total Interior Population	64	116	176	209	422	927	2,430	4,647	+13.0%	+11.7%**
North American total	3,722	5,085	8,847	10,904	15,625	19,759	23,647	34,803	+7.7%	+6.0%**

[1] Estimates for 1968-2000 were from Caithamer (2001). Data for Yukon and nw British Columbia Pacific Coast swans 1985-2000 were revised slightly in 2005 (see methods).

[2] Estimates reported in 1975 were obtained in 1974 or 1975.

[3] Asterisks denote significance of regression slopes at the following *P*-values: * = $P < 0.05$, ** = $P < 0.0001$.

Table 3. Age distribution (percent cygnets) of North American trumpeter swans observed during quinquennial surveys, 1968-2005[1].

Population and flock	1968	1975	1980	1985	1990	1995	2000	2005
Pacific Coast Population								
Alaska	32	28	32	18	27	24	19	27
Yukon and northwestern British Columbia				15	37	39	26	30
Total Pacific Coast Population	32	28	32	18	27	25	19	27
Rocky Mountain Population								
Canadian	29	33[2]	27	30	32	30	32	31
Tri-state Area Flock	26	15[2]	5	27	25	15	24	22
Other U.S. flocks	18	18	31	8	27	14	13	14
Total Rocky Mountain Population	25	18[2]	16	28	30	28	30	30
Interior Population								
High Plains	33	30	27	40	34	21	28	23
Mississippi and Atlantic Flyways			0	14	27	26	30	32
Total Interior Population	33	30	25	33	30	25	30	31
North American total	31	27	30	19	27	25	22	28

[1] Estimates for 1968-2000 were from Caithamer (2001).

[2] Estimates reported in 1975 were obtained in 1974 or 1975.

Table 4. Social status of adult and subadult[1] trumpeter swans observed during the 2005 North American trumpeter swan survey.

Population and flock	Paired (%)	Single (%)	In flocks (%)	Swans categorized
Pacific Coast Population				
Alaska	69.2	6.7	24.1	17,245
Yukon and northwestern British Columbia	65.1	4.8	30.1	867
Total Pacific Coast Population	69.0	6.6	24.4	18,112
Rocky Mountain Population				
Canadian	76.1	5.3	18.6	3,270
Tri-state Area Flock	53.0	7.3	39.7	355
Other U.S. flocks	65.3	2.0	32.7	49
Total Rocky Mountain Population	73.7	5.4	20.9	3,674
Interior Population				
High Plains	70.7	6.4	22.9	362
Mississippi and Atlantic Flyways	62.3	3.2	34.5	1,114
Total Interior Population	64.4	4.0	31.6	1,476
North American total	69.5	6.2	24.3	23,262

[1]Table entries exclude adults for which social status was not determined.

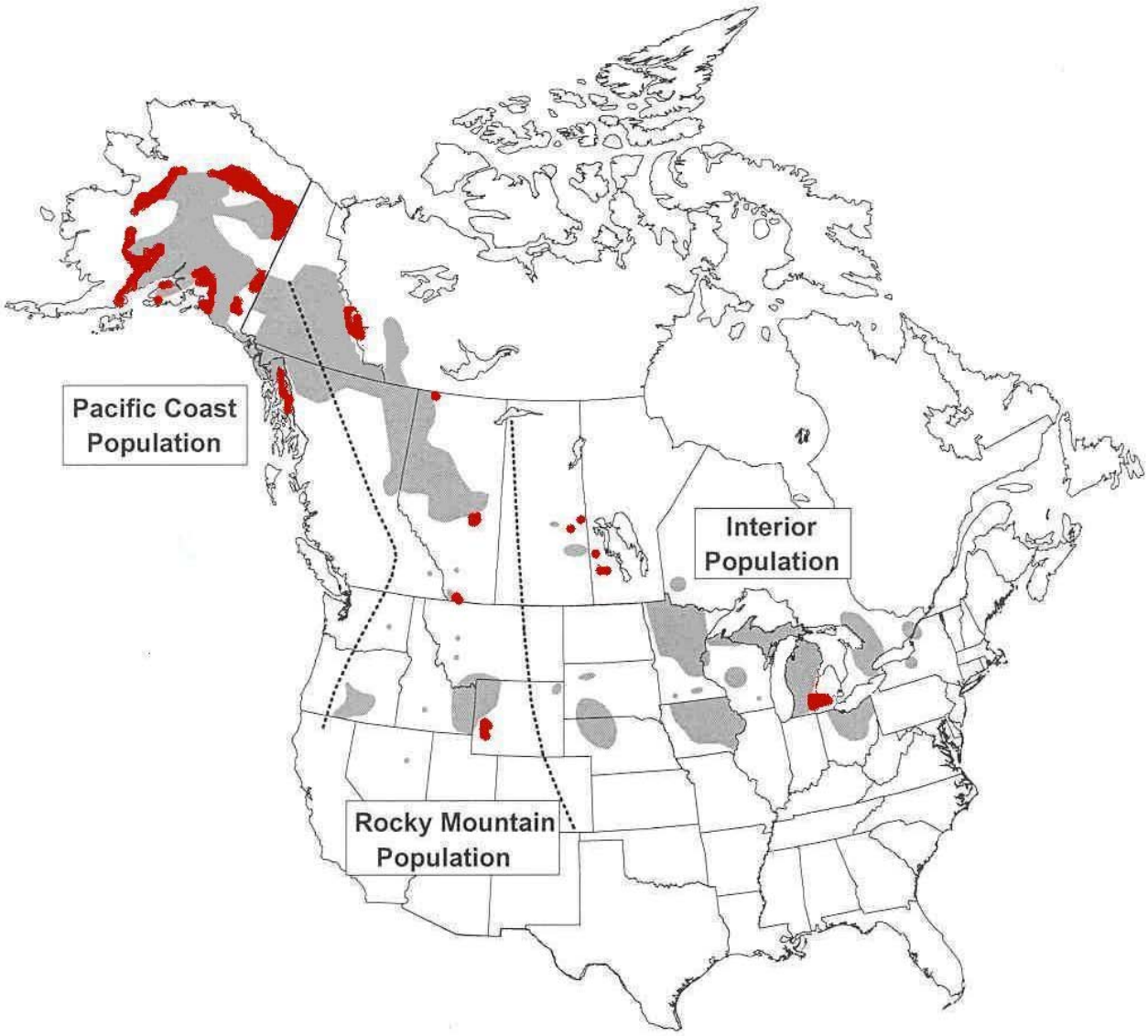

Fig. 1. Approximate breeding range of Pacific Coast, Rocky Mountain, and Interior populations of trumpeter swans. Trumpeter swan range expansion reported by survey biologists during the 2005 North American trumpeter swan survey is shown in red.

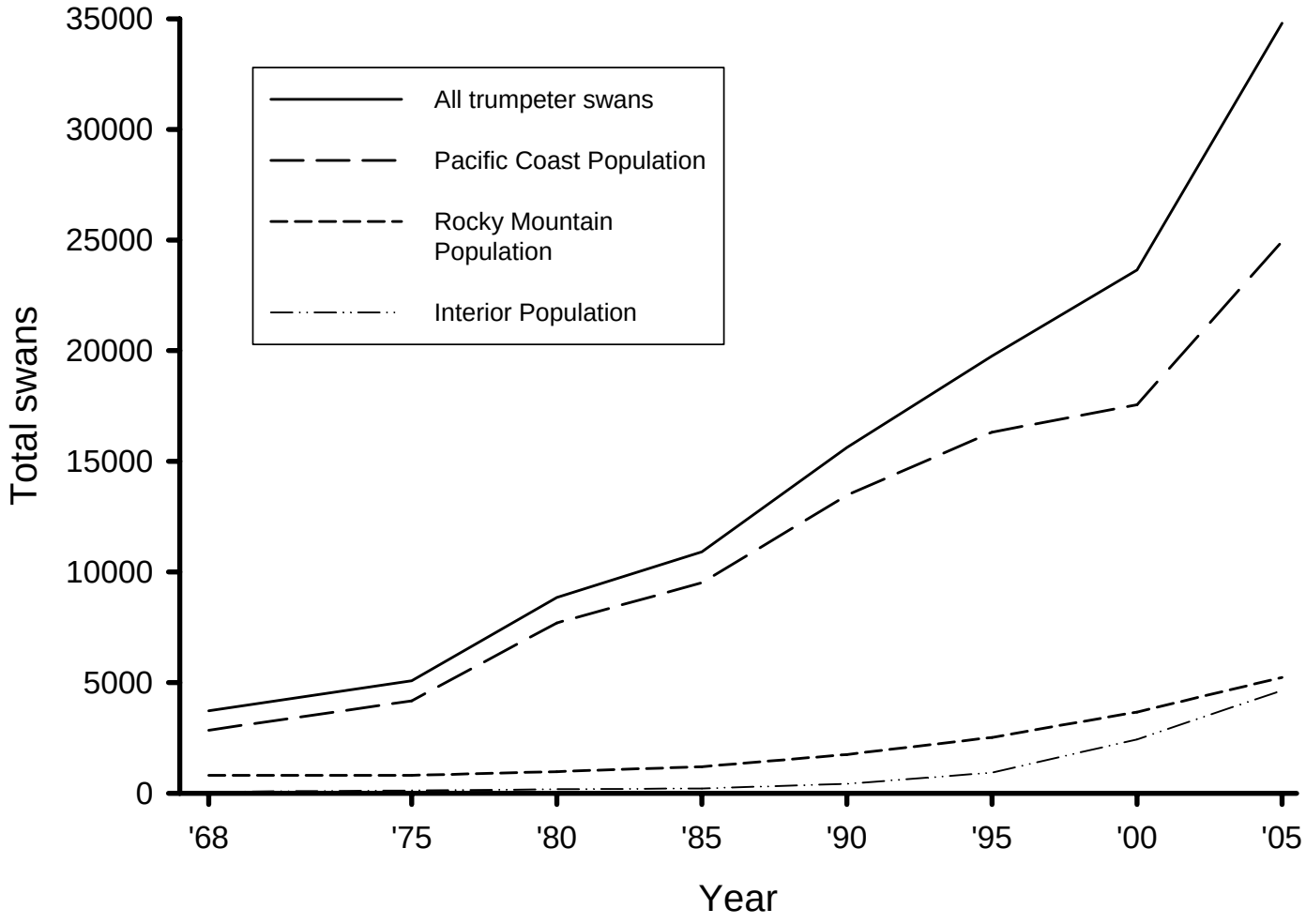

Fig. 2. Total North American and population-specific trumpeter swan abundance estimates resulting from quinquennial trumpeter swan surveys, 1968-2005.

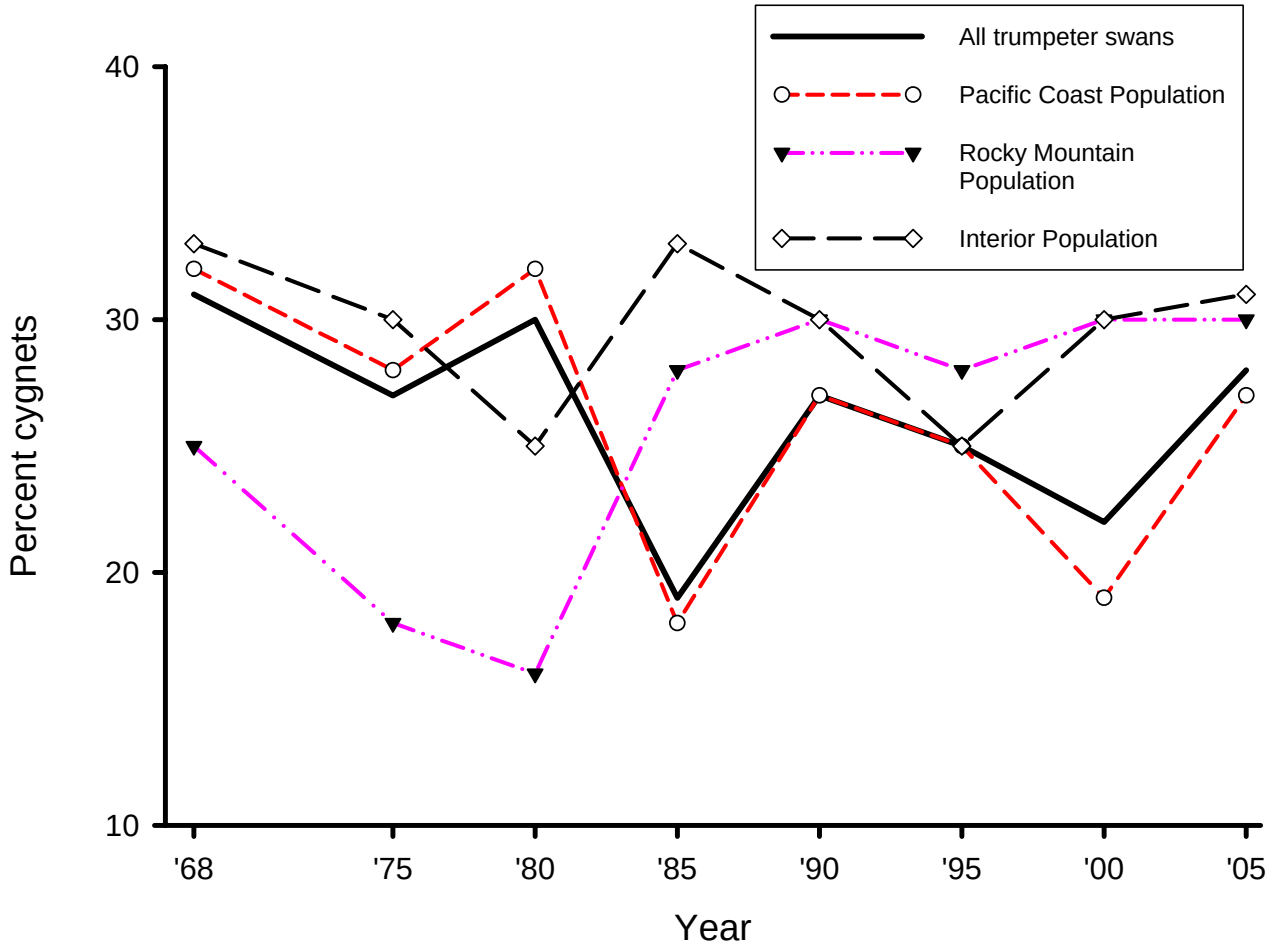

Fig. 3. Age distribution (percent cygnets) of North American trumpeter swans observed during quinquennial trumpeter swan surveys, 1968-2005.

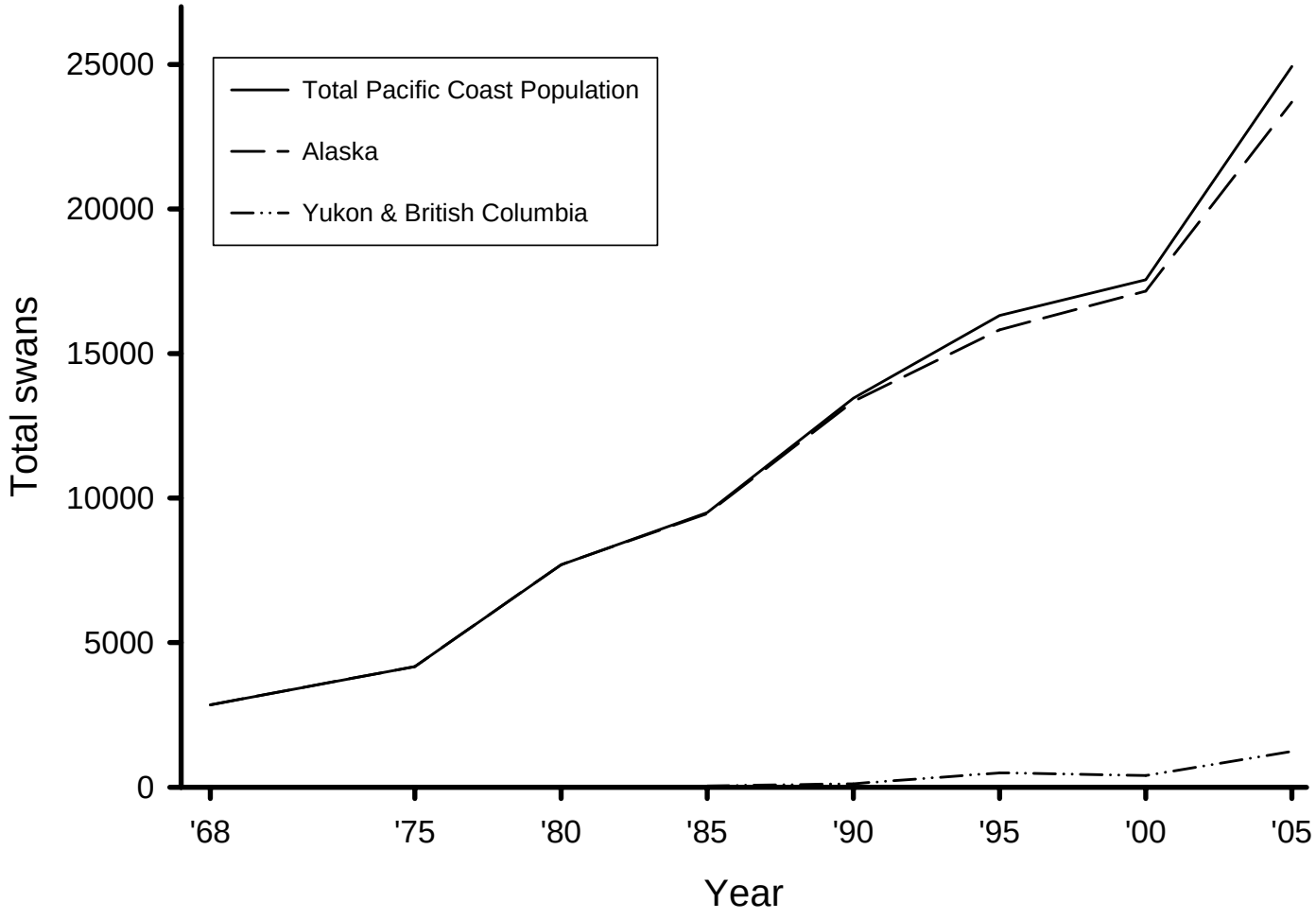

Fig. 4. Pacific Coast Population trumpeter swan abundance estimates resulting from quinquennial trumpeter swan surveys, 1968-2005.

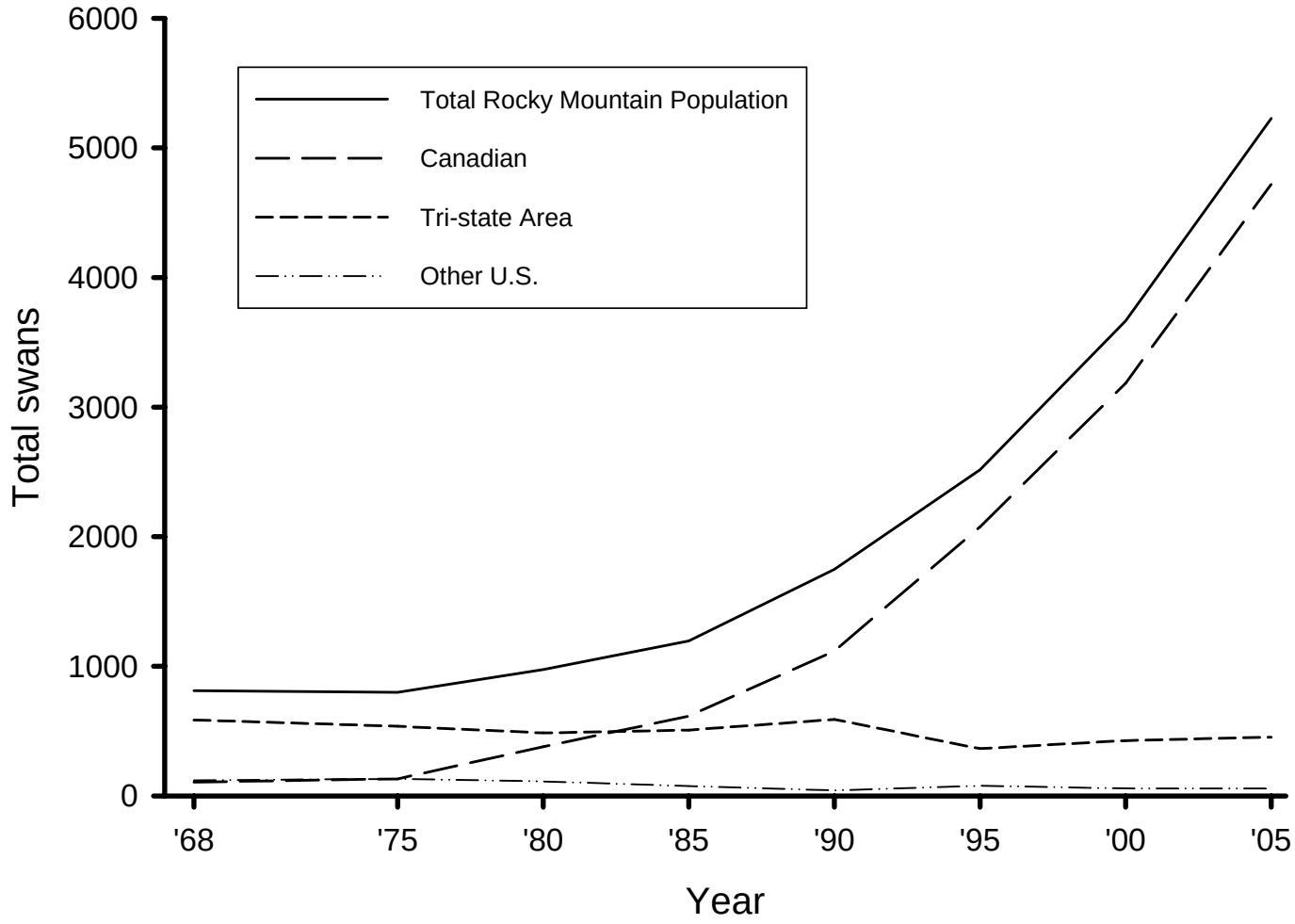

Fig. 5. Rocky Mountain Population trumpeter swan abundance estimates resulting from quinquennial trumpeter swan surveys, 1968-2005.

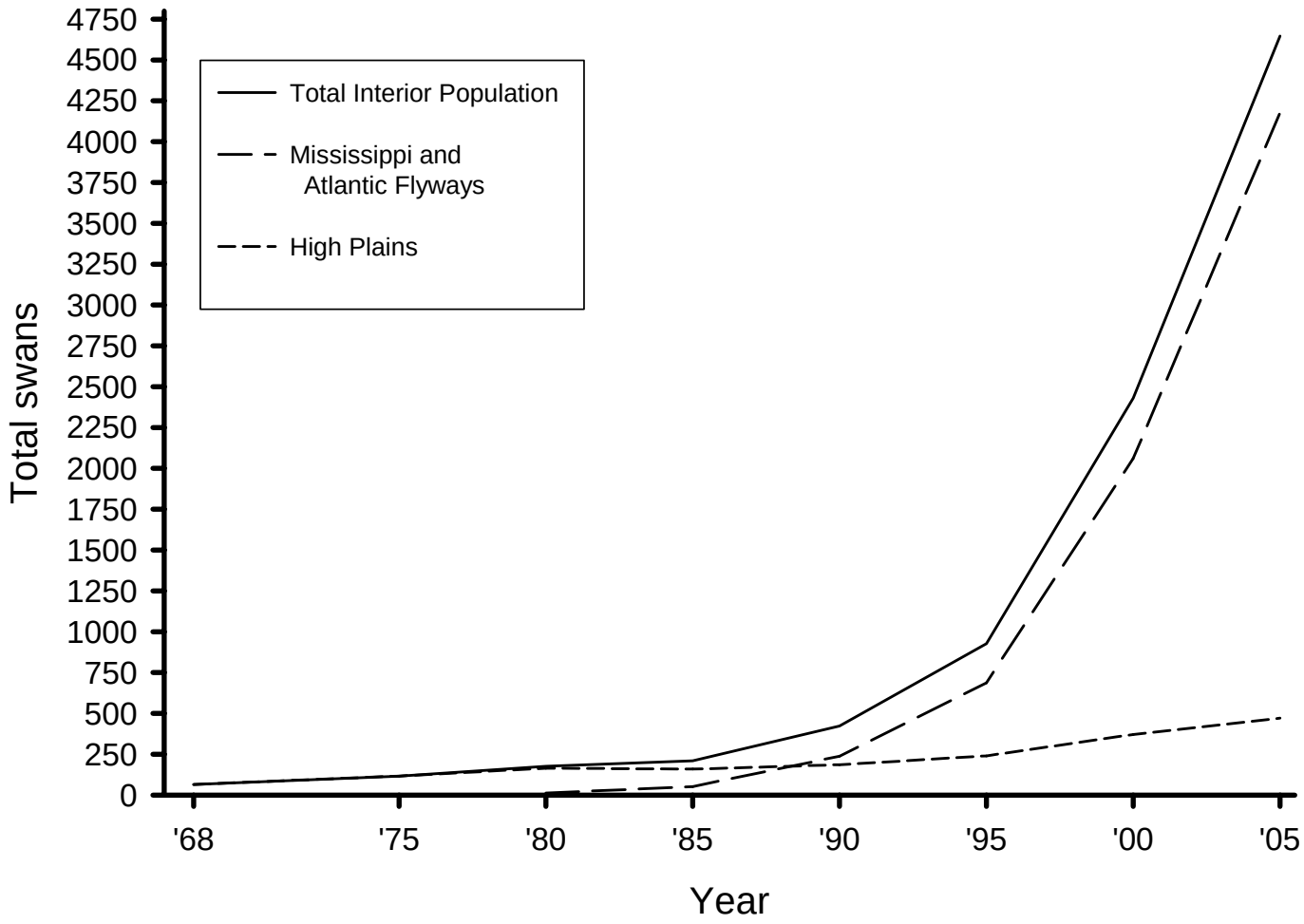

Fig. 6. Interior Population trumpeter swan abundance estimates resulting from quinquennial trumpeter swan surveys, 1968-2005.

Appendix A. Raw data from the 2005 North American trumpeter swan survey.

Population	Flock	Region	State or Province	2005 start	2005 end	Method[1]	Coverage[2]	Adults	Cygnets	Total swans	Flocked adults	Flocks
Pacific Coast	Pacific	AK	AK	20-Jul-05	8-Sep-05	1	1	17245	6447	23692	4148	658
Pacific Coast	Pacific	YK & n. BC	YK & BC	11-Aug-05	20-Aug-05	1	2	868	369	1236	261	60
Rocky Mountain	Canadian	YK & n. BC	YK & BC	11-Aug-05	26-Aug-05	1	2	1194	599	1793	67	15
Rocky Mountain	Canadian	BC - ne	BC	13-Aug-05	18-Aug-05	1	1	438	152	590	66	17
Rocky Mountain	Canadian	BC - se	BC	24-Aug-05	24-Aug-05	1	1	138	51	189	30	6
Rocky Mountain	Canadian	NWT	NWT	24-Aug-05	8-Sep-05	1	1	327	88	415	73	11
Rocky Mountain	Canadian	AB	AB	24-Aug-05	14-Sep-05	1	1	1173	558	1731	374	46
Rocky Mountain	Canadian	SK	SK	5-Jul-05	5-Jul-05	2	1	0	0	0	0	0
Rocky Mountain	Tri-state Area	MT	MT	14-Sep-05	27-Sep-05	1	1	112	40	152	57	7
Rocky Mountain	Tri-state Area	WY	WY	14-Sep-05	15-Sep-05	5	1	107	36	143	29	5
Rocky Mountain	Tri-state Area	ID	ID	16-Sep-05	17-Sep-05	1	1	136	22	158	55	13
Rocky Mountain	Other U.S.	Ruby Lake	NV	14-Sep-05	14-Sep-05	1	1	17	0	17	3	1
Rocky Mountain	Other U.S.	Malheur	OR	19-Sep-05	19-Sep-05	2	1	20	5	25	10	2
Rocky Mountain	Other U.S.	Summer L.	OR	29-Sep-05	29-Sep-05	5	3	3	0	3	3	1
Rocky Mountain	Other U.S.	OR - other	OR	29-Sep-05	29-Sep-05	5	3	9	3	12	0	0
Interior	High Plains	SD	SD	8-Sep-05	10-Sep-05	1	1	73	10	83	39	7
Interior	High Plains	NE	NE	8-Sep-05	10-Sep-05	1	1	211	64	275	31	8
Interior	High Plains	WY	WY	8-Sep-05	10-Sep-05	**?**	**?**	0	0	0	0	0
Interior	High Plains	MB	MB	19-Aug-05	30-Aug-05	1	1	25	10	35	0	0
Interior	High Plains	SK	SK	21-Aug-05	21-Aug-05	1	1	53	25	78	13	4
Interior	MS & AT Flyway	ON	ON	15-May-05	7-Jan-06	5	1	454	190	644		
Interior	MS & AT Flyway	MN	MN	May[4]	Mid-winter	2	4	1421	579	2000		
Interior	MS & AT Flyway	WI	WI	15-May-05	6-Oct-05	5	1	186	245	431		
Interior	MS & AT Flyway	MI	MI	15-Aug-05	30-Nov-05	5	1	540	188	728	249	22
Interior	MS & AT Flyway	IA	IA	26-Sep-05	10-Oct-05	2	1	202	67	269	131	87
Interior	MS & AT Flyway	OH	OH	10-Sep-05	20-Sep-05	5	1	45	46	91	4	1
Interior	MS & AT Flyway	NY	NY	1-Jul-05	15-Sep-05	5	1	10	3	13	0	0

Appendix A. Continued.

Population	Flock	Region	State or Province	Pairs with cygnets	Pairs without cygnets	Total pairs	Singles with cygnets	Singles without cygnets	Total broods	Mean brood size	n for brood size[3]
Pacific Coast	Pacific	AK	AK	2023	3947	5970	60	1097	2084	3.09	2084
Pacific Coast	Pacific	YK & n. BC	YK & BC	98	184	282	2	40	100	3.74	72
Rocky Mountain	Canadian	YK & n. BC	YK & BC	182	347	529	1	68	183	3.31	71
Rocky Mountain	Canadian	BC - ne	BC	65	108	173	0	26	65	2.38	65
Rocky Mountain	Canadian	BC - se	BC	19	34	53	0	2	19	2.68	19
Rocky Mountain	Canadian	NWT	NWT	37	79	116	0	22	37	2.38	37
Rocky Mountain	Canadian	AB	AB	163	210	373	3	50	166	3.36	166
Rocky Mountain	Canadian	SK	SK	0	0	0	0	0	0		0
Rocky Mountain	Tri-state Area	MT	MT	13	12	25	0	5	15	2.46	13
Rocky Mountain	Tri-state Area	WY	WY	8	23	31	3	13	11	3.27	11
Rocky Mountain	Tri-state Area	ID	ID	8	30	38	0	5	8	2.75	8
Rocky Mountain	Other U.S.	Ruby Lake	NV	0	7	7	0	0	0		0
Rocky Mountain	Other U.S.	Malheur	OR	3	2	5	0	0	3	1.67	3
Rocky Mountain	Other U.S.	Summer L.	OR	0	0	0	0	0	0	0.00	0
Rocky Mountain	Other U.S.	OR - other	OR	1	3	4	0	1	1	3.00	1
Interior	High Plains	SD	SD	5	12	17	0	0	5	2.00	5
Interior	High Plains	NE	NE	25	57	82	2	14	24	2.09	24
Interior	High Plains	WY	WY	0	0	0	0	0	0	0.0	
Interior	High Plains	MB	MB	3	7	10	0	5	3	3.33	3
Interior	High Plains	SK	SK	9	10	19	0	2	9	2.78	92
Interior	MS & AT Flyways	ON	ON	50	15	65	1		52	3.80	52
Interior	MS & AT Flyways	MN	MN[4]								
Interior	MS & AT Flyways	WI	WI	68	25	93			68	3.60	68
Interior	MS & AT Flyways	MI	MI	58	77	135	3	18	61	3.08	61
Interior	MS & AT Flyways	IA	IA	20	11	31	1	8	21	3.19	21
Interior	MS & AT Flyways	OH	OH	13	5	18	3	2	16	2.88	16
Interior	MS & AT Flyways	NY	NY	1	4	5	0	0	1	3.00	1

[1]Survey method (1 = aerial, 2 = ground, 3 = other, 5 = combination of methods).

[2]Extent of survey coverage (1 = believed complete census, 2 = sample of entire range, 3 = census of part of range).

[3]Number of broods observed to estimate mean brood size.

[4] MN survey not formally conducted in 2005. Estimates are based on periodic ground counts from spring through mid-winter.

Appendix B. Participants and cooperators in the 2005 North American trumpeter swan survey.

Akaran, J.	U.S. Fish and Wildlife Service
Anderson, P.	U.S. Fish and Wildlife Service
Andrews, R.	Iowa Department of Natural Resources
Arbuckle, R.	Ducks Unlimited Canada
Ball, G.	Manitoba Department of Natural Resources
Barber, J.	Ohio Division of Wildlife
Bazin, R.	Canadian Wildlife Service
Bertram, M.	U.S. Fish and Wildlife Service
Betts, T.	National Park Service
Beyersbergen, G.	Canadian Wildlife Service
Boersen, M.	Michigan Department of Natural Resources
Bogaczyk, B.	U.S. Forest Service
Bollinger, K.	U.S. Fish and Wildlife Service
Bortner, B.	U.S. Fish and Wildlife Service
Brackney, A.	U.S. Fish and Wildlife Service
Brazeau Brown, M.	Private
Breault, A.	Canadian Wildlife Service
Bronson, J.	Wisconsin Department of Natural Resources
Bryant, J.	U.S. Fish and Wildlife Service
Buchholtz, C.	U.S. Fish and Wildlife Service
Cameron, S.	Parks Canada Agency
Carey, C.	Oregon Department of Fish and Wildlife
Carlson, E.	Michigan Department of Natural Resources
Cassinelli, R.	U.S. Fish and Wildlife Service
Catterson, N.	U.S. Forest Service
Chapman, D.	Montana Aircraft, Inc.
Clark, J.	Alberta Sustainable Resource Development
Collins, G.	U.S. Fish and Wildlife Service
Comeau-Kingfisher, S.	U.S. Fish and Wildlife Service
Conant, B.	U.S. Fish and Wildlife Service
Corcoran, R.	U.S. Fish and Wildlife Service
Cornely, J.	U.S. Fish and Wildlife Service
Cozzolino, S.	New York Division of Fish, Wildlife, and Marine Resources
Dau, C.	U.S. Fish and Wildlife Service
Denison, D.	Alpine Aviation
Denton, J.	U.S. Bureau of Land Management
Dubovsky, J.	U.S. Fish and Wildlife Service
Eckler, J.	New York Division of Fish, Wildlife, and Marine Resources
Eckstein, R.	Wisconsin Department of Natural Resources
Eldridge, B.	U.S. Fish and Wildlife Service
Ellis. J.	U.S. Fish and Wildlife Service
Eskowich, K.	Ducks Unlimited Canada
Ficht, B.	Private
Ficht, J.	Alberta Sustainable Resource Development
Fischer, J.	U.S. Fish and Wildlife Service
Foerster, S.	Catteraquai Conservation Authority
Found, C.	Alberta Sustainable Resource Development
Fountain, R.	Wye Marsh Wildlife Management Area
Fremmerlid, M.	Slave Air
French, R.	Michigan Department of Natural Resources
Frey, S.	Parks Canada Agency

Appendix B. Continued.

Gibbons, M.	Parks Canada Agency
Gingras, B.	Canadian Wildlife Service
Gonion, S.	U.S. Fish and Wildlife Service
Greene, R.	Wisconsin Department of Natural Resources
Grimes, S.	U.S. Fish and Wildlife Service
Groves, D.	U.S. Fish and Wildlife Service
Guldager, N.	National Park Service
Hall, W.	Wisconsin Department of Natural Resources
Hans, M.	U.S. Fish and Wildlife Service
Hardy, D.	Wisconsin Department of Natural Resources
Harrison, B.	Ducks Unlimited Canada
Hartley, J.	Alberta Public Lands Department
Harwood, C.	U.S. Fish and Wildlife Service
Hawkings, J.	Canadian Wildlife Service
Hayes, S.	Parks Canada Agency
Heckbert, M.	Alberta Sustainable Resource Development
Henniger, E.	Private
Hobson, D.	Alberta Sustainable Resource Development
Hodges, J.	U.S. Fish and Wildlife Service
Hoffman, D.	Iowa Department of Natural Resources
Hogrefe, T.	Michigan Department of Natural Resources
Hopp, J.	Wisconsin Department of Natural Resources
Hubbs, A.	Alberta Sustainable Resource Development
Huhndorf, J.	U.S. Fish and Wildlife Service
Ivey, G.	The Trumpeter Swan Society
Johnson, B.	Alberta Sustainable Resource Development
Johnson, J.	Kellogg Bird Sanctuary
Jozwiak, E.	U.S. Fish and Wildlife Service
Kaye, R.	Parks Canada Agency
King, J.	U.S. Fish and Wildlife Service
King, R.	U.S. Fish and Wildlife Service
Kingdon, B.	Private
Kittelson, S.	Minnesota Department of Natural Resources
Koerner, T.	U.S. Fish and Wildlife Service
Kunnas, F.	Alberta Sustainable Resource Development
Labrie, G.	Slave Air
Larned, B.	U.S. Fish and Wildlife Service
Latour, P.	Canadian Wildlife Service
Linck, M.	Three Rivers Park
Liston, J.	Private
Logan, D.	U.S. Forest Service
Long, B.	Wyoming Wetland Society
Lumsden, H.	Ontario Ministry of Natural Resources, retired
Lust, G.	Mountain Air Research
MacDougal, K.	Parks Canada Agency
Mackay, J.	U.S. Fish and Wildlife Service
Mallek, E.	U.S. Fish and Wildlife Service
Manthey, P.	Wisconsin Department of Natural Resources
Matteson, S.	Wisconsin Department of Natural Resources
McEneaney, T.	U.S. National Park Service
McIntyre, C.	U.S. National Park Service

Appendix B. Continued.

Miller, P.	Wisconsin Department of Natural Resources
Mills, T.	U.S. Fish and Wildlife Service
Mitchell, C. D.	U.S. Fish and Wildlife Service
Mulders, D.	Canadian Wildlife Service
Nelson, J.	Wisconsin Department of Natural Resources
Niewoonder, J.	Michigan Department of Natural Resources
Oates, R.	U.S. Fish and Wildlife Service
Oehlers, S.	U.S. Forest Service
Olson, D.	U.S. Fish and Wildlife Service
Paisley, R.	Wisconsin Department of Natural Resources
Parker, M.	U.S. Fish and Wildlife Service
Parton, B.	New York Division of Fish, Wildlife, and Marine Resources
Patla, S.	Wyoming Fish and Game
Paul, C.	Allison Air Service
Porter, R.	Private landowner Alberta
Pryor, P.	Canadian Wildlife Service
Quinlan, R.	Alberta Sustainable Resource Development
Racchini, C.	U.S. Forest Service
Raynes, B	Jackson Hole Bird Club president
Reid, M.	National Park Service
Rifleman, R.	Private
Rising, G.	Private
Roblee, K.	New York Division of Fish, Wildlife, and Marine Resources
Rogers, K.	U.S. Bureau of Land Management
Roy, R.	U.S. Fish and Wildlife Service
Sallows, T.	Parks Canada Agency
Schmidt, J.	University of Alaska, Fairbanks
Scotton, B.	U.S. Fish and Wildlife Service
Shea, R.	The Trumpeter Swan Society
Sherman, D.	Ohio Division of Wildlife
Simpson, B.	Dauphin Air
Simpson, F.	Ducks Unlimited Canada
Sitar, K.	Michigan Department of Natural Resources
Spindler, M.	U.S. Fish and Wildlife Service
Sprenger, J.	Wisconsin Department of Natural Resources
Stepniski, D.	Alberta Sustainable Resource Development
St. Louis, M.	Oregon Department of Fish and Wildlife
Stradley, R.	U.S. National Park Service
Swift, B.	New York Division of Fish, Wildlife, and Marine Resources
Tate, D.	Parks Canada Agency
Terwilliger, M.	National Park Service
Tesky, L.	Wisconsin Department of Natural Resources
Thompson, P.	U.S. Forest Service
Tibbels, A.	Ohio Division of Wildlife
Timm, H.	U.S. Fish and Wildlife Service
Trost, R.	U.S. Fish and Wildlife Service
Visser, L.	Michigan Department of Natural Resources
Vivion, M.	U.S. Fish and Wildlife Service
Weeks, J.	Michigan Department of Natural Resources
Weinfurter, M.	Wisconsin Department of Natural Resources
Wilson, H.	U.S. Fish and Wildlife Service
Witt, M.	Ohio Division of Wildlife

Wright, K.	Alberta Conservation Association
Wynbrandt, J.	Private
Zroback, F.	Ontario Ministry of Natural Resources

U.S. Department of the Interior
U.S. Fish & Wildlife Service

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